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**NUCLEAR REGULATORY COMMISSION**

Title: Entergy Nuclear Vermont Yankee

Docket Number: 50-271-LR; ASLBP No. 06-849-03-LR

Location: Newfane, Vermont

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

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ATOMIC SAFETY AND LICENSING BOARD

HEARING

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In the Matter of: ||  
 ENTERGY NUCLEAR VERMONT ||  
 YANKEE, LLC || Docket No. 50-271-LR  
 and || ASLB No. 06-849-03-LR  
 ENTERGY NUCLEAR OPERATIONS, ||  
 INC. (Vermont Yankee Nuclear ||  
 Power Station) ||

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Wednesday, July 23, 2008

Windham County Superior Court  
7 Court Street  
Newfane, Vermont

BEFORE:

ALEX S. KARLIN, Chair, Administrative Judge  
RICHARD E. WARDWELL, Administrative Judge  
WILLIAM REED, Administrative Judge

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PROCEEDINGS

8:31 A.M.

1  
2  
3 JUDGE KARLIN: Good morning. I'm Alex  
4 Karlin. This Board, Atomic Safety and Licensing  
5 Board, is now reconvening here on July 23rd in the  
6 matter of Entergy's application for a license renewal  
7 for its Vermont Yankee facility.

8 Today, we're going to turn to contention  
9 3 in this matter, NEC and the State of Vermont have a  
10 contention which I will read here just for setting the  
11 stage. As I have it, "Entergy's license renewal  
12 application does not include an adequate plan to  
13 monitor and manage aging of the steam dryer during the  
14 period of extended operation." So that's the bare  
15 bones of the words of the contention as it's been  
16 admitted.

17 What I will do this morning is have the  
18 witnesses for this contention brought into the witness  
19 box and sworn in and then ask the attorneys for the  
20 parties to introduce the exhibits that are relevant  
21 and that they're presenting relevant to this  
22 contention so that's what I was planning to do.

23 Do either of my colleagues have anything  
24 they'd like to say on the outset this morning?

25 Anything from the counsel for the parties,

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1 procedurally or otherwise we need to talk about this  
2 morning?

3 So we're ready to go with contention 3.  
4 Great.

5 With that, perhaps I -- are all the  
6 witnesses seated? Dr. Hopfenfeld, you'll probably need  
7 him over there as well.

8 And Ms. Carpentier will put up the name  
9 tags. This is helpful to us.

10 (Pause.)

11 Great, thank you. Could I ask you all to  
12 please rise and raise your right hand.

13 (The witnesses were sworn.)

14 Thank you. Please be seated.

15 Welcome. We are hopeful that this  
16 contention 3 might not take as long as contention 2  
17 and if the thickness of the submissions by the parties  
18 is any indication, we may have some reason for hoping  
19 it will be shorter than contention 2. So welcome.

20 I guess I would now ask counsel for  
21 Entergy to have your witnesses introduce whatever  
22 exhibits you so have appropriately.

23 MR. LEWIS: Judge Karlin, Mr. Diaz will  
24 introduce the first one.

25 JUDGE KARLIN: Mr. Diaz, go ahead.

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1 MR. TRAVIESCO-DIAZ: Thank you, Mr.  
2 Chairman.

3 Mr. Hopenfeld, will you please state your  
4 full name for the record?

5 MR. HOFFMAN: John R. Hoffman.

6 JUDGE KARLIN: Everyone needs to speak up  
7 as much as they can, please.

8 (Off the record.)

9 JUDGE KARLIN: Mr. Diaz, please continue.

10 MR. TRAVIESCO-DIAZ: Mr. Lukens, will you  
11 please state your full name for the record?

12 MR. LUKENS: Larry D. Lukens.

13 MR. TRAVIESCO-DIAZ: Mr. Hoffman and Mr.  
14 Lukens --

15 JUDGE KARLIN: Please also speak up so the  
16 people can hear you.

17 MR. TRAVIESCO-DIAZ: Mr. Hoffman and Mr.  
18 Lukens, do you have in front of you a document bearing  
19 the caption of this proceeding entitled "Joint  
20 Declaration of John R. Hoffman and Larry D. Lukens in  
21 NRC Contention 3"?

22 MR. LUKENS: Yes, I do.

23 MR. HOFFMAN: Yes.

24 MR. TRAVIESCO-DIAZ: Did you prepare this  
25 document for use in this proceeding?

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1 MR. LUKENS: Yes.

2 MR. HOFFMAN: Yes.

3 MR. TRAVIESCO-DIAZ: Do you have any  
4 corrections to make to this testimony?

5 MR. LUKENS: Yes, I have.

6 MR. TRAVIESCO-DIAZ: Will you please state  
7 what those corrections are?

8 MR. LUKENS: In the testimony, answer 46,  
9 line 7 which is the last line of the table, change the  
10 number 47\*\*(71.2 percent) to 48\*\*(72.7).

11 MR. TRAVIESCO-DIAZ: And that's on page  
12 25?

13 Please proceed.

14 MR. LUKENS: On page 25, answer 46, line  
15 12 which is the first footnote, the first line of  
16 footnote \*\*, change 47 previous indications were re-  
17 identified: 19 to 48 previous indications were  
18 previously identified; 27.

19 On page 25, line 14 which is the third  
20 line of that footnote, delete the word either between  
21 2007 and the word do and page 25, line 15 which is the  
22 fourth line of that footnote, change the phrase  
23 conditions or because the previous indication was to  
24 conditions and nine previous indications were.

25 MR. TRAVIESCO-DIAZ: With those

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1 corrections, is this testimony true and correct to the  
2 best of your knowledge?

3 MR. LUKENS: Yes.

4 MR. HOFFMAN: Yes.

5 MR. TRAVIESCO-DIAZ: Do you adopt it as  
6 your direct testimony in this proceeding?

7 MR. LUKENS: Yes.

8 MR. HOFFMAN: Yes.

9 MR. TRAVIESCO-DIAZ: Mr. Chairman, I move  
10 that the declaration of John R. Hoffman and Larry D.  
11 Lukens be admitted into evidence and bound to the  
12 record at this point.

13 JUDGE KARLIN: Any objections? Hearing  
14 none, it shall be admitted. Thank you.

15 MR. TRAVIESCO-DIAZ: Mr. Chairman, we also  
16 have marked a set of exhibits to this testimony which  
17 are numbered Exhibits A302 through A316. One of those  
18 exhibits A315 has corrections and those corrected  
19 exhibits have been handed over to the parties and to  
20 the Board. And I would move that all these exhibits  
21 be admitted into evidence at this point.

22 JUDGE KARLIN: Any objections from the  
23 parties?

24 Hearing none, they're admitted.

25 Thank you, Mr. Diaz.

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1 NRC staff, Ms. Baty?

2 MS. BATY: Actually, Ms. Bielecki is going  
3 to --

4 JUDGE KARLIN: Okay, Ms. Bielecki.

5 MS. BIELECKI: Mr. Scarbrough, could you  
6 please state your full name for the record?

7 MR. SCARBROUGH: Tom G. Scarbrough.

8 MS. BIELECKI: Mr. Hsu, will you please  
9 state your name?

10 MR. HSU: Kaihwa Robert Hsu.

11 MS. BIELECKI: And Mr. Rowley?

12 MR. ROWLEY: Jonathan Gabriel Rowley.

13 MS. BIELECKI: Do you have before you the  
14 affidavit of Kaihwa Robert Hsu, Jonathan G. Rowley,  
15 and Thomas G. Scarbrough concerning NEC's contention  
16 3, steam dryer?

17 MR. HSU: I do.

18 MR. ROWLEY: I do.

19 MR. SCARBROUGH: I do.

20 MS. BIELECKI: And did you prepare this  
21 testimony for this proceeding?

22 MR. HSU: Yes.

23 MR. ROWLEY: Yes.

24 MR. SCARBROUGH: Yes.

25 MS. BIELECKI: Do any of you have any

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1 corrections to this testimony?

2 MR. HSU: No.

3 MR. ROWLEY: No.

4 MR. SCARBROUGH: No.

5 MS. BIELECKI: Have you prepared a  
6 statement of professional qualifications?

7 MR. HSU: Yes.

8 MR. ROWLEY: Yes.

9 MR. SCARBROUGH: Yes.

10 MS. BIELECKI: Is it attached thereto?

11 MR. HSU: Yes.

12 MR. SCARBROUGH: Yes.

13 MR. ROWLEY: Yes.

14 MS. BIELECKI: Do you adopt this testimony  
15 as your initial testimony in this proceeding?

16 MR. HSU: Yes.

17 MR. SCARBROUGH: Yes.

18 MR. ROWLEY: I do.

19 MS. BIELECKI: I move this testimony into  
20 evidence, Your Honor.

21 JUDGE KARLIN: All right, any objections?

22 Hearing none, it's admitted. Thank you.

23 MS. BIELECKI: We also have Staff Exhibits  
24 14, 15, and 19. I would like to move these into  
25 evidence as well. There are no corrections.

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1 JUDGE KARLIN: Any objections? No  
2 objections, admitted. Thank you, Ms. Bielecki.

3 NEC, please.

4 MS. TYLER: Dr. Hopenfeld's testimony  
5 regarding contention 3 has already been admitted. I  
6 now move to admit NEC's pre-filed exhibits, NEC JH-54  
7 through NEC JH-61 and NEC JH-68 through JH-69.

8 JUDGE KARLIN: There are no changes on any  
9 of those?

10 MS. TYLER: No.

11 JUDGE KARLIN: Any objections to that?  
12 No. Hearing none, they're admitted as well.

13 With that, I think we have the  
14 preliminaries undertaken and we can turn to the  
15 contention.

16 I thought -- I had a couple of questions  
17 that maybe we can start with because I'm a little  
18 confused about what the aging management plan that  
19 Entergy has proposed and the staff has evaluated, what  
20 it is, what we're talking about.

21 If I could ask the staff to turn to --  
22 well, it's prefiled written testimony that was  
23 formerly Exhibit 4 by the staff, question 4. Could  
24 you refer to that, please?

25 MS. TYLER: Judge Karlin, may I provide

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1 Dr. Hopenfeld the materials? He just indicated that  
2 he doesn't have a copy.

3 JUDGE KARLIN: Yes, sure. I mean we've  
4 been doing this every day. So he should have that  
5 material.

6 MS. TYLER: I agree.

7 JUDGE KARLIN: We shouldn't have to do  
8 this every time I ask a question.

9 I guess question is for Mr. Rowley, is  
10 that the correct way to pronounce it?

11 MR. ROWLEY: Rowley.

12 JUDGE KARLIN: Rowley, Mr. Rowley, because  
13 in question 4 on page 3 of your pre-filed testimony  
14 the question is asked: describe Entergy's program to  
15 monitor and manage the effects of aging on Vermont  
16 Yankee steam dryer during the period of extended  
17 operations.

18 And you refer -- and what's the answer to  
19 that? What is the plan that the steam dryer aging  
20 management plan that you currently have approved that  
21 will apply for the period of extended operation?

22 MR. ROWLEY: What is it?

23 JUDGE KARLIN: Yes. There is one entity  
24 called a steam dryer monitoring plan that was used  
25 under the uprate and there's another entity that's

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1 referred to as the BWR VIP-139 program. Which one is  
2 it?

3 MR. ROWLEY: Well, there's a commitment,  
4 37 to once the staff approves the VIP-139 that the  
5 Applicant will then use that program and if it's not  
6 approved, they will continue to use their steam dryer  
7 monitor plan. It incorporates the GE SIL 644.

8 JUDGE KARLIN: Okay, so commitment 37. It  
9 says if BWR VIP-139 -- well, it doesn't really say  
10 that. Let's go to commitment 37. Pull that out,  
11 FSER, appendix A. Let's see what it says.

12 (Pause.)

13 Are you able to see? Let me ask a quick  
14 question Dr Wardwell has raised. The lights are  
15 dimmed to try to keep it cooler in the room. Can you  
16 all read the materials all right?

17 MR. ROWLEY: I can.

18 JUDGE KARLIN: So page A-13 of the FSER  
19 which is Staff Exhibit 1. Continuing inspections in  
20 accordance with the steam dryer monitoring plan,  
21 revision 3 in the event that BWR-139 is not approved  
22 prior to the period of extended operation.

23 So is the steam dryer monitoring plan  
24 revision 3 the aging management plan upon which the  
25 staff has approved or recommends approving this

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1 application?

2 MR. ROWLEY: It is contingent upon staff's  
3 approval of VIP-139.

4 JUDGE KARLIN: What if the staff doesn't  
5 approve it?

6 MR. ROWLEY: We do think that the steam  
7 dryer monitoring plan --

8 JUDGE KARLIN: Could you speak up? I  
9 didn't hear you.

10 MR. ROWLEY: We do think the steam dryer  
11 monitoring plan will adequately manage the aging of  
12 the steam dryer.

13 JUDGE KARLIN: Okay, so there's sort of a  
14 fork in the road coming about whether or not the staff  
15 approves the BWR VIP-139.

16 MR. ROWLEY: Correct.

17 JUDGE KARLIN: And if it does approve that  
18 BWR VIP-139, then what happens?

19 MR. ROWLEY: Then the Applicant will use  
20 that as its aging management program.

21 JUDGE KARLIN: Okay, and if staff doesn't  
22 approve it, then what happens?

23 MR. ROWLEY: They will still continue the  
24 steam dryer monitoring plan that they currently --

25 JUDGE KARLIN: Okay, so the current one

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1 that applies is the steam dryer monitoring plan  
2 revision 3?

3 MR. ROWLEY: Yes.

4 JUDGE KARLIN: And that is going to apply  
5 for the next 20 plus years unless some event happens  
6 in the future?

7 MR. ROWLEY: Correct.

8 JUDGE KARLIN: So let's focus on that and  
9 the testimony, well, let me ask on the steam dryer  
10 monitoring plan. Let's go to page four and five of  
11 the testimony, pre-filed, and there apparently are  
12 some conditions you refer to on page five? License  
13 condition five specifies that there are in each of the  
14 three scheduled refueling outages, a visual inspection  
15 shall be conducted?

16 MR. ROWLEY: I think Mr. Scarbrough can  
17 answer that.

18 JUDGE KARLIN: Well, no. Why are one of  
19 you talking about one and the other --

20 MR. SCARBROUGH: The reason that I was  
21 involved with the power uprate review and that's where  
22 the licensed conditions were placed in the license  
23 amendment for the power uprate, and this was part of  
24 the condition for the steam dryer monitoring plan and  
25 the license renewal was a different renewal.

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1 JUDGE KARLIN: Well, you did the uprate.  
2 and this is the license renewal. So we're talking  
3 about the license renewal?

4 MR. SCARBROUGH: Yes, what was done in the  
5 power uprate we carried forward. That was already  
6 reviewed. We do the review for that since this is so  
7 recent, we just carry it forward, and it will carry  
8 forward in the licensing renewal.

9 JUDGE KARLIN: Okay. So Mr. Scarbrough,  
10 you did the EPU, steam dryer monitoring plan?

11 MR. SCARBROUGH: That was part of our  
12 review.

13 JUDGE KARLIN: Part of your review.  
14 Perhaps you can help us with the testimony. What is  
15 the steam dryer monitoring plan revision 3 that was  
16 approved under the uprate call for?

17 Let me go to page four of your testimony  
18 or the testimony and see if it was yours -- yes, that  
19 was your testimony.

20 And I quote, "in its SDMP Entergy stated  
21 that the Vermont Yankee steam dryer would be inspected  
22 during refueling outages scheduled for the fall of  
23 2005, spring of 2007, fall of 2008, and spring of  
24 2010, in accordance of recommendations of GE SIL 644,"  
25 right?

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1 MR. SCARBROUGH: Yes.

2 JUDGE KARLIN: How many inspections is  
3 that?

4 MR. SCARBROUGH: Three. They can do three  
5 as part of the requirement of the license conditions  
6 of the power uprate. After the first three outages  
7 afterward, they would do those inspections.

8 JUDGE KARLIN: Well, actually that's four.  
9 Fall of 2005, spring 2007, fall 2008, spring 2010.  
10 That's four.

11 MR. SCARBROUGH: Fall '05 was before it  
12 was issued.

13 JUDGE KARLIN: So there's three scheduled  
14 and so on page five when you refer to -- for example,  
15 license condition 5 specifies that during each of the  
16 three scheduled refueling outages beginning, blah,  
17 blah, blah, a visual inspection shall be conducted."

18 Right? Those are the three scheduled  
19 outages you're talking about?

20 MR. SCARBROUGH: Yes.

21 JUDGE KARLIN: Condition 5 is a condition,  
22 imposed condition of this license or or the EPU?

23 MR. SCARBROUGH: It's the power uprate.

24 JUDGE KARLIN: Okay. And license  
25 condition 6 specifies the results of the visual

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1 inspection during the three scheduled refueling  
2 outages shall be reported. Again, that's under the  
3 EPU and the three scheduled outages and in 2010,  
4 right?

5 License condition 7, later on that page,  
6 it says, "license condition 7 specifies that the  
7 requirements for meeting the SDMP shall be implemented  
8 upon issuance of the EPU and shall continue until the  
9 completion of one full operating cycle at EPU  
10 conditions."

11 Does that mean that the obligation to do  
12 the inspection terminates after the completion of one  
13 full operating cycle?

14 MR. SCARBROUGH: After they complete that  
15 third outage, that third inspection in 2010, what we  
16 are trying to do is come up with a sunset provision in  
17 the license condition so that eventually these  
18 conditions would merge into a longer term program.

19 JUDGE KARLIN: Okay.

20 MR. SCARBROUGH: Part of what they also  
21 are part of this license condition provision is the  
22 commitment or the license condition that they  
23 implement the GE SIL service information letter, 644,  
24 rev. 1.

25 JUDGE KARLIN: Yes.

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1 MR. SCARBROUGH: And that has a long-term  
2 program beyond the power uprate, so this -- once they  
3 performed the inspections of the three after power  
4 uprate and assuming and those conditions in that they  
5 do not see any significant issues --

6 JUDGE KARLIN: Right.

7 MR. SCARBROUGH: Then this would sunset  
8 out and then they would be into long-term GE  
9 recommendation for whatever they decide in terms of  
10 the GE recommendations. And this is 644 and currently  
11 in 644 --

12 JUDGE KARLIN: Now let me stop you there.  
13 So these are the visual inspections, right?

14 MR. SCARBROUGH: Yes.

15 JUDGE KARLIN: And the GE 644 is the  
16 monitoring of plant parameters?

17 MR. SCARBROUGH: Actually, they're both.

18 JUDGE KARLIN: Okay, but let me just focus  
19 on this. I'm just concerned. License condition 7 of  
20 the uprate says that the duty of Entergy to do these  
21 visual inspections, as I read this, terminates after  
22 the completion of one full operating cycle if  
23 everything is fine for that one cycle. At 2010,  
24 they're done. They don't have to do any more visual  
25 inspections under the EPU.

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1 MR. SCARBROUGH: No, they do, because  
2 there's a license condition here for SIL 644.

3 JUDGE KARLIN: Okay.

4 MR. SCARBROUGH: And SIL 644 is a long-  
5 term GE recommendation and SIL 644 says they inspect  
6 every other outage --

7 JUDGE KARLIN: Where does it say that in  
8 this -- where does it say that, that they will do that  
9 during the period of extended operations?

10 MR. SCARBROUGH: It's in Exhibit -- the GE  
11 SIL 644 with exhibit -- I don't know the number.

12 JUDGE KARLIN: Well, I have GE 644, but  
13 what I want is the permit condition that says they're  
14 going to be obliged to do that during the next 20 plus  
15 years.

16 MR. SCARBROUGH: That is the commitment to  
17 continue --

18 JUDGE KARLIN: Well, let's go to the  
19 commitment. It doesn't say that. Let me see. Let's  
20 go back to what the commitment says.

21 MR. SCARBROUGH: They're going to continue  
22 to do the steam dryer monitoring plan.

23 JUDGE KARLIN: Right, and the steam dryer  
24 monitoring plan, if they do -- they can do that. If  
25 I was Entergy I would say I'll do three of them and

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1 I've just complied with the steam dryer monitoring  
2 plan.

3 MR. SCARBROUGH: The steam dryer  
4 monitoring plan incorporates 644. It doesn't say here  
5 in the commitment, but we know what the steam dryer  
6 monitoring plan uses GE SIL 644.

7 JUDGE KARLIN: Well, commitment 37 doesn't  
8 say anything about SIL 644, does it, Mr. Rowley?

9 MR. ROWLEY: No, it does not.

10 JUDGE KARLIN: Let's go -- there's another  
11 provision that might. Let's go to FSER Section 1.7 on  
12 page 112.

13 That's a summary of proposed license  
14 conditions, right? And it says the third license  
15 condition, "the third license condition requires the  
16 implementation of the most recent staff approved  
17 version of the boiling water reactor vessels and  
18 internal project integrated surveillance program as  
19 the method to demonstrate compliance of the  
20 requirements of" blah, blah, blah, 10 CFR Part 50.

21 It doesn't say anything about SIL 644.  
22 What I'm trying to find is the mention in the FSER,  
23 the mention in exhibits here today that say Entergy  
24 will do the -- continue to do visual monitoring after  
25 the 2010.

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1 MR. ROWLEY: I'm trying to find it in the  
2 aging management program that you -- we put it in  
3 there. It's not specific in the commitment.

4 JUDGE KARLIN: Let's go to the aging  
5 management plan review. 3.174 of the FSER is the  
6 section I found. Maybe there are other sections.

7 Maybe it's in there. It's pretty short.  
8 It shouldn't take as long. Where does --

9 MR. ROWLEY: What page are you on, sir?

10 JUDGE KARLIN: Page 3.174 of the FSER.

11 (Pause.)

12 MR. ROWLEY: That's one location where we  
13 talk about the FE-139.

14 JUDGE KARLIN: It says Section 3.1.2.1.6  
15 of the FSER, cracking due to flow-induced vibration  
16 and it discussed in the discussion column blah, blah,  
17 blah, the Applicant stated that BWR vessel internal  
18 program will manage cracking in the stainless steel  
19 steam dryers."

20 I see that's a will. Obviously, the BWR  
21 VIP program 139 isn't even in existence yet. So that  
22 couldn't be working.

23 MR. ROWLEY: The draft is up for approval.

24 JUDGE KARLIN: Okay, well, let's talk  
25 about the draft. What is the BWR VIP? What is that?

1 Who is most familiar with the BWR VIP?

2 Mr. Scarbrough, thank you.

3 MR. SCARBROUGH: It's a group, the BWR  
4 owners group. It's a project that the BWR owners  
5 group has in place to look at all internal aspects of  
6 the reactor vessel. They do reviews of loose parts  
7 evaluations and they prepare guidance documents for  
8 the boiling water reactors.

9 And the staff has interactions with them  
10 on a regular basis for what their projects are. And  
11 one of the areas that they're developing is that the  
12 BWR VIP 139 and that's one of their projects, where  
13 they're looking at the whole history of steam dryer  
14 issues in terms of the experience they've had with  
15 them, what are some of the areas of recommendations in  
16 terms of evaluating the stresses and the loads in the  
17 dryer, talking about the --

18 JUDGE KARLIN: Okay, the operative words  
19 it's an industry group?

20 MR. SCARBROUGH: Yes.

21 JUDGE KARLIN: Does it involve the public?  
22 The members of the public like Dr. Hopenfeld?

23 MR. SCARBROUGH: We do have meetings with  
24 them, they are public. We do have public meetings  
25 with them.

1 JUDGE KARLIN: Is there a copy of the BWR  
2 VIP-139 as an exhibit in the record here?

3 MR. SCARBROUGH: I do not believe it is.

4 JUDGE KARLIN: There's a lot of references  
5 to that in the testimony and in the FSER. I kept  
6 looking for it, saying oh, this must be an important  
7 document. We better look at it and see how good it  
8 is. Is it in here?

9 MR. SCARBROUGH: No, I mean --

10 JUDGE KARLIN: You are the staff who  
11 reviewed this. Any of the parties, is there an  
12 exhibit that's -- yes, Mr. Lukens?

13 MR. LUKENS: Your Honor, VIP-139 was  
14 submitted in discovery. However, it was not submitted  
15 by Entergy as an exhibit. I do have a copy of it.

16 JUDGE KARLIN: All right. Well, I'm not  
17 surprised you would have a copy of it, but this is  
18 good, but it's not an exhibit. It's not in the record  
19 here. So I guess we can't look at it or understand  
20 what it says.

21 MR. ROWLEY: Your Honor, if I could, could  
22 I have you turn to page 3.26 of the SER, Section  
23 3.0.3.2.7.

24 JUDGE KARLIN: What page, 3-56?

25 MR. ROWLEY: 3-56. This is where you see

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1 -- if you go to the last paragraph on that page, talk  
2 about commitment 37 and that they're going to do the  
3 steam dryer monitoring plan revision 3 and set these  
4 inspections , incorporating the guidelines of the SIL  
5 so that tells there. It wasn't in the commitment in  
6 the Appendix A that the SIL was going to be a part of  
7 the monitoring plan, but here in the evaluation for  
8 the vessel in terms of the program. We state that.

9 JUDGE KARLIN: In a letter dated, 3.56  
10 says "in a letter dated August 22, 2006, the Applicant  
11 committed commitment 37 to continue inspections in  
12 accordance with the VYNPS steam dryer monitoring plan  
13 revision 3." Is that what you're referring to?

14 MR. ROWLEY: Yes.

15 JUDGE KARLIN: These inspections  
16 incorporate the guidelines of GE SIL 644 rev. 1 in  
17 accordance with existing procedures.

18 Okay, so continue inspections in  
19 accordance with the steam dryer monitoring plan rev.  
20 3. Didn't we just read that the steam dryer  
21 monitoring plan rev. 3 says inspections can end as  
22 soon as you get a full cycle?

23 MR. ROWLEY: That was for EPU purposes but  
24 the commitment is to continue that for license  
25 renewal.

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1 JUDGE KARLIN: It says continue it in  
2 accordance with the steam dryer monitoring plan. And  
3 if I'm Entergy I can say I just completed the steam  
4 dryer monitoring plan. I've complied. I'm done.

5 MR. ROWLEY: The plan is the same, almost  
6 the same as the program that's there for them to use.  
7 But it doesn't have to stop. It's a continue --

8 JUDGE KARLIN: It doesn't have to stop,  
9 but it says it can stop. If Entergy -- it seems to me  
10 they could fully comply with the steam dryer  
11 monitoring plan and this commitment by saying we have  
12 gone through one full cycle. The steam dryer  
13 monitoring plan says we can stop. We're stopping. We  
14 just complied with the provision that said all we need  
15 to is comply with the steam dryer monitoring plan.

16 MR. ROWLEY: The license conditions for  
17 EPU says that they can stop in 2010 for the plan, but  
18 the plan will continue on in license renewal. The  
19 plan is nothing that stops -- the condition says they  
20 can stop using the plan.

21 JUDGE KARLIN: They continue in accordance  
22 with the steam dryer monitoring plan and steam dryer  
23 monitoring plan says they must continue until they go  
24 through a full cycle of when they're clean and then  
25 they can stop.

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1 MR. ROWLEY: The license condition says  
2 they use the plan through 2010. But the plan doesn't  
3 stop --

4 JUDGE KARLIN: Well, I think it's a legal  
5 matter and I'm troubled by the fact that this is -- I  
6 can read that and I do read that as calling for --  
7 allowing Entergy to call visual inspections. I think  
8 maybe some additional clarity at the minimum is needed  
9 on that because it would allow them to stop  
10 monitoring, stop visual inspections in accordance with  
11 the steam dryer monitoring plan as soon as they have  
12 a full clean cycle. And any good lawyer could say  
13 that's the way it's interpreted. I understand that  
14 may not be what you intended.

15 Let me focus on page 11 -- I'm sorry, 10  
16 on the questions for the Entergy witnesses. E3-01,  
17 Exhibit - -this was previously an exhibit, your  
18 testimony. A question, number 21 on what was page 10.

19 Question: Please describe the Aging  
20 Management Program for the steam dryer included the  
21 Vermont Yankee license renewal application.

22 And you quote the Applicant saying  
23 "cracking due to flow-induced vibration in stainless  
24 steel steam dryers is managed by the BWR vessel  
25 internal program. BWR vessels internal program

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1 currently incorporates" -- now is that the steam dryer  
2 monitoring plan?

3 What is the plan? I'll ask Mr. Lukens, I  
4 guess. What is the currently committed to license in  
5 the license renewal application of what you're going  
6 to do to manage the aging of the steam dryer?

7 MR. LUKENS: Our current commitment in the  
8 license renewal process is to continue the inspections  
9 and monitoring specified in GE SIL 644. And GE SIL  
10 644 does not run out at some point after power uprate.  
11 The ongoing reinspection criteria in GE SIL 644 for  
12 uprated plants is a full inspection of all susceptible  
13 accessible areas at least once every two refueling  
14 outages.

15 JUDGE KARLIN: Okay, can you show me that?

16 MR. LUKENS: Yes, sir.

17 (Pause.)

18 Exhibit E3-09.

19 JUDGE KARLIN: Please identify what that  
20 is.

21 MR. LUKENS: It is GE SIL No. 644  
22 rev. 2 entitled BWR steam dryer integrity.

23 JUDGE KARLIN: All right.

24 MR. LUKENS: And appendix D --

25 JUDGE KARLIN: D as in dog?

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1 MR. LUKENS: Yes, sir. Which is on page  
2 30 of the document.

3 JUDGE KARLIN: I'm with you.

4 MR. LUKENS: Is entitled monitoring  
5 guidelines.

6 JUDGE KARLIN: All right.

7 Now let me ask you on this monitoring  
8 guidelines, is this monitoring of the plant  
9 parameters?

10 MR. LUKENS: Yes, sir. It is.

11 JUDGE KARLIN: Is it visual inspection?  
12 As I understand it, your plan consisted of two major  
13 components? One, monitoring of plant parameters on a  
14 continuous basis and the other is visual inspections  
15 at each refueling outage.

16 MR. LUKENS: That is correct.

17 JUDGE KARLIN: Is Appendix D only the  
18 monitoring on a continuous basis?

19 MR. LUKENS: Yes, that's my understanding.

20 JUDGE KARLIN: Okay, Appendix D doesn't  
21 include the visual inspections?

22 MR. LUKENS: That's correct. It is in  
23 Appendix C, Charlie, which is on page 15.

24 JUDGE KARLIN: Okay, page 15, Appendix C,  
25 inspections.

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1 MR. LUKENS: I've seen this within the  
2 last 48 hours.

3 JUDGE KARLIN: All right. I see it calls  
4 for a number of criteria with regard to inspections  
5 and some recommendations. Is there -- maybe there is  
6 an integral there that says every outage or every  
7 second outage --

8 MR. LUKENS: I apologize for the  
9 confusion, Your Honor. If I could direct your  
10 attention to pages 6 and 7 of the SIL.

11 JUDGE KARLIN: All right.

12 (Pause.)

13 JUDGE KARLIN: I didn't find it, but it  
14 might be in there.

15 MR. LUKENS: Page six, the second column  
16 is entitled recommended actions. Letter A is for all  
17 plants.

18 JUDGE KARLIN: Repeat the visual  
19 inspection of all susceptible locations at least once  
20 every two refueling outages. Is that -- that's  
21 unquote, right?

22 MR. LUKENS: That's correct.

23 JUDGE KARLIN: Okay, so that's Entergy's  
24 commitment.

25 MR. LUKENS: It goes beyond that, sir. On

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1 page seven, Section B as in bravo, says "in addition  
2 for plants planning on increasing operating power  
3 level above original license thermal power" and that  
4 would be Vermont Yankee, "the recommendations  
5 presented in A above should be modified as follows"  
6 and this is where it describes the baseline  
7 inspection.

8 JUDGE KARLIN: Yes.

9 MR. LUKENS: And repeating visual  
10 inspection during each subsequent refueling outage the  
11 wording is not identical to our commitment for three  
12 consecutive outages, but it does say until at least  
13 two full operating cycles at the final uprated power  
14 level have been achieved and that turns out to be  
15 three consecutive refueling outages.

16 JUDGE KARLIN: Well, okay. So all right.  
17 I have some questions about that, but I guess let me  
18 see if I understand you. You're saying that Entergy  
19 has committed to monitor in accordance with the -- do  
20 the visual inspections in accordance with this  
21 appendix C of SIL 644 on this frequency.

22 MR. LUKENS: That is correct.

23 JUDGE KARLIN: Okay. And this frequency  
24 would consist of -- is not consistent -- is it  
25 consistent with what was said in the refueling outage?

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1 MR. LUKENS: I haven't heard anything  
2 inconsistent, Your Honor.

3 JUDGE KARLIN: Okay.

4 MR. LUKENS: The commitment is --

5 JUDGE KARLIN: Where is that commitment?  
6 Where is the commitment in the FSER, is the license  
7 condition, in the commitment 37 that says that this  
8 will be followed? Can I find it? And maybe the staff  
9 can help me.

10 MR. ROWLEY: Commitment 37, it doesn't say  
11 anything more specific than that. They will continue  
12 to use the SIL 644, the directive on page 3-56 of the  
13 SER. That's --

14 JUDGE KARLIN: Well, having said something  
15 in the SER doesn't make it legally binding, does it?  
16 It's not a commitment.

17 MR. ROWLEY: Well, a commitment --

18 JUDGE KARLIN: It's not a license  
19 condition.

20 MR. ROWLEY: There's a license condition  
21 in Section 1.7 that says that the commitments are  
22 going to be put into the FSER and FSER updated for  
23 that renewal period.

24 JUDGE KARLIN: Well, isn't the license  
25 condition of 1.7 of the FSER talking about the BWER

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1 VIP 139?

2 MR. ROWLEY: Right --

3 JUDGE KARLIN: That's not what this is.

4 MR. ROWLEY: No. The other commitment, I  
5 think the first and second one on that page talks  
6 about them having to update the UFSAR.

7 JUDGE KARLIN: Yes.

8 MR. ROWLEY: That's where these  
9 commitments will be -- have to put into the UFSAR.

10 JUDGE KARLIN: Wait a second. So let's go  
11 to that. "The first license condition requires the  
12 applicant to include UFSAR supplement required by 10  
13 CFR 54.21D and the next UFSAR update as required by  
14 Sections such and such."

15 Is that what you mean?

16 MR. ROWLEY: Right. These commitments --

17 JUDGE KARLIN: No, no. That's what we're  
18 supposed to find that there's a commitment that they  
19 will do visual monitoring on this basis?

20 MR. ROWLEY: No, the commitment is there  
21 in Appendix A which lists all 51 commitments of --

22 JUDGE KARLIN: But Appendix A doesn't  
23 refer to SIL 644. Does it?

24 MR. ROWLEY: Well, it's tied in commitment  
25 37, says they're going to continue to do monitoring

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1 plan, and we know that the monitoring plan  
2 incorporates GE SIL 644.

3 JUDGE KARLIN: Who knows? Who knows?  
4 Does NEC know? Does the Board know?

5 MR. ROWLEY: You have to look at the  
6 Commitment 37 as written and go to the aging  
7 management program, Section 3 page 3-56 to get the  
8 complete story. My oversight, when we put that  
9 commitment together to include those words that said  
10 they would continue, but it is there in SER.

11 JUDGE KARLIN: The fact that there is  
12 something state in the SER does not make it legally  
13 binding. It is not a legal commitment. It's not a  
14 commitment. It's not a licensed condition. It's a  
15 statement. In fact, Judge Ferrar, just recently had  
16 a case where the staff specifically took the position  
17 because it's in the FSER does not make it binding at  
18 all. So anyway, I'll move on.

19 Let us go back to Mr. Lukens and Mr.  
20 Hoffman, and look to your testimony about the BWR VIP-  
21 139. Now as I understand the idea is that for the  
22 time being, the steam dryer monitoring program, Rev 3,  
23 which was approved under the uprate, will be  
24 monitoring the management program for the steam dryer  
25 to the end of time, unless this contingency occurs,

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1 right?

2 Now let's look at this: "Vermont Yankee  
3 will evaluate BWR VIP-139 once it is approved by the  
4 staff and either include its recommendations in the  
5 VYNPS BWR, vessels improvement ground, or inform staff  
6 of the VYNPS's exceptions to that document. Is that  
7 what's going to happen when BWR VIP-139 comes out and  
8 is approved?

9 MR. LUKENS: Yes, is it. The BWR VIP-139  
10 incorporates the SIL requirements as additional backup  
11 technical material, it looked like the SIL was maybe  
12 20 some-odd pages. The VIP document was on the order  
13 of 200 pages.

14 JUDGE KARLIN: So the BWR VIP-139. Let's  
15 think about the things that have to happen. First,  
16 the staff has to approve it, right?

17 Is that right, Mr. Scarbrough?

18 MR. LUKENS: If I may, Your Honor.

19 JUDGE KARLIN: Yes?

20 MR. LUKENS: The BWR VIP Program sponsored  
21 by EPRI has been committed by the entire BWR industry  
22 to NRC and is part of our current licensing basis.  
23 BWR VIP-139 was issued in 2005 and we --

24 JUDGE KARLIN: What do you mean issued?  
25 BWR VIP --

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1 MR. LUKENS: Issued by EPRI and therefore  
2 incorporated into our current licensing basis as part  
3 of our requirement for dryer inspection.

4 JUDGE KARLIN: So EPRI is the Electric,  
5 Edison, Electric --

6 MR. LUKENS: The Electric Power Research  
7 Institute.

8 JUDGE KARLIN: And EPRI is the entity that  
9 previously in this proceeding refused to allow NEC to  
10 look at the documents? Okay, so EPRI and the industry  
11 put together BWR VIP-139?

12 MR. LUKENS: That's correct.

13 JUDGE KARLIN: Is it a public document  
14 that we can see?

15 MR. LUKENS: It is proprietary.

16 JUDGE KARLIN: So it's not public  
17 document?

18 MR. LUKENS: That's my understanding.

19 JUDGE KARLIN: Nobody can see it except  
20 the industry.

21 MR. LUKENS: That's my understanding.

22 JUDGE KARLIN: And it was developed by the  
23 industry and it's been submitted to the NRC, is that  
24 correct?

25 MR. LUKENS: Yes.

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1 JUDGE KARLIN: And New England Coalition  
2 and no one else has seen it? Now, it's under review  
3 by the Agency. Is that correct, Mr. Scarbrough?

4 MR. SCARBROUGH: Yes, it is.

5 JUDGE KARLIN: And are you part of the  
6 review team?

7 MR. SCARBROUGH: Yes, I am.

8 JUDGE KARLIN: And when do you expect to  
9 make a decision on approval or not approval?

10 MR. SCARBROUGH: I think some time this  
11 year. I think it's in the final stages.

12 JUDGE KARLIN: And in the approval  
13 process, is there some time an iterative process where  
14 the NRC will ask for changes?

15 MR. SCARBROUGH: Right, yes, and we have  
16 sent out requests for this new information as part of  
17 that. And part of that review was the BWR 139  
18 document referred back to the SIL for 644 for guidance  
19 in times of repetitive visual inspections and that  
20 sort of thing, so one of our questions was, you know,  
21 what -- explain that, and they sent answers back in on  
22 that --

23 JUDGE KARLIN: Okay, my point is is that  
24 there is an iterative process going on between the  
25 industry and NRC on BWR VIP-139?

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1 MR. SCARBROUGH: Yes, there is.

2 JUDGE KARLIN: And no member of the public  
3 is part of that iterative process.

4 MR. SCARBROUGH: We have had public  
5 meetings, and when we meet, we have public meetings --

6 JUDGE KARLIN: Are they able to see the  
7 RAIs that you send out?

8 MR. SCARBROUGH: I believe that they are.

9 JUDGE KARLIN: Are they able to see the  
10 BWR VIP-139 that the RAI is about?

11 MR. SCARBROUGH: I would have to ask --

12 JUDGE KARLIN: I'm not surprised --

13 MR. SCARBROUGH: I would have to ask the  
14 management --

15 MS. BATY: Your Honor, if we had an  
16 opportunity to check, there may be a non-proprietary  
17 version of that.

18 JUDGE KARLIN: You can check all you want.  
19 We'll be within your --

20 MS. BATY: Yes, I just wondered if we  
21 could have an opportunity after lunch to check?

22 JUDGE KARLIN: Okay, so there's iterative  
23 process going on between industry and NRC. The BWR  
24 VIP-139 may evolve during that process or change in  
25 some way. But one that we haven't seen. And this

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1 Board hasn't seen.

2 And at some point the staff may or may not  
3 decide to accept BWR 139, right?

4 MR. SCARBROUGH: Right.

5 JUDGE KARLIN: So there's a contingency,  
6 one, will the staff accept BWR-139?

7 There's another contingency will BWR VIP-  
8 139 change between now and when the staff accepts it.  
9 Do you agree, Mr. Scarbrough?

10 MR. SCARBROUGH: Yes.

11 JUDGE KARLIN: And then there's another  
12 contingency, as I read this, Mr. Lukens, which is when  
13 BWR VIP, once it is approved by the staff, then  
14 Vermont Yankee will evaluate it.

15 MR. LUKENS: Yes, sir.

16 JUDGE KARLIN: And then you'll decide  
17 whether you want to adopt it.

18 MR. LUKENS: May I explain?

19 JUDGE KARLIN: No, let's read this.

20 MR. LUKENS: That's what it says.

21 JUDGE KARLIN: Vermont Yankee will  
22 evaluate BWR VIP-139 once it is approved by the staff  
23 and then you get -- you decide whether you want to use  
24 it. It's not a commitment to use it if the staff  
25 approves it. It's a commitment to use it if the staff

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1 approves and you decide you want to use it. Right?

2 MR. LUKENS: Not exactly, sir.

3 JUDGE KARLIN: Okay.

4 MR. LUKENS: VIP-139 is part of our  
5 current licensing basis. NRC approval of VIP-139 may  
6 include certain conditions or limitations that go  
7 beyond the requirements of VIP-139.

8 Regardless of --

9 JUDGE KARLIN: I'm sorry, what may --

10 MR. LUKENS: The staff approval of VIP-139  
11 may include conditions or limitations on certain  
12 sections of VIP-139.

13 Since we don't know what those might be,  
14 this wording simply says we have to look at any  
15 conditions or limitations to determine whether it is  
16 possible for us to meet this.

17 JUDGE KARLIN: So what we have is staff  
18 may or may not approve it. Staff may or may not  
19 impose conditions on it and if staff imposes any  
20 conditions on it or any -- it doesn't say. You can  
21 decide whether you want to use it or not.

22 MR. LUKENS: We cannot decide whether we  
23 want to use it or not.

24 JUDGE KARLIN: Well, it says "Entergy will  
25 evaluate BWR VIP-139 once it is approved by the staff

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1 and either include its recommendations in the BWR  
2 Vessels Improvement Program, or inform the staff of  
3 Entergy's exceptions to the document", right?

4 MR. LUKENS: That's correct.

5 JUDGE KARLIN: So you don't like it, you  
6 don't have to agree with it?

7 MR. LUKENS: No, sir. That's not true.

8 JUDGE KARLIN: Well, you either agree to  
9 it or you say no, we have exceptions.

10 MR. LUKENS: We may take exceptions to  
11 additional conditions or limitations that the staff  
12 may impose above the requirements of VIP-139, but we  
13 are required --

14 JUDGE KARLIN: I thought we just heard it  
15 was an iterative process and VIP-139 isn't a done deal  
16 until they get finished negotiating with the NRC about  
17 it?

18 JUDGE WARDWELL: Let me ask a question to  
19 help clarify this for me.

20 I think it was Mr. Hoffman or Mr. Lukens  
21 about a half an hour ago stated that the VIP-139 was  
22 issued and is filed as of 2005. Is that correct?

23 MR. LUKENS: That is correct.

24 JUDGE WARDWELL: So there is not a draft  
25 of VIP-139 floating around. 139 is a final document

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1 issued by EPRI, is that correct?

2 MR. LUKENS: Yes, it is.

3 JUDGE WARDWELL: And you're stating that  
4 that's part of your current licensing basis?

5 MR. LUKENS: That is correct.

6 JUDGE WARDWELL: So you are obligated to  
7 continue that under your current licensing basis?

8 MR. LUKENS: That is correct.

9 JUDGE WARDWELL: Is that going to be  
10 extended, is there commitment to extend that in  
11 regards to the license renewal?

12 MR. LUKENS: The program of BWR Vessel  
13 Internal Program sponsored by EPRI is an on-going  
14 process for the life of the plant, yes. That will be  
15 an on-going process.

16 JUDGE WARDWELL: The only thing you're  
17 couching here is the phrase "its recommendations"  
18 which refer back to staff's recommendations of what  
19 they might have in regards to their review of the  
20 current final 139 document?

21 MR. LUKENS: That is correct.

22 JUDGE WARDWELL: Thank you.

23 JUDGE KARLIN: Well, that's really -- I'm  
24 not sure really that's what it says. That may be your  
25 intent, but to me it seems to say you will evaluate

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1 the BWR VIP-139 once it is approved by the staff and  
2 either adopt it or tell you, the staff, you have  
3 exceptions to it.

4 Now let me go on on page 11, you start,  
5 Mr. Lukens, in your testimony, pre-filed anyway, on  
6 question 24, and answer 24, the dryer monitoring  
7 program and you describe the dryer monitoring program  
8 in the next few pages of testimony.

9 Is that the steam dryer monitoring  
10 program, rev. 3 under the EPU or is that the steam  
11 dryer monitoring program under BWR VIP-139?

12 What are you describing here?

13 MR. LUKENS: We are describing steam dryer  
14 monitoring program revision 3 that was implemented  
15 during EPU and that will continue for the life of the  
16 plant.

17 JUDGE KARLIN: So this is not BWR VIP-139?

18 MR. LUKENS: No, sir.

19 JUDGE KARLIN: We don't know what that is?  
20 The Board Members have no idea what that is. Is that  
21 correct?

22 MR. LUKENS: Yes, sir.

23 JUDGE WARDWELL: Is that proprietary too.  
24 Is that why we don't have that as an exhibit?

25 MR. LUKENS: It is proprietary, yes.

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1 JUDGE KARLIN: And even if there's a  
2 nonproprietary version of it, we don't have it, one  
3 way or the other, so we can't base a decision on it,  
4 I think. But I just want to know when you're talking,  
5 I think it's important for us to know as we go on with  
6 this contention, when you're describing the plan,  
7 there seems to me to be two plans that are floating  
8 here. One is the what I'll call existing steam dryer  
9 monitoring program rev. 3 that was approved under the  
10 uprate and you all would interpret will continue under  
11 the renewal. And I understand it will versus the BWR  
12 VIP-139 and when we ask questions what are you going  
13 to do, how is it going to work, how will it be  
14 conducted? I think it's important for us to know  
15 which one we're talking about and which one you're  
16 talking about. It seems to me the only one that makes  
17 any sense here for us today is the steam dryer  
18 monitoring plan, rev. 3 that's under the EPU because  
19 the BWR VIP-139 is a pig in a poke. We haven't seen  
20 it. We don't know what it is. It may not be approved  
21 by the staff. It may not be accepted by Entergy. And  
22 it's just an absolute blank box that we cannot  
23 evaluate or understand.

24 So when you testify, hopefully, you will  
25 tell us which one you're talking about and presumably

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1 the only one that is of relevance here today is the  
2 one that's on the table right now which is the SD,  
3 steam dryer monitoring plan rev. 3.

4 JUDGE WARDWELL: And what is that though?  
5 Isn't that as much a black box? We don't have that  
6 before us either, do we?

7 MR. LUKENS: I'm sure we have. It is an  
8 exhibit.

9 JUDGE WARDWELL: Okay. I thought you said  
10 it wasn't. The steam dryer monitoring plan rev. 3 is  
11 an exhibit.

12 JUDGE KARLIN: Okay.

13 JUDGE WARDWELL: And how does that relate  
14 to 139? 139 was final at the time that was written.

15 MR. LUKENS: That's correct. The steam  
16 dryer monitoring plan is based on SIL 644 as it  
17 applies to monitoring an inspection. The currently  
18 issued VIP-139 does not contain pre-inspection  
19 criteria.

20 The inspection guidelines in the two  
21 documents are identical, but currently VIP-139 does  
22 not contain reinspection criteria. SIL-644 contains  
23 those reinspection criteria as I indicated on pages  
24 six and seven of the SIL. And SIL-644 applies to  
25 uprated plants.

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1                   So the difference between the SIL and VIP-  
2 139 is that for uprated plants the SIL contains  
3 additional reinspection criteria that are not VIP-139.

4                   JUDGE WARDWELL: Let's take the other  
5 option then, what happens if, in fact, staff approves  
6 it, doesn't have any recommendations, so it's fine the  
7 way it is. We're off and running with now VIP-139  
8 controlling. Where does the SIL come back into play  
9 in regards to assuring there's continual inspections?

10                  MR. LUKENS: Perhaps Mr. Scarbrough can  
11 address how the SIL is incorporated into the current  
12 VIP-139 that's before the staff.

13                  JUDGE WARDWELL: I don't care about that.  
14 I'm more interested in how does a SIL get incorporated  
15 in the aging management plan proposed for license  
16 renewal, if in fact, the 139 is approved prior to even  
17 issuing the license for this?

18                  MR. SCARBROUGH: Yes, and that's part of  
19 the issue with BWR VIP-139 is that the issue now just  
20 refers back, it doesn't have those reinspection forms  
21 so that's something that we've been interacting with  
22 BWR with about and their proposal in the BWR VIP-139  
23 for that document is different. They have a more  
24 graded approach. It is a different approach, so that  
25 would have to be reviewed as part of the switch over.

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1 If they're going to switch over -- if the entity is  
2 going to switch over from SIL 644 to BWR 139, the  
3 inspection, reinspection forms are different. Right  
4 now, the issue version from what I understand don't  
5 have any, but the new version --

6 JUDGE KARLIN: So let me stop you right  
7 there. BWR VIP-139 doesn't have any visual inspection  
8 forms, is that what you just said?

9 MR. SCARBROUGH: The ones on the street  
10 right now --

11 JUDGE WARDWELL: The one that they issued,  
12 the one that Entergy is hanging its hat on doesn't  
13 have any inspection requirements.

14 MR. SCARBROUGH: Reinspection, and that  
15 was one of the questions we asked them. And the  
16 answer --

17 JUDGE WARDWELL: And if you decide you  
18 want to impose that as a condition, then Entergy says  
19 we reserve the right to object to that and not adopt  
20 it.

21 Is that right, Mr. Lukens?

22 MR. LUKENS: No, sir.

23 JUDGE KARLIN: So tell me what's right.

24 MR. LUKENS: If the staff says we want  
25 uprated plants to continue with the guidance of SIL

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1 644, then the transition from steam dryer monitoring  
2 plan to VIP-139 is seamless. We just keep doing what  
3 we're doing.

4 JUDGE KARLIN: Wait a second. But you  
5 don't have to. You just said you didn't have to. You  
6 weren't going to agree to it.

7 Might agree, might not agree. But it's an  
8 opportunity for you to make a decision.

9 MR. LUKENS: SIL 644 reinspection  
10 requirements are part of our current licensing basis  
11 for the remainder of the plant life.

12 JUDGE KARLIN: But they are not part of  
13 BWR 139, VIP-139. BWR VIP-139, if approved by the  
14 staff as is, you won't have to do any of those  
15 inspections.

16 MR. LUKENS: Yes, sir, we --

17 JUDGE KARLIN: You might do it  
18 voluntarily.

19 MR. LUKENS: We still will be obligated  
20 under our licensing basis to perform reinspections to  
21 SIL-644.

22 JUDGE KARLIN: I don't understand. Let me  
23 look at --

24 JUDGE WARDWELL: Let me ask you this then  
25 just to clarify that. Is it correct then that you're

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1 saying that all of your current licensing bases that  
2 doesn't relate to -- all of your current licensing  
3 bases have to be followed for the extended period of  
4 operations for the renewal, unless it's modified by  
5 the license renewal itself?

6 MR. LUKENS: That is my understanding, but  
7 I'm not a licensing engineer.

8 JUDGE WARDWELL: Mr. Scarbrough, do you  
9 have any knowledge or anyone from the staff, Rowley or  
10 Hsu?

11 MR. SCARBROUGH: I'm sorry, could you  
12 repeat the question?

13 JUDGE WARDWELL: Yes, the question is Mr.  
14 Lukens said that SIL is part of their current  
15 licensing basis so he was using that as the support  
16 for the fact that the ongoing inspections will  
17 continue regardless. And my question relates to do  
18 all of the current license bases follow through and  
19 now exist for the extended period of operations unless  
20 modified by the license renewal process?

21 MR. SCARBROUGH: My understanding in terms  
22 of like a GE service letter, it's a recommendation for  
23 BWR plants to implement some activity based on the  
24 knowledge of EEH and SIL 644 is that service  
25 information letter. It says you have a piece of

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1 equipment and these are the actions we recommend you  
2 perform.

3 My understanding is is those plants are  
4 obligated to respond to those recommendations. They  
5 have to either implement them or have a reason why  
6 they're not implementing them and our expectation is  
7 that if there's SIL 644 out there which says you will  
8 do this, they are expected to do that or have a  
9 justification for why not.

10 JUDGE WARDWELL: Mr. Rowley?

11 MR. ROWLEY: One of our key principles of  
12 the license rule is that the current license will  
13 carry forward into the renewal period.

14 JUDGE KARLIN: But on page 5 of your  
15 testimony, Mr. Scarbrough, at the bottom you say "if  
16 BWR VIP-139 is approved, prior to the period of  
17 extended operation Entergy would convert to BWR VIP-  
18 139 guidelines from the GE SIL 644." This is telling  
19 me it's an either/or. You're saying they wouldn't do  
20 644 any more. They would do this BWR VIP-139.

21 MR. SCARBROUGH: In terms of the  
22 guidelines, the BWR VIP-139 is much more extensive in  
23 terms of the information that they provide.

24 JUDGE KARLIN: I'm not looking for  
25 guidance. I'm looking for permit conditions that are

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1 enforceable by NRC. And are you saying 644 is gone  
2 and BWR VIP-139 comes into place in lieu thereof?

3 MR. SCARBROUGH: In terms of the license  
4 renewal that was their request, that they have the  
5 option to switch over --

6 JUDGE KARLIN: They have the options.

7 MR. SCARBROUGH: Yes. And the intent  
8 would be that BWR VIP-139 has more information and  
9 that there are some areas in it where it recommends  
10 additional inspections in terms of the guidance based  
11 on lessons learned since it was issued. So there are  
12 some places where it actually adds additional  
13 inspection areas of the dryer. So there are some  
14 improvements in the latest versions because they have  
15 been responding back in those issues and in March of  
16 '05 they've been responding back to questions that  
17 have taken place that they're going to upgrade it and  
18 improve it as they go by. But this is a statement  
19 saying that this was our understanding of the actions  
20 that will take place --

21 JUDGE KARLIN: It wasn't saying it was  
22 your understanding, it was your testimony under oath  
23 that that's what would happen.

24 MR. SCARBROUGH: Right, that was my  
25 understanding of what they would do. They would be

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1 converting over to --

2 JUDGE KARLIN: No, you're the regulator.  
3 Why don't you tell us what the regulatory -- what  
4 you're imposing. It sounds like that's what you're  
5 saying. If this happens, then A. If it doesn't  
6 happen, then B.

7 MR. SCARBROUGH: Right, our expectation  
8 would be that they would continue.

9 JUDGE KARLIN: All right.

10 JUDGE WARDWELL: Staff was required to  
11 make an assessment that -- let me back up quickly. We  
12 all agree that the steam dryer falls under aging  
13 management review. Do you agree?

14 MR. SCARBROUGH: Yes.

15 JUDGE WARDWELL: Entergy, do you agree  
16 with that?

17 MR. LUKENS: Yes.

18 JUDGE WARDWELL: There's a requirement  
19 that demonstrates that aging management is carried out  
20 for the life of the plant or if you have, in effect,  
21 demonstrated through aging management analyses as  
22 required, no one has brought up any TLAA's in this  
23 situation, so we're into developing an Aging  
24 Management Program for the steam dryer. Is that  
25 correct?

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1 Do both parties agree to that?

2 MR. LUKENS: Yes.

3 MR. SCARBROUGH: Yes, sir.

4 JUDGE WARDWELL: What is in your  
5 understanding the Aging Management Program that  
6 Entergy is going to be implementing that you approved  
7 in regards to saying that it's adequate under as  
8 documented in the FSER?

9 MR. SCARBROUGH: I was not a party to  
10 writing the license renewal FSER, but in terms of the  
11 power uprate --

12 JUDGE WARDWELL: No, I'm -- okay, then I'm  
13 not interested in your testimony.

14 MR. SCARBROUGH: Okay.

15 JUDGE WARDWELL: Are either of you three  
16 able to address what is the Aging Management Program  
17 that the staff is approving as being a demonstration  
18 that the management of this particular component, the  
19 steam dryer, will be managed throughout the life of  
20 the plant?

21 MR. ROWLEY: At this moment, it is the  
22 steam dryer monitoring plan, revision 3, that  
23 incorporates GE SIL 644.

24 JUDGE WARDWELL: And where is that stated  
25 as their proposed Aging Management Program?

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1 MR. ROWLEY: It's on page 3-56 of the SER,  
2 the Aging Management Program VIP, vessel internal  
3 program.

4 JUDGE WARDWELL: I can't refer to this  
5 right now off the top, quickly, but do they have any  
6 statements in their application stating that is their  
7 Aging Management Program for the steam dryer?

8 MR. SCARBROUGH: I can't recall exactly  
9 what the application says.

10 JUDGE KARLIN: Let me go to page six of  
11 the testimony of the staff. Question 4C. This is Mr.  
12 Hsu. Is that the correct pronunciation, sir?

13 MR. HSU: Yes.

14 JUDGE KARLIN: Hsu, and Mr. Rowley, "the  
15 staff finds the implementation of BWR VIP-139  
16 acceptable because BWR VIP-139 will provide guidance  
17 for use of the latest methods and technologies,"  
18 etcetera.

19 Are you with me there?

20 MR. HSU: Yes.

21 JUDGE KARLIN: Now this is the BWR VIP-139  
22 that we haven't seen.

23 Mr. Scarbrough, it is your testimony that  
24 the staff is likely to take final action approving  
25 that within this year?

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1 MR. SCARBROUGH: I believe so.

2 JUDGE KARLIN: And you're on the group  
3 that's reviewing that?

4 MR. SCARBROUGH: Yes, sir.

5 JUDGE KARLIN: So by the end of the year,  
6 the steam dryer monitoring program, rev. 3 that the  
7 staff has based its approval on will disappear and a  
8 whole different program will be applicable to this for  
9 the next 20 plus years.

10 MR. SCARBROUGH: I assume so.

11 JUDGE KARLIN: I mean there's a juncture  
12 coming which is the staff approval of BWR VIP-139.  
13 Until that juncture occurs, steam dryer management  
14 plan, rev. 3, is the one that they're committed to and  
15 you're suggesting there's approval upon when that  
16 juncture occurs, if the staff approves it, if Entergy  
17 decides to accept it, then a whole other program jumps  
18 into place, BWR VIP-139. Is this correct, Mr.  
19 Scarbrough?

20 MR. SCARBROUGH: Yes, it's a different  
21 program.

22 JUDGE KARLIN: And we don't know anything  
23 about it, this Board, this Intervenor. Is that  
24 correct?

25 MR. SCARBROUGH: Yes, sir. I assume so.

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1 JUDGE WARDWELL: And let's go on. We do  
2 know something about it. We know it's not as rigorous  
3 in regards to the inspection program that the SDMP is.

4 MR. HSU: We are not sure right now  
5 because --

6 JUDGE WARDWELL: We're talking about what  
7 we're --

8 MR. HSU: The 139 of not being approved by  
9 the staff yet, okay, that's the BWR VIP-139 issuer.  
10 They're the issuer. But after -- and last year  
11 approved -- they're going to issue another version of  
12 the BWR VIP-139. They call it BWR VIP-139A which  
13 includes all the steps additional inspection,  
14 additional requirements and all the additional  
15 improvement in there. So that's all BWR VIP-139 is  
16 working on.

17 JUDGE WARDWELL: That's fine, if I can  
18 interrupt. I understand that. And that's fine, but  
19 that's a potential in the future. That's not reality.

20 MR. HSU: Yes.

21 JUDGE WARDWELL: You made a statement here  
22 at page six that Judge Karlin just quoted where you  
23 say the staff finds that the implementation of BWR  
24 VIP-139 acceptable because BWR VIP-139 will provide  
25 the guidance for use of the latest methods and

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1 technologies, yadda, yadda, yadda.

2 That statement was made I can say with  
3 confidence prior to any of the future implementation  
4 you've just described that may take place in the  
5 future. I've heard testimony today that the current  
6 139 that you say is acceptable here does not include  
7 inspections in it. Is that correct?

8 JUDGE KARLIN: Mr. Scarbrough?

9 MR. SCARBROUGH: That's correct. It does  
10 not. It refers back to SIL 644. It indicates that  
11 there was not -- there was not reinspection  
12 requirements and that was one of our questions to EPRI  
13 that was -- and they refer back to 644 in their  
14 response to us.

15 MR. LUKENS: Your Honor, if I might  
16 clarify, the inspection criteria in VIP-139 are  
17 identical to the inspection criteria in SIL 644. The  
18 difference is VIP-139 as currently issued, does not  
19 have reinspection criteria. The SIL does have  
20 reinspection criteria.

21 JUDGE WARDWELL: Staff, how could you make  
22 the statement on page six that you find implementation  
23 of 139 acceptable without that reinspection criteria?

24 MR. SCARBROUGH: Our understanding was  
25 that in lieu of not having that the SIL 644 guidance

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1 would be followed. In terms of the reinspection  
2 because our discussions with BWR VIP was that they  
3 were not trying to set up the reinspection  
4 frequencies, but they were going to leave that to GE  
5 SIL 644. That was the plan. And the response to a  
6 question from us they said well, we're looked at the  
7 data and we're going to have a more graded approach.  
8 So their original plan was they were going to develop  
9 a later addition of 139 with all the data that they  
10 have from all the inspections of all the steam dryers.

11 JUDGE WARDWELL: You're repeating  
12 yourself. You still haven't answered my question.

13 How could you make the statement that the  
14 limitation of 139 is acceptable without that and all  
15 you're saying if I configure what you've said now is  
16 that you made that in the back of your mind you were  
17 thinking that's because SIL also would be incorporated  
18 in some way, but it's not documented or assured  
19 anywhere.

20 MR. SCARBROUGH: Yes, sir.

21 JUDGE WARDWELL: Mr. Lukens, what did you  
22 propose in your application as your Aging Management  
23 Program for the steam dryer? If you could quote the  
24 page or reference in that application where you  
25 addressed this?

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1 MR. LUKENS: In our testimony at page 11,  
2 the response to question 24.

3 The question is please describe the  
4 proposed steam dryer monitoring program.

5 JUDGE WARDWELL: I'm sorry, what page  
6 number?

7 MR. LUKENS: Page 11.

8 JUDGE WARDWELL: Okay.

9 MR. LUKENS: And answer 24 provides the  
10 description of the steam dryer monitoring program and  
11 at seven lines up from the bottom of that bottom  
12 paragraph, I'm sorry, this contains monitoring  
13 provisions. It apparently does not have the word  
14 inspection here.

15 JUDGE KARLIN: Well, let me try to help  
16 you there, Mr. Lukens. I think if we go to the  
17 preceding page, page 10, that's the one I was asking  
18 you questions about and the question is please  
19 describe the Aging Management Program for the steam  
20 dryer for the license renewal application and there  
21 you cite to section of the license renewal application  
22 3.1.2.2.11 that we were talking about earlier.

23 MR. LUKENS: Yes.

24 JUDGE KARLIN: Check cracking due to flow-  
25 induced vibration is managed by the BWR's vessels

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1 internal program, whatever that is. The vessels  
2 approved currently incorporates GE SIL 644 and then we  
3 talk about the BWR VIP event in the future doesn't  
4 sound like it's very far in the future, end of this  
5 year, when a new plan can spring into place if you  
6 agree to it.

7 Is that -- so the current one is -- this  
8 is your testimony here, is it not?

9 JUDGE WARDWELL: So that is your aging  
10 management plan?

11 MR. LUKENS: Our aging management program  
12 today is SIL 644.

13 JUDGE KARLIN: And as you previously  
14 testified when I asked about page 11, 12, 13, when you  
15 describe your steam dryer monitoring program the  
16 description is what? The SDMP rev. 3 or the BWR VIP-  
17 139 and you said SDMP rev. 3. Is that correct?

18 MR. LUKENS: Correct.

19 JUDGE KARLIN: So this is not BWR VIP-139,  
20 what you're describing in answer to question 24, 25,  
21 26?

22 MR. LUKENS: That's correct.

23 JUDGE KARLIN: Okay. So if we go back to  
24 FSER 3-175, let me ask this of the NRC staff, in this  
25 long document here, where does the FSER discuss the

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1 steam dryer Aging Management Program? I found the  
2 discussion at 3-174 to 3-175.

3 MR. ROWLEY: On page 3-56.

4 JUDGE KARLIN: Mr. Rowley has referenced  
5 us to 3-56. That was helpful. I understand there's  
6 a condition, commitment 37 in the appendix. And I  
7 understand that there's a reference on page 1.12 in  
8 the license conditions.

9 Am I missing discussion anywhere else in  
10 this long document? Is this where you discuss the  
11 steam dryer management program? Are there any other  
12 places where a more thorough discussion or any more  
13 details?

14 MR. ROWLEY: I have to get back to you on  
15 that one.

16 JUDGE KARLIN: Okay. We'll be taking a  
17 break here in a little bit. I mean I don't know if  
18 there is. I don't think there is. I'm not trying to  
19 trick you. I just didn't find it. And if there is,  
20 I'd like to read it and study it. But on page 3-175,  
21 it says staff finds that since the applicant committed  
22 to implement BWR VIP-139, if approved by the staff,  
23 this aging effect or mechanism will be adequately  
24 managed as recommended by GALL that Dr. Wardwell was  
25 questioning about.

1 In the alternative, "if the staff does not  
2 issue an SER approving BWR VIP-139, steam dryer  
3 inspections will continue in accordance with steam  
4 dryer monitoring plan rev. 3. The steam dryer  
5 monitoring plan would also assure the aging effects  
6 that the mechanism will be adequately managed. So the  
7 staff is saying either way, you're satisfied that the  
8 steam dryer aging management will be adequately  
9 managed. Is that right?

10 MR. HSU: Yes.

11 JUDGE KARLIN: All right, I think at this  
12 point we need to take a short break. Why don't we  
13 take a break for 10 minutes, if we would, please. In  
14 10 minutes we'll reconvene. At this point, we're  
15 adjourned.

16 (Off the record.)

17 JUDGE KARLIN: All right, we will go back  
18 on the record, Mr. Reporter.

19 I will remind the witnesses you are still  
20 under oath, so please recognize that.

21 Now I think the NRC staff had a question  
22 that you might want to give us - did you find anything  
23 more on the FSER? Did you have enough time to do  
24 that?

25 Okay.

1 MR. ROWLEY: No, sir, those two locations.

2 JUDGE KARLIN: Those are the only  
3 locations? All right, fine.

4 All right, we will proceed.

5 Dr. Reed.

6 JUDGE REED: We're going to shift gears,  
7 and focus more specifically on the contention that NEC  
8 has brought forward, and just to refocus us, I'd like  
9 to ask Dr. Hopenfeld to remind us in hopefully a very  
10 few words exactly what the bone of contention is here.

11 Would you restate the contention three for  
12 us as succinctly as you can?

13 DR. HOPENFELD: The contention right now is  
14 based on an in-service inspection, and primarily  
15 moisture monitoring.

16 The contention is, the contention is that  
17 fatigue crack from high-cycle flow-induced vibrations  
18 cannot be monitored, but in-service inspection.

19 Also moisture monitor is up to the tap,  
20 and it's not reliable as an indicator of potential  
21 drier disintegration. It's the essence of it.

22 Am I loud enough?

23 JUDGE REED: No, that's fine. That's  
24 helpful.

25 Do you have something further to say?

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1 DR. HOPENFELD: The issue is,  
2 disintegration of the drier that form new spots that  
3 can be carried into the steam lines or they can deform  
4 in some unanticipated places, and that you will  
5 interfere with the normal operation of the plant or  
6 abnormal operation, or DBA-designed accidents.

7 JUDGE REED: Okay, let's stop there.

8 Now you have stated in your testimony that  
9 public safety hazard will result if the drier was  
10 damaged in some -

11 DR. HOPENFELD: I can't hear.

12 JUDGE REED: You couldn't hear?

13 I'm sorry. I'll turn toward you and speak  
14 more clearly.

15 You had stated that a public safety hazard  
16 would result if the drier was damaged, and some of its  
17 parts broke loose and were transported by flow or  
18 gravity to other areas of the reactor system.

19 I think I've just restated what you said  
20 earlier?

21 DR. HOPENFELD: Correct.

22 JUDGE REED: So you agree with that  
23 statement?

24 DR. HOPENFELD: Yes.

25 JUDGE REED: Would you explain in your mind

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1       how would these loose parts constitute a safety  
2       hazard?

3                   DR. HOPENFELD: Well, I will give you the  
4       example that I remember from many years --

5                   JUDGE KARLIN: I'm having trouble hearing  
6       you. Can we take a brief break right here? We might  
7       need to close the window.

8                   (Whereupon, the matter went off the record  
9       briefly.)

10                  JUDGE KARLIN: Go ahead, continue.

11                  DR. HOPENFELD: Where the bathroom got  
12       breached, and got into the -- and blocked the flow  
13       channel of the fermium reactor. That's the extreme  
14       example.

15                  We had many examples, in the case of BWRs  
16       in a steam generator.

17                  JUDGE REED: What kind of reactor was the  
18       fermium reactor?

19                  DR. HOPENFELD: It was a sodium-cooled  
20       reactor. It was a prototype.

21                  JUDGE REED: Did it have anything to do  
22       with the steam drier?

23                  DR. HOPENFELD: No. I'm just giving you  
24       the extreme case, asking what's possible in an extreme  
25       case. I can't visualize how it's going to get in

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1 there. In one extreme case the part can block the  
2 channel or block flow channels on the top. It's not  
3 the same reactor, no. The concept is the same.

4 Also in the case of the BWR steam  
5 generators, we had many situations where loose tar  
6 because of J-tubes forming part of coming down that  
7 would cause interference with the - causing tubes to  
8 vibrate, and causing them to wear out that led to  
9 steam generated tube rupture.

10 These are examples. I cannot anticipate -  
11 - you can premise about the infinite number of  
12 scenarios where safety functions would be affected.  
13 Flow parts could go in there and block the - or  
14 interfere with the safety relief valve. But you know  
15 I haven't looked at all the possibilities. This is  
16 some significant number.

17 JUDGE REED: So the two things that I heard  
18 that you were concerned with is the flow channel not  
19 be blocked, or that the safety release valve.

20 DR. HOPENFELD: I gave you an example.  
21 That's not what you heard. What I'm trying to say, it  
22 interfered with the safety functions of the system, of  
23 the reactor, during normal and abnormal operation. I  
24 gave you two examples, but just examples.

25 JUDGE REED: If the plant were shut down

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1 immediately following the generation of loose parts,  
2 do you still believe that there would be a safety  
3 problem or a hazard to the public?

4 DR. HOPENFELD: I couldn't answer that in  
5 either way, because I don't know. It depends on the  
6 particular situation. It depends on what happens  
7 during the shutdown due to SCRAM. I don't know. It  
8 depends where the parts are, or what is being blocked.

9 JUDGE REED: You are postulating these  
10 loose parts and suggesting it would be a safety  
11 hazard?

12 DR. HOPENFELD: Yes.

13 JUDGE WARDWELL: So why don't you give us  
14 an example of one where it would be a safety hazard  
15 immediately after a shutdown?

16 DR. HOPENFELD: Well, I gave you one, if  
17 for some reason a relief valve opens up, and it's  
18 supposed to open up during an accident, and it doesn't  
19 open up.

20 JUDGE WARDWELL: That's true with any  
21 accident that has something to do with the steam  
22 drier, isn't it?

23 DR. HOPENFELD: No, the steam drier is the  
24 source for loose parts in here. That's the purpose fo  
25 this whole contention.

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1 JUDGE WARDWELL: So your testimony is that  
2 the loose part could get up into -

3 MR. FAIR: Oh, it doesn't - no, it doesn't  
4 have to come from the steam drier. It can come from  
5 some other place. The issue here is the steam drier,  
6 that we found recently, because of the review, about  
7 three or four or five or six steam generators have  
8 developed cracks because of flow induced vibration,  
9 and parts went into places they shouldn't have been.

10 JUDGE WARDWELL: And it is feasible for a  
11 part from the steam drier to get to the relief valve?

12 DR. HOPENFELD: Probably, yes. I can't -  
13 I'd have to analyze it. It's feasible for any part  
14 from this fuel line, depends on what's the size, to  
15 get anywhere in the system.

16 JUDGE REED: Okay, you also stated a little  
17 more specifically in your testimony that, and I quote,  
18 loose parts may block flow channels in the reactor  
19 core; block spray cooling nozzles; or prevent the  
20 MSIVs from isolating the system during loss of coolant  
21 accidents.

22 You injected this idea of a loss of  
23 coolant accident associated with loose parts. So are  
24 you postulating a LOCA associated with a steam drier  
25 failure?

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1 DR. HOPENFELD: All I'm saying is there are  
2 certain basis action, steam rupture is one, major  
3 steam line rupture. Under that condition, because of  
4 the extra loads that you get associated - let me just  
5 back up. Under normal condition you have a pressure  
6 drop across that drier. That's one way, . In addition  
7 to this, you have acoustic sources which generate  
8 pressure forces which result in loads on the drier.  
9 During transients like LOCAs you have different type  
10 of forces. You have flow forces that additionally  
11 could impact the drier. You have large sources of  
12 energy that could further induce very large vibrations  
13 or resonance frequency on the drier.

14 Would you like me to give you an example?  
15 I'd be glad to. It's almost at firsthand. When the  
16 Turkey Point in Florida started up, it was heated up,  
17 a steam line broke or relief valve just blew up, the  
18 whole building, all the structures, were shaking up to  
19 about two to three minutes. There was a tremendous  
20 amount of energy released.

21 Now you have a drier that sits there and  
22 is just about to crack up, because it's already got  
23 cracks. When you have that kind of situation where a  
24 large energy release causes large amplitude vibrations  
25 on the drier, it will disintegrate, and it would

1 interfere with the safety shutdown of the plant, or  
2 whatever you do in a particular situation to shut down  
3 the plant safety, to mitigate the accident.

4 And without going into the specifics of  
5 the accident, and the whole scenario exactly, I cannot  
6 go beyond this point. I can only give you general -

7 JUDGE REED: I would like to persist a  
8 little in understanding your concerns about a LOCA,  
9 since you introduced that in your testimony.

10 And I'm puzzled as to whether you believe  
11 that a failure of the steam drier would occur  
12 simultaneously with a LOCA?

13 DR. HOPENFELD: Yes.

14 JUDGE REED: Just by chance?

15 DR. HOPENFELD: No, it's not by chance.

16 JUDGE REED: So you think one causes the  
17 other?

18 DR. HOPENFELD: Yes.

19 JUDGE REED: Which causes which?

20 DR. HOPENFELD: The forces that are  
21 generated due to the LOCA, depends on what the LOCA is  
22 and where it is, whether it's a circulating line  
23 break, or is there a feedline break, or whatever it  
24 is.

25 JUDGE REED: So you are postulating a LOCA

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1 occurs, and that would cause a failure of the steam  
2 drier.

3 DR. HOPENFELD: Correct.

4 JUDGE REED: And then that failure of the  
5 steam drier then would cause some problem that would  
6 make -

7 DR. HOPENFELD: In mitigating the accident.

8 You see when you have an accident -

9 JUDGE REED: Well, if had a LOCA, we kind  
10 of had the worst one.

11 DR. HOPENFELD: No, because you can have  
12 the LOCA some place, there are various procedures --

13 JUDGE REED: I'm trying to understand what  
14 your concern is.

15 DR. HOPENFELD: But you mitigate. And this  
16 is -- would be interfering. You say I introduce it?  
17 No, I believe it's in the regulation. I don't  
18 remember exactly where it is, where you are supposed  
19 to mitigate the components. I don't know exactly, 54  
20 or something, the component is supposed to withstand  
21 normal operation and DBA operation.

22 JUDGE REED: Let me turn to the staff and  
23 ask is there any requirement to consider a failure of  
24 the steam drier in association with a loss of coolant  
25 accident?

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1 MR. SCARBROUGH: No, sir, not that I'm  
2 aware of.

3 JUDGE REED: Could you repeat that?

4 MR. SCARBROUGH: No, sir, not that I'm  
5 aware of.

6 JUDGE REED: Is there any reason to believe  
7 that a LOCA could in fact cause failure of the steam  
8 drier?

9 MR. SCARBROUGH: When, as part of the power  
10 uprate, the licensee was required to locate at  
11 transients, and the load upon transients, from  
12 transients, including slowly vibration loads and the  
13 loads from brakes, relief valves opening, different  
14 things, they have to go through the transient  
15 evaluation and look at the stresses that would be on  
16 the drier. And that was part of the evaluation in  
17 terms fo power uprate, and the loads allowed under  
18 those types of conditions are greater than the loads  
19 allowed for normal operations of the steam drier  
20 because of fatigue. There is allowed to be  
21 degradation of the drier, some plastic deformation and  
22 things of that nature. So there are - the limits are  
23 there for higher than the normal loads that we would  
24 get from fatigue-oriented loads.

25 And so those - they did look at those, and

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1 they found that there was not situations where they  
2 would exceed the allowable loads made in the code.  
3 Even though this is not a code component, they  
4 followed those hints of guidance.

5 JUDGE REED: Can you envision a scenario in  
6 which the failure of the steam drier, some loose -  
7 generation of a loose part following a loss of coolant  
8 accident would exacerbate that accident, would make  
9 the conditions worse, or lead to a higher probability  
10 of core melt?

11 MR. SCARBROUGH: I'm not aware of - the  
12 examples that we had from Quad Cities failure, they  
13 had some loose parts. They ended up in various  
14 places. But there was not any situation where they  
15 caused a safety related component to not be able to  
16 perform its function.

17 JUDGE REED: so there was no LOCA?

18 MR. SCARBROUGH: Right, there was no LOCA.

19 JUDGE REED: I'm just following up on this  
20 introduction of the concept of a loss of coolant  
21 accident in association with the steam drier.

22 MR. SCARBROUGH: I'm not aware of what  
23 might be a problem from that, because with the LOCA  
24 situation you are spraying water into the reactor, you  
25 are getting the pressure down, you are dropping

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1 pressure in certain flows. I'm not aware of what --  
2 you would be trying to mitigate that event. And I'm  
3 not aware of what might be additional problems caused  
4 by a drier heat problem.

5 JUDGE REED: Is there in your mind any  
6 scenario by which a loose part from the drier could  
7 interfere with the injection of cooling water flow  
8 following a LOCA?

9 MR. SCARBROUGH: No.

10 JUDGE REED: Is that likely in your mind?

11 MR. SCARBROUGH: No, sir, I don't think it  
12 would interfere with the cooling water flow during the  
13 testing.

14 JUDGE REED: Dr. Hopenfeld, is there  
15 anything you would like to add?

16 DR. HOPENFELD: Definitely. First of all,  
17 I haven't seen, or they haven't provided us with an  
18 analysis as to what they have done, and I don't  
19 believe they have provided the Board with what kind of  
20 study they have done in the year or two in studying  
21 these things.

22 JUDGE REED: To study these things?

23 DR. HOPENFELD: Yes, to study the accident  
24 scenarios, to ask your question, the drier  
25 disintegrating and resulting in interfering with the

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1 mitigation of the accident.

2 I don't know what kind of study, they  
3 haven't presented to us any of these studies. But I  
4 concur from what the gentleman says that usually they  
5 are looking into the drier in perfect condition. When  
6 the drier is in perfect condition, you can see that if  
7 you put all those loads on it, it may stay in perfect  
8 condition.

9 But the issue here is we already you have  
10 a pre-cracked drier. To a certain point, if you don't  
11 know how pre-cracked it is, you have -

12 JUDGE REED: Well, we - pardon me - we are  
13 going to investigate that in some detail. So let's  
14 leave the question of not knowing for a moment, and  
15 proceed with this assumption that it does fail.

16 How can it do damage? That is the issue.

17 DR. HOPENFELD: Oh, okay.

18 I'll give you one example. Suppose the  
19 parts come in, fall down and interfere with the water  
20 that comes out of the spray nozzle, just don't let the  
21 water out. I don't know where those parts would fall.  
22 Suppose the whole lead hardened structure just falls  
23 on the core.

24 JUDGE REED: I'm not entirely familiar with  
25 boiling water reactors, so I'm needing some help here

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1 from this panel of experts.

2 What is - it seems unlikely to me that a  
3 loose part from the top of this reactor would be able  
4 to find its way down and block an inlet flow for  
5 cooling water.

6 DR. HOPENFELD: That was just one scenario.

7 JUDGE REED: I just would like to ask NRC  
8 once again whether you see any mechanism by which that  
9 would be either possible or likely?

10 MR. SCARBROUGH: No, sir, not for the  
11 injection flow. The steam drier in terms of the  
12 pieces, if there were pieces, they could come out and  
13 go down the steam lines. There are relief valves  
14 there. There are Ids there.

15 JUDGE REED: So failure of a valve is a  
16 possibility, but it's more likely that the loose parts  
17 would be carried down the steam lines and cause some  
18 failure down in that part of the system?

19 MR. SCARBROUGH: Yes, there was a situation  
20 at Quad Cities where a cover plate fell down directly  
21 on top of the motion separator. It was a large piece,  
22 and sat there. There is another piece at Quad Cities  
23 which they think did migrate down to the bottom of the  
24 reactor vessel head, where there was very low flow.

25 There is potential for components to move

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1 various places. From a point of view of a relief  
2 valve, unless the relief valves were open there is no  
3 driving head to push that piece up into the branch  
4 line for that relief valve. It is going to be sort of  
5 carried on down the stream, and there were some pieces  
6 found at Quad Cities in the turbine strainers. There  
7 were some strainers, found some pieces in the -- but  
8 that's - they do look at things like that. And  
9 actually the BWR VIP is - they have a BWR VIP 06 -

10 JUDGE REED: VIP?

11 MR. SCARBROUGH: Yes, BWR V-I-P.

12 JUDGE REED: V-I-P?

13 MR. SCARBROUGH: That group is looking at  
14 a document, they have a document called 06 where they  
15 look at various loose parts, and that is part of one  
16 of the documents they are upgrading now to look at  
17 where the potential - where could all these loose  
18 parts go if there were any. And that's what they are  
19 evaluating.

20 But in terms of a LOCA, I'm not aware of  
21 places where there might be a problem with injection  
22 flow.

23 JUDGE REED: Dr. Hopenfeld.

24 DR. HOPENFELD: In safety studies what you  
25 do is, you look at vulnerable places, even in channel,

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1 some valve that interferes with the shutdown  
2 procedure. And there may be others, some of them like  
3 I can't even think of, but there are many. You go  
4 through that, and you say, I don't know where this  
5 thing comes from. I know I have a potential source  
6 somewhere; I don't know how to get to it. Okay? You  
7 look at those, and you see what the consequences are.  
8 And then you run an insanity study and see whether  
9 that makes sense, whether you really have that kind of  
10 - insanity.

11 JUDGE KARLIN: Insanity? Okay.

12 DR. HOPENFELD: You see -

13 JUDGE KARLIN: Is that an acronym?

14 DR. HOPENFELD: No, I was just quoting  
15 these things that I hear. I have a very simple mind.  
16 So you see whether that makes sense.

17 Now what we hear here, it's talk talk  
18 talk, that we haven't done this, and we are looking at  
19 a situation that occurred four years ago and there  
20 were some parts carried into the turbine lines. But  
21 that is not a generalization. That's not a safety  
22 study that happens here. All that is it just sends  
23 you a signal because of better luck. But I haven't  
24 seen anybody conducting a safety study to see where  
25 those loose parts would come in. I've seen those

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1 studies done many years ago for BWRs and steam  
2 generators, the same thing. You don't sit there and  
3 figure out exactly how the thing is going to  
4 disintegrate, and when it's going to blow up. You  
5 just can't postulate that kind of thing. It's just  
6 too difficult. It depends on how weakened - you see  
7 what happens is, the reason this thing is brought up  
8 is because the structure is weakened, okay. You  
9 already have a weakened structure. And that's what  
10 you worry about. If it's weakened, then all these  
11 parts - by itself, the steam drier by itself is not a  
12 safety function. It's not a safety-related component,  
13 and it probably wasn't in the design for ASME code.

14 But now what we see, we have experience  
15 here, that you have four or five reactors have  
16 experience failure in this area, then that's the  
17 reason you have to see what the safety consequences  
18 are. And I haven't seen a study of that.

19 JUDGE REED: Okay, can I ask you to pause  
20 there.

21 And since you brought up this concept of  
22 several reactors having failures, I'd like to pursue  
23 that for a moment.

24 I'd like to direct my questions on this to  
25 Entergy. I'm not sure exactly which of you two

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1 gentlemen is the right person to answer these  
2 questions, but I will address them to both of you.

3 So what I'd like to do is understand a  
4 little bit better about the history of steam drier  
5 failures, in particular, I'd like to know more about  
6 the Quad Cities incidents of 2002 and 2003.

7 So I wonder if someone could briefly  
8 describe for me what happened in that reactor, in  
9 those years?

10 MR. HOFFMAN: Yes, sir. I might need to  
11 refer to a document.

12 JUDGE REED: Speak very loudly.

13 MR. LUKENS: Yes, sir, I will answer that  
14 question.

15 Quad Cities went through I believe it was  
16 a 117 percent power uprate. We started plant  
17 operation in early 2007 - March of 2002, excuse me.  
18 I believe it was March of 2002.

19 JUDGE REED: They started operations at the  
20 new -

21 MR. LUKENS: At the elevated power level.

22 JUDGE REED: And what was the increase?

23 MR. LUKENS: 117 percent I believe.

24 JUDGE REED: I thought it was 13 percent,  
25 but was it 17 percent?

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1 MR. LUKENS: Yes, 1-1-7, yes, sir.

2 JUDGE REED: So very close to the 20  
3 percent.

4 JUDGE WARDWELL: And what were the absolute  
5 power levels before and after? In megawatt or  
6 electric?

7 MR. HOFFMAN: I do not know the answer to  
8 that question. Nor do I plan to know it.

9 JUDGE WARDWELL: But a similar plant or a  
10 very different vintage BWR? How close are they? The  
11 two plants?

12 MR. HOFFMAN: Relatively similar, it's a  
13 BWR-3.

14 JUDGE REED: Both plants are BWR-3s?

15 MR. HOFFMAN: They're similar. They  
16 started operation. Through about three months of  
17 operation they noted some increase in motion  
18 carryover. At the time that was a new phenomenon, so  
19 they apparently didn't understand the meaning of that;  
20 operated a little bit longer; shut the plant down -

21 JUDGE WARDWELL: What do you mean by a  
22 little bit longer?

23 MR. HOFFMAN: About another month. Shut  
24 the plant down, and they found some failures, sections  
25 of the steam dryer.

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1 JUDGE REED: And didn't they see initial  
2 anomalies during the course of that month in plant  
3 parameters?

4 MR. HOFFMAN: They found some additional -  
5 right - plant parameter anomalies.

6 JUDGE REED: So there is reason to believe  
7 that it wasn't a single incidence of failure, but a  
8 sequence of failures that occurred over a period of a  
9 month of operation?

10 MR. HOFFMAN: The plant is in regression of  
11 that failure. It started failing, and then progressed  
12 further.

13 JUDGE WARDWELL: Did any of the data  
14 indicate that? Or is that just a supposition on your  
15 part?

16 MR. HOFFMAN: That is a supposition. But  
17 obviously, that became the indicator that for unknown  
18 - perhaps unknown loadings occurring on steam dryers  
19 causing very rapid failures, essentially stress  
20 loadings that exceeded the endurance limit of the  
21 material and resulted in rapid failure.

22 JUDGE REED: Did you see any plots of the  
23 plant parameters over that month to see if there was  
24 a trend in any of them, either increasing or  
25 decreasing? Or just the jump -

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1 MR. HOFFMAN: I have not seen any, no, sir.

2 JUDGE WARDWELL: Has anyone else seen those  
3 plots?

4 MR. SCARBROUGH: Nor for that event you are  
5 talking about. There was a later event -

6 JUDGE WARDWELL: We'll get to that later,  
7 I just wanted to - while you were still talking about  
8 it. Go ahead.

9 JUDGE REED: So can you explain why the  
10 plant was not shut down immediately?

11 MR. HOFFMAN: I can't answer. I didn't  
12 work for that company. I wasn't there.

13 JUDGE REED: Dr. Hopenfeld?

14 MR. HOFFMAN: I would like to make one  
15 comment. I think it is important, and it's informing  
16 to us. And it's on account of, meant made in regard  
17 to the new phenomenon. It's very important to realize  
18 what we are talking about.

19 Each time - and I watched the thing mostly  
20 -- each time there is an event the current that is  
21 being used, this is the new phenomena, you go out and  
22 look into what happened you find out it is not a new  
23 phenomena; it's just a phenomena that nobody has  
24 anticipated, because nobody has looked.

25 And what I'm bringing here is a phenomena

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1 that I think somebody should anticipate, that we  
2 already have a precursor to indicate that these things  
3 do - or could crack up. And you ought to look at it  
4 as a safety hazard.

5 And one reason I cannot answer all your  
6 questions, where these things go and exactly what  
7 happens with them and see that that study should have  
8 been done. It's GE's job to do that. But I haven't  
9 seen it done.

10 Accordingly, it's a new phenomena. It's  
11 getting away from that, from doing the analysis.

12 JUDGE REED: Could we continue with your  
13 description of the Quad Cities incidents?

14 MR. HOFFMAN: Yes, sir.

15 They shut the plant down, and they  
16 revealed, they found a missing part. They modified  
17 the plant. The root cause that they determined for  
18 that event was high-cycle fatigue.

19 JUDGE WARDWELL: Could you describe that  
20 mechanism that causes this fatigue, and how it differs  
21 from metal fatigue that, if you were here, we  
22 discussed quite much in detail the last day and a  
23 half, and what's the difference between the two, and  
24 the phenomena of it, and then the parameters or the  
25 conditions that tend to aggravate that particular

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1 phenomena associated with steam dryers.

2 MR. HOFFMAN: The difference would be - it  
3 is metal fatigue. The high-cycle fatigue is fatigue  
4 resulting generally in lower stresses over a large  
5 number of cycles, as compared to what you call low-  
6 cycle fatigue, which might be a high stress cycle over  
7 a low number of cycles.

8 If you recall the discussion about the SN  
9 curve, which is the cycles, stress versus the number  
10 of cycles, that you can have a very high stress for a  
11 low number of cycles; you could have a low stress for  
12 a high number of cycles. But you get to a point which  
13 you would call the endurance limit. It's the stress  
14 below which you could essentially operate an infinite  
15 number of cycles and not have fatigue failure.

16 And that is typically accepted to be on  
17 the order of  $10^7$ th cycles. If you have a component  
18 that has experienced 10 million or more cycles,  $10^7$   
19 cycles or more and hasn't failed, the second  
20 conclusion is that it's not subject to fatigue  
21 cycling. It will essentially operate untime-limited  
22 under those operating conditions.

23 JUDGE WARDWELL: The phrase, vibration  
24 fatigue, is also used, isn't it, for this situation?

25 MR. HOFFMAN: The vibration is what the

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1 loading is as compared to say a pressure loading or a  
2 tensile loading. It is what causes the stress, the  
3 fatigue of stress in cycles. And there can be a  
4 number of forces that cause that stress.

5 JUDGE WARDWELL: And then the primary  
6 source of those stresses are vibration. Are there any  
7 other situations that would cause those low-cycle  
8 stresses? The size vibration?

9 MR. HOFFMAN: In the case of the dryer, the  
10 vibrations, yes, pressure fluctuations causing  
11 vibrations, that is correct, sir.

12 JUDGE KARLIN: Mr. Hoffman, before we  
13 return to Dr. Reed's questioning, I'm trying to  
14 follow. You are talking about certain events that  
15 occurred at the Quad Cities facility plant.

16 MR. HOFFMAN: Yes, sir.

17 JUDGE KARLIN: I note that - I'm trying to  
18 follow this, the Exhibit D3-09, which is the BWR steam  
19 dryer SIL 644 describes a number of events. Which one  
20 are we - are we on one of those? For example Appendix  
21 A to that 644, SIL 644 describes an event on a certain  
22 date. Let's see what the date was. 2002, is that the  
23 event you were just testifying about?

24 MR. HOFFMAN: It was -

25 JUDGE KARLIN: Which one?

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1 MR. HOFFMAN: Let me find it in this.

2 JUDGE KARLIN: Yes, the first one.

3 MR. HOFFMAN: Yes.

4 JUDGE KARLIN: On page one of the SIL they  
5 refer to a lower horizontal cover plate failure  
6 occurred in BWR-3 in 2002. Is that it? I mean I just  
7 want to know so I can follow what you are talking  
8 about?

9 MR. HOFFMAN: Yes, sir, that is it.

10 JUDGE KARLIN: Okay, then on page two of  
11 that SIL 644, they say, Appendix A provides more  
12 detailed description of this event. So the event you  
13 are testifying about is the event described in  
14 Appendix A of SIL 644?

15 MR. HOFFMAN: Yes, sir.

16 JUDGE KARLIN: Great. I'll follow you  
17 there.

18 JUDGE REED: I'd like for Mr. Hoffman to  
19 continue describing these two events, because so far  
20 we have only touched on the first one.

21 MR. HOFFMAN: Okay.

22 The second event was an event at Quad City  
23 where they had a power - a power operated relief valve  
24 actuation. They repaired the valve, the plant  
25 returned to serve. After returning to service they

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1 found a change in the moisture carry-over, unexplained  
2 change in the moisture carry-over.

3 Plant operated for it looks like about  
4 three weeks. They saw that the moisture carry-over  
5 continued to increase. They reduced the power level  
6 to the pre-EPU level, and the moisture carry-over went  
7 down.

8 JUDGE KARLIN: May I ask, when you say the  
9 second event, is that referred to in SIL 644?

10 MS. HOFMANN: It would be Appendix Bravo,  
11 I'm speaking from Appendix B.

12 JUDGE KARLIN: Appendix B, okay, that is,  
13 and the event occurred in?

14 MR. HOFFMAN: April of 2003.

15 JUDGE KARLIN: Okay, are you getting your  
16 information about this event from SIL 644

17 MR. HOFFMAN: Yes, I am, sir.

18 JUDGE KARLIN: So you have no personal  
19 knowledge of any of this?

20 MR. HOFFMAN: I have no personal knowledge.

21 JUDGE KARLIN: Okay, so we could just as  
22 well read 644.

23 JUDGE REED: So in both of these events the  
24 plant operated for a period of weeks with, if I can  
25 use the phrase, off-normal parameters that should have

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1 led the plant operators to be concerned, but they  
2 continued to operate the plant with loose parts that  
3 had broken off the steam generator - steam dryer.

4 MR. HOFFMAN: The plant continued to  
5 operate with those abnormal indications, that's  
6 correct, sir.

7 JUDGE REED: I have several questions about  
8 this particular series of incidents.

9 First of all, was there an inspection  
10 program in place at the time, for the Quad Cities  
11 steam dryer?

12 MR. HOFFMAN: Not that I'm aware of, no,  
13 sir.

14 JUDGE REED: So they were not looking for  
15 cracks?

16 MR. HOFFMAN: They were - no, sir.

17 JUDGE REED: Is this the first time that  
18 the steam dryer actually cracked?

19 MR. HOFFMAN: Yes. As a result of power  
20 uprate, yes.

21 JUDGE REED: But were there other failures  
22 as a result of normal operation?

23 MR. HOFFMAN: I don't know that. I don't  
24 know that, sir, no.

25 JUDGE REED: What is the position of

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1 Entergy with regard to shutting down the plant,  
2 Vermont Yankee, if you detect any of these parameters  
3 like moisture carry-over that if you see a small  
4 change, what would your procedures require?

5 MR. HOFFMAN: We had a procedure that off-  
6 normal procedure ON-3178, that the operators of - in  
7 issue requires them if they see a change in any of the  
8 monitored parameters which are, as described in our  
9 testimony mismatches in steam flow, changes -  
10 unexplained changes in reactor film pressure;  
11 unexplained mismatches in reactor water levels; or  
12 increases in moisture carry-over. They immediately  
13 enter this off-normal operating procedure which  
14 requires an assessment of, do we understand why that  
15 moisture carry-over changed? Do we understand why the  
16 level changed?

17 There may be operating evolutions going on  
18 that you would expect those parameters to change, so  
19 you would conduct that evaluation. If it did not  
20 explain the reason for - the operators and the  
21 engineers cannot explain the reason for the changing  
22 of those parameters, and they conclude that it might  
23 be caused by dryer damage, there are immediate steps  
24 to be taken including power reductions and shutdown of  
25 the reactor.

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1 JUDGE REED: So who would review these  
2 changes in parameters, and who would make a decision  
3 about continued operation?

4 MR. HOFFMAN: Parameter changes would be  
5 reviewed by the operators in the control room before  
6 the orientations. If they saw changes in those  
7 parameters, and they could not explain why they were  
8 changing, because of the evolutions they were going  
9 through, they would notify engineering. We would  
10 enter our engineering operations evaluation process,  
11 bring in the engineering folks to look at the data and  
12 start those evaluations.

13 JUDGE WARDWELL: And how long would that  
14 take in your estimation?

15 MR. HOFFMAN: They report immediately to  
16 engineering. Engineering would start work  
17 immediately.

18 JUDGE WARDWELL: This doesn't mean the next  
19 day when the engineers show up for work, it means  
20 immediately?

21 MR. HOFFMAN: Yes, sir. They would call  
22 people in office in order to do those evaluations.

23 JUDGE WARDWELL: So again, it is your  
24 belief that if there were a failure of the steam dryer  
25 at Vermont Yankee and it were detectible in the sense

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1 that you could see the results in some of the plant  
2 parameters, that the plant would be shut down  
3 immediately and would not continue like Quad Cities to  
4 operate for a period of months?

5 MR. HOFFMAN: That is correct; we would  
6 not. I could add, also, these - further bolstering  
7 of that is, once the issue was found at Quad Cities,  
8 the industry - and Vermont Yankee - started looking  
9 at, and we analyzed it. We don't have a situation  
10 where we have an increase in power level, didn't  
11 anticipate those vibrations, and didn't analyze them.  
12 They were, as Mr. Scarbrough said, thoroughly  
13 evaluated as part of the power uprating process,  
14 predicted to be below the endurance limit for the  
15 dryer.

16 They started a power extension test  
17 program that was conducted during the ascension to the  
18 higher power level, confirmed the analytical results.  
19 We have confidence that is not operating in a regime  
20 that is subject to high-cycle fatigue. And even above  
21 that we have this ongoing monitoring program to look  
22 for any changes in parameters. We are not relying on  
23 - we have a double assurance essentially.

24 JUDGE REED: Are you familiar with the  
25 analysis that was done prior to the power uprate?

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1 MR. HOFFMAN: I personally am not.

2 JUDGE REED: The analysis that was done  
3 prior. Mr. Lukens?

4 MR. LUKENS: I was not involved in that  
5 analysis.

6 JUDGE REED: Neither of you can speak to  
7 the analysis?

8 MR. LEWIS: No, sir.

9 JUDGE REED: But there was some sort of  
10 stress analysis done to determine that the fatigue  
11 stresses were below this endurance limit; is that -  
12 did I phrase that question correctly?

13 MR. HOFFMAN: Yes, that's correct. There  
14 were very extensive stress analysis.

15 JUDGE WARDWELL: What endurance limit are  
16 you comparing it to? Is it a cyclic limit? Is the  
17 limit determined from a cyclic test?

18 MR. HOFFMAN: Yes, it's the ASME code  
19 endurance limit.

20 JUDGE WARDWELL: Endurance limit for what?  
21 I mean there are all kinds of endurance limits.

22 MR. HOFFMAN: For the material, the  
23 material of what's in this new material that the dryer  
24 is manufactured from.

25 JUDGE WARDWELL: Are you testifying that

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1 they have an endurance limit for cyclic stress  
2 loading?

3 MR. HOFFMAN: Yes, the SN curve would go  
4 down to a point where it is essentially asymptotic to  
5 a horizontal line.

6 JUDGE WARDWELL: This commitment to do  
7 these corrective actions that you were describing,  
8 these off-normal procedures, is that linked to your  
9 aging management plan program in any fashion?

10 MR. HOFFMAN: That is the - these  
11 monitorings, these parameters that are monitored are  
12 the ones described in the steam generator monitoring  
13 plan, yes, sir.

14 JUDGE WARDWELL: The aging management  
15 program that was submitted with your application makes  
16 no reference to any of these corrective actions that  
17 you just described.

18 So how is it linked to that?

19 MR. HOFFMAN: I don't understand the  
20 question, sir.

21 JUDGE WARDWELL: In your application there  
22 is no reference to any of these off-normal loadings,  
23 or any corrective action for that matter. A couple of  
24 hours ago we quoted what those were, and it was just  
25 basically a commitment to either continue the steam

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1 dryer management program as it now exists, or to go to  
2 VIP 139.

3 And that is only with your blessing in  
4 regards to some other recommendations. But it has no  
5 other details in regards to corrective actions like  
6 you have just described that would take place. How  
7 are those linked to those aging management programs to  
8 assure that they could and would be implemented?

9 MR. HOFFMAN: Those are the implementing  
10 procedures for executing the program. In other words  
11 the aging management program essentially will monitor  
12 those physical parameters, and will conduct periodic  
13 inspections. We have converted those statements into  
14 implementing plan procedures. And that's what the  
15 operators would do; that's what the engineers would  
16 use to carry out those requirements.

17 JUDGE WARDWELL: Well, part of a monitoring  
18 program associated with aging management would consist  
19 of corrective actions as part of the data collection,  
20 inspection, interpretation, evaluation and then  
21 implementation of what needs to be done in regards to  
22 actions associated with the information that is being  
23 collected, via visual inspection or monitoring of  
24 parameters.

25 You described nice corrective action.

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1 Where are those linked to in part of the aging  
2 management program?

3 And the reason I ask this is because I  
4 assume someone in your company could in fact change  
5 some of these off-normal procedures not knowing they  
6 are linked to any specific aging management plan  
7 required of a license renewal application, potentially  
8 even get it approved by the NRC staff if it wasn't  
9 flagged that these off-normal operations are linked to  
10 this aging management and circumvent what you just  
11 described as the program that is needed for this  
12 operation?

13 I'm trying to get some assurances that  
14 there is a linkage there so that that they can't be  
15 changed without recognizing that you are changing your  
16 aging management program.

17 Just to avoid too much delay here, if you  
18 want to get back to that, we will pick that up after  
19 a break or something, if we can remember to get back  
20 to it. I won't, so I hope somebody else will remember  
21 to get back to it.

22 Let me ask another question then. You  
23 have many off-normal procedures, correct, for a  
24 variety of different measurements you are making as  
25 you normally operate the plant that has nothing to do

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1 with the steam dryer, correct?

2 MR. HOFFMAN: Yes, sir.

3 JUDGE WARDWELL: So in fact, and you may be  
4 monitoring, you will be monitoring some of the same  
5 parameters you monitor for the steam dryer in regards  
6 to other aspects that may be a cause for those off-  
7 normal types of values. Is that correct?

8 MR. HOFFMAN: Yes, sir.

9 JUDGE WARDWELL: So there is a potential  
10 that someone could accidentally - accidentally is the  
11 wrong word - inadvertently say, gee, we really ought  
12 to change this off-normal procedure if they weren't  
13 aware that it's in fact directed in part by the need  
14 to monitor this to determine whether the steam dryer  
15 is cracking? There is that potential, is there not?

16 Or is the title of this off-normal  
17 procedure an aging management program, corrective  
18 action for the steam dryer?

19 MR. HOFFMAN: The title is not, but the  
20 discussion in the procedure, which is an integral part  
21 of the procedure, says steam dryer cracking has been  
22 observed in the BWR industry. It's sort of spelling  
23 out what the purpose of this procedure is to respond  
24 to potential steam dryer cracking.

25 So the procedure does tie a linkage.

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1 JUDGE WARDWELL: And what is that  
2 procedure? This is a written procedure, and it's in  
3 the control room and other places, in engineering et  
4 cetera, that dictates what needs to be done in  
5 response to various parameters exceeding the critical  
6 values?

7 MR. HOFFMAN: Yes, sir. This is called  
8 Off-Normal Procedure 3178, increased moisture carry-  
9 over.

10 JUDGE KARLIN: Is that an exhibit here? I  
11 mean do we have a reference we can see that?

12 MR. HOFFMAN: Yes, it's Exhibit 7, E-3-07  
13 B1.

14 JUDGE KARLIN: Great.

15 JUDGE WARDWELL: I think that addresses the  
16 delay in question sufficiently.

17 MR. HOFFMAN: Okay.

18 JUDGE KARLIN: And if I may follow up a  
19 little bit, as I understand it there is a steam dryer  
20 management program consists of a dryer monitoring  
21 program and a dryer inspection program, right?

22 MR. HOFFMAN: Yes, sir.

23 JUDGE KARLIN: Correct? And in your  
24 testimony on page 11 as we were discussing before,  
25 under what you had titled subparagraph B, dryer

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1 monitoring program, that's what we are talking, that's  
2 what you have been describing to us, the monitoring  
3 program as opposed to the inspection program; is that  
4 correct?

5 mR. HOFFMAN: Yes, sir, that's correct.

6 JUDGE KARLIN: Okay, and the dryer  
7 monitoring program, without going over question 24,  
8 describe the dryer monitoring program to be  
9 implemented. Question 25: How would this be - detect  
10 cracking? Question 26: What additional  
11 recommendations were contained in Rev. 2 to GE SIL  
12 644, question 27, how is the monitoring and moisture  
13 carry-over to be performed?

14 Question 28: How and by whom is the  
15 significance of measurement and moisture to be  
16 assessed? Twenty-nine: How is the monitoring to be  
17 performed?

18 All these questions and answers deal with  
19 the steam dryer monitoring program, Rev. 3, which is  
20 part of the EPU and is going to be continued; is this  
21 correct?

22 MR. HOFFMAN: Yes, sir. Our plan is the  
23 monitoring during plant operation for abnormal plant  
24 operation, coupled with the inspections during the  
25 fueling outage.

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1 So the aging management is both of them.

2 JUDGE KARLIN: But if BWR VIP 139 is  
3 approved by the staff, and Entergy likes it, then all  
4 this is gone and something else is going to happen; is  
5 that correct? This is not describing BWR VIP 139.  
6 Does this describe BWR 139? Or does it describe -

7 MR. HOFFMAN: The parameters are generally  
8 the same, yes.

9 JUDGE KARLIN: They are generally the same.

10 MR. HOFFMAN: Correct.

11 JUDGE KARLIN: But this is not a  
12 description of BWR VIP 139, this is a description of  
13 SDMP - or steam dryer monitoring plan Rev. 3, right?

14 MR. HOFFMAN: That is correct, sir.

15 JUDGE KARLIN: Okay.

16 JUDGE REED: Okay, let's continue talking  
17 about the experience of the industry with regard to  
18 dryer failures.

19 We talked about Quad Cities. Could you  
20 share with us other incidents that have occurred  
21 throughout the BWR community?

22 MR. HOFFMAN: There was another event, I  
23 wasn't personally involved in any of these events, I  
24 am reading from the report. There was a failure in  
25 March of 2004, fatigue crack, in the hood panel to end

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1 plate weld at BWR.

2 JUDGE KARLIN: And let me stop you. You  
3 are reading from SIL 644?

4 MR. HOFFMAN: Yes, sir.

5 JUDGE KARLIN: Okay, fine.

6 MR. HOFFMAN: This particular crack  
7 occurred after approximately 16 years of operation,  
8 the last nine of which were at a lower power level  
9 increase, 5 percent stretch power. And it concluded  
10 that the weld was - this was not - given the length of  
11 time they concluded this was not high-cycle fatigue.  
12 It was a slower process.

13 JUDGE REED: Did they operate for a period  
14 of time with loose parts in the system?

15 MR. HOFFMAN: They did not.

16 JUDGE REED: Did they shut down  
17 immediately?

18 MR. HOFFMAN: My understanding of this one,  
19 they didn't see any abnormal plant parameters to  
20 indicate -

21 JUDGE REED: What led them to discover  
22 failure?

23 MR. HOFFMAN: My understanding is there was  
24 an inspection during a refueling outage. They were  
25 inspecting the dryer, and they found this crack.

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1 JUDGE REED: Do you think it's possible in  
2 the case of Vermont Yankee that you could operate with  
3 loose parts in the system and not detect them?

4 MR. HOFFMAN: Mr. Lucas is here to answer  
5 the inspection part. We do ongoing dryer inspection.

6 JUDGE REED: Your inspections occur every  
7 refueling outage. What is the period of time between  
8 refueling outages?

9 MR. LUKENS: Eighteen months.

10 JUDGE REED: Eighteen months? So you could  
11 conceivably operate for a long period of time with a  
12 loose part if you are only dependent on inspections.

13 I am looking at how you detect dryer  
14 failures - how you monitor the plant to ensure that  
15 you are not operating with a failed dryer during  
16 routine operation.

17 We will come to inspections in a little  
18 bit.

19 MR. HOFFMAN: Our design analyses  
20 demonstrated, or concluded, that there would not be a  
21 high-cycle fatigue problem which would lead to the  
22 generation of loose parts. The startup test - or the  
23 power extension test program for the power uprate  
24 confirmed the validity of those analyses, and there is  
25 nothing that could cause those stresses to change

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1 above what they were when we increased power.

2 JUDGE REED: Well, that may be the case,  
3 and if I - if you were betting your money on that, you  
4 would say you didn't have to do any inspections or  
5 anything. You are confident that you are not going to  
6 have these failures. But you can't be certain. Is  
7 that correct?

8 MR. HOFFMAN: Not 100 percent certain.

9 JUDGE REED: You've done the analysis, you  
10 just said that you - I don't remember your exact  
11 words, but you were confident that nothing could fail  
12 because you have done some upgrades to the dryer, is  
13 that right?

14 MR. HOFFMAN: Yes.

15 JUDGE WARDWELL: In fact this failure  
16 mechanism is - didn't you testify that it is low-  
17 stress cyclic low cadences from vibration as opposed  
18 to any high peak stresses that causes this failure.  
19 Low stress measurements during the power uprate are  
20 significant in what fashion in regards to addressing  
21 this mode of failure?

22 Mr. HOFFMAN: High-cycle fatigue is high  
23 number of cycles at a lower stress than a low-cycle  
24 fatigue, which is high stress low number of cycles.  
25 But there still are stress levels associated with it

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1 that could cause a failure, and there are stress  
2 levels below which you would not get a failure,  
3 because of stresses below the endurance limit.

4 JUDGE WARDWELL: And that's where you are  
5 in regards to measurements that were made during the  
6 power uprate?

7 MR. HOFFMAN: That's correct. The  
8 computational setting was below the endurance limit.  
9 The power extension test program would further what  
10 that remittance level would be, but we are confident  
11 that we are below, the stress limit is below cycle  
12 fatigue.

13 JUDGE REED: I'm a little puzzled. You  
14 keep bringing up this issue of computations. How  
15 significant is the analysis that you did prior to the  
16 power uprate in the actions that you are taking with  
17 regard to the steam dryer today? Is it a significant  
18 factor?

19 MR. HOFFMAN: It is not significant  
20 anymore, because we demonstrated at the time of power  
21 uprate that the stress levels were below the endurance  
22 limit and -

23 JUDGE REED: You demonstrated that. Now  
24 help me understand how you demonstrated it? By  
25 computation?

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1 MR. HOFFMAN: Analyses -

2 JUDGE REED: Analysis?

3 MR. HOFFMAN: Analyses were performed to  
4 compute stresses. Confirmatory measurements were  
5 taken during the power ascension test program to  
6 validate those computations. And those are the stress  
7 levels that the dryer saw then and continues to see.  
8 So we no longer need to confirm those stresses,  
9 because there is nothing to cause the stress to  
10 change. They were caused by the operation at 120  
11 percent power, and that's where we are.

12 So unless we change, unless we increase  
13 the power there would be nothing to cause those  
14 stresses to increase.

15 JUDGE REED: I believe Dr. Hopenfeld has  
16 some contentions with regard to this issue. I would  
17 like to give the floor to him for a minute.

18 JUDGE WARDWELL: Can we before we get to  
19 him, I'd like to get to a couple of more points on  
20 these stresses if we could.

21 JUDGE REED: Yes, sur.

22 JUDGE WARDWELL: If we could.

23 How are those stresses measured during the  
24 power uprate?

25 MR. HOFFMAN: They were measured by

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1 instrumentation placed on the main steam lines.

2 JUDGE WARDWELL: So strain gauges of some  
3 sort?

4 MR. HOFFMAN: Strain gauges and pressure  
5 gauges.

6 JUDGE WARDWELL: Why didn't you measure the  
7 dryer directly, stresses on the dryer directly rather  
8 than the steam line?

9 MR. HOFFMAN: I cannot answer that. It  
10 would require installation of strain gauges on the  
11 dryers. I don't know why that is so.

12 JUDGE WARDWELL: And where are those strain  
13 gauges now?

14 MR. HOFFMAN: It's just no longer in  
15 service.

16 JUDGE WARDWELL: Are they still in place?

17 MR. HOFFMAN: I don't believe so.

18 JUDGE WARDWELL: Is there a reason why you  
19 took them out, do you know?

20 MR. HOFFMAN: The requirement for  
21 monitoring ended after a certain period of time.

22 JUDGE WARDWELL: But it seems to me - have  
23 you ever heard - are both of you engineers?

24 MR. LUKENS: Yes, sir.

25 MR. HOFFMAN: Yes, sir.

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1 JUDGE WARDWELL: In your general  
2 engineering experience with other industries and  
3 facets, have you ever heard of stress monitoring as  
4 kind of a common practice for various other types of  
5 engineered facilities in order to assure that it's  
6 meeting the design - the anticipation during the  
7 design?

8 MR. LUKENS: No, sir.

9 MR. HOFFMAN: I have not.

10 MR. LUKENS: Never heard of anyone doing  
11 it.

12 MR. HOFFMAN: I have not, no, sir.

13 JUDGE REED: Let's see, I was about to ask  
14 Dr. Hopenfeld if he had any comments regarding this  
15 issue.

16 DR. HOPENFELD: On a scale of zero to 100,  
17 their liability for their calculation is about 20.  
18 The reason - can you hear me?

19 JUDGE KARLIN: What's the basis for 20?

20 DR. HOPENFELD: My judgment, I told you.

21 JUDGE KARLIN: Oh, it's your judgment.

22 DR. HOPENFELD: I told you, from zero to  
23 100, I would back him up. What they did, they had  
24 strain gauges somewhere in the steam lines, I don't  
25 know how many 16, whatever. From those strain gauges

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1 they used an acoustic model, and they calculated what  
2 the loads on the dryer are going to be at some  
3 critical location using a similar code to what we  
4 heard yesterday, some kind of FDN American analysis  
5 code reading the stresses, that document sourced. Now  
6 going from the steam line, and going to the dryer, is  
7 a big step. These equations are not that simple. You  
8 got a lot of different sources.

9 I imagine acoustic sources, different  
10 interferences, they interact with each other, this is  
11 not a trivial case. You just can't do that.  
12 Nevertheless they did that, they came up and GE ran a  
13 mockup at San Jose to benchmark, calibrate, in other  
14 words to see if they can rationalize or explain that  
15 those forces are really - are relevant to calculating  
16 the stress on the dryer.

17 Then they really never provided the detail  
18 of their analysis. They describe it to the ACRS, and  
19 they almost laughed about it, they didn't think it had  
20 any value, but never heard of -- if you look at NEC  
21 JH-54 and 5, the language concludes, what the ACRS  
22 conclusion there -

23 JUDGE REED: I'm sorry, could you give that  
24 reference again?

25 DR. HOPENFELD: Yes, 54-5.

1 JUDGE REED: Is the reference NEC JH-54 at  
2 page 5, sir?

3 DR. HOPENFELD: Yes. ACRS.

4 JUDGE REED: Okay, that's your report.

5 DR. HOPENFELD: Yes, it's my report. I  
6 don't see it - yes, okay, I said - I said in the  
7 middle of the page there, you will see you there the  
8 interpretation of the strain gauge data. If you ask  
9 the ACRS questions about whether they have done LOCA  
10 models -

11 JUDGE REED: Whoa, whoa, paragraph and line  
12 number, please.

13 DR. HOPENFELD: The second paragraph.

14 JUDGE REED: The second paragraph?

15 DR. HOPENFELD: On page five.

16 JUDGE KARLIN: So in that second paragraph  
17 it says, this is your report, this is what you wrote.

18 DR. HOPENFELD: Right.

19 JUDGE KARLIN: You are saying, and you  
20 quote: quote, ACRS questioned the validity of the  
21 analytical models, close quote.

22 Okay, that is your statement of what- you  
23 are quoting yourself as to what you are saying ACRS  
24 said.

25 DR. HOPENFELD: Right.

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1 JUDGE KARLIN: Now, how do we know they  
2 really said that?

3 DR. HOPENFELD: I gave a reference.

4 JUDGE KARLIN: Is that an exhibit here?

5 DR. HOPENFELD: Is it? I don't remember.  
6 I believe it is.

7 JUDGE KARLIN: No, I don't think it is.

8 DR. HOPENFELD: Well, it's reference 10.  
9 Yes, it is.

10 MS. TYLER: I have to interject I think at  
11 this point if I may.

12 I don't think the original contention  
13 three was largely about the validity of the stress  
14 load modeling. The validity of these models that you  
15 are now discussing with Dr. Hopenfeld.

16 JUDGE KARLIN: Right, which is all thrown  
17 out if I might add when we grant the motion for  
18 summary disposition.

19 MS. TYLER: They represented that they were  
20 not using the models and relying on their prior  
21 analysis using the models. And on that basis the  
22 board, as we understood it, prohibited us from  
23 litigating this issue that you are now discussing.

24 JUDGE KARLIN: That's right. Are you  
25 objecting to your witness testifying on this subject?

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1 MS. TYLER: I'm just noting I think that he  
2 has one paragraph of testimony about this issue in his  
3 testimony. And so we, based on instruction from the  
4 board, we really haven't submitted evidence -

5 JUDGE KARLIN: Well, let me try to stop  
6 you. Are you registering a motion or an objection of  
7 some kind, or is this just a speech? There is not  
8 motion here. We are allowing him to testify with  
9 regard to these computer models.

10 I would expect the NEC and the applicant  
11 to object to that, but we are allowing it.

12 JUDGE WARDWELL: And I'll modify a little  
13 bit also what Judge Karlin just said. I don't believe  
14 we are getting into the details of the model. We are  
15 talking about the stress levels that were measured  
16 during the uprate to indicate where we are at.

17 I'm sensitive of the fact that unless  
18 there is a demonstration that Entergy is relying on  
19 those models as part of their aging management plan,  
20 the discussion of those stress levels is still  
21 applying.

22 It is the motion for summary disposition  
23 related specifically to not challenging those use of  
24 those models in their aging management program,  
25 because Entergy has stipulated that they are not using

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1 those models..

2 If in fact it ever comes up here that they  
3 do need them, and they testify and end up saying, yes,  
4 we really do need that to reach a certain conclusion,  
5 then in fact that opens up the door again, at least in  
6 my opinion, and we'll have to discuss it as a board at  
7 that time.

8 That's all thrown out. In the meantime we  
9 are still wanting to have a feeling for how did these  
10 stress levels come about, and so far as my question is  
11 going to continue on in regards to whether or not it  
12 is practical to do it as part of an aging management  
13 plan, and a reasonable thing to do as an aging  
14 management plan.

15 But that's where it's going with it, and  
16 I don't believe we spent much time on the model. We  
17 are talking mostly about the stress levels.

18 I did hear the ACM wants from them.  
19 That's fine. We are not discussing how that applies  
20 to the aging management plan yet that I heard.

21 JUDGE KARLIN: All right, so let's just  
22 proceed.

23 DR. HOPENFELD: Well, going -

24 JUDGE KARLIN: Do we have a question on the  
25 table?

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1 JUDGE REED: No, it was Entergy that  
2 brought up this issue of models earlier.

3 (Simultaneous voices)

4 JUDGE REED: Did they bring up the models?

5 JUDGE WARDWELL: Yes, they did.

6 JUDGE REED: I thought they were just  
7 talking about stress levels. I didn't hear anything  
8 about models from them.

9 JUDGE KARLIN: They didn't use the word  
10 models, but they used the word, model, but they used  
11 the word, analyses. So I think it's fair game for Dr.  
12 Holdenfeld to speak to this subject.

13 DR. HOPENFELD: I think it's very important  
14 to the model, when they talk about the validity of  
15 this analysis based on these models, it's not based -  
16 that's the key - it's not based - they didn't have -  
17 they didn't have strain gauges on the dryer to show  
18 you -

19 JUDGE WARDWELL: So you are testifying,  
20 just so -

21 (Simultaneous voices)

22 JUDGE WARDWELL: I'm stopping you now. To  
23 simplify and curtail your testimony you are testifying  
24 that in fact you object to the accuracy with which the  
25 stress levels that they assume to be or calculate to

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1 be on their steam dryer during their uprate may not be  
2 as accurate as they may think it is.

3 DR. HOPENFELD: Correct, and I'm giving you

4 -  
5 JUDGE WARDWELL: And that's all we need to  
6 know.

7 Is there anything else -

8 DR. HOPENFELD: I said 20 percent, and I  
9 was trying to explain why the liability of their  
10 calculation is no better than 20 percent.

11 JUDGE KARLIN: We're not here to litigate  
12 the validity of the models that were used for the  
13 uprate. We are not here to litigate the uprate that  
14 was already litigated.

15 Entergy has representatives, as Dr.  
16 Wardwell stated. And we based our ruling on the  
17 motion for summary disposition. On the representation  
18 that those models and those calculations in the uprate  
19 are not the basis for their aging management program  
20 in this matter. So we are pushing at the margins to  
21 talk about it at all. And unless and until Entergy -  
22 or we conclude that Entergy is using those models,  
23 then we are not here to litigate whether the models  
24 are good or bad.

25 DR. HOPENFELD: We're going by the models

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1 just because the validity of my statement is -

2 JUDGE KARLIN: Just let your counsel, Ms.  
3 Tyler.

4 MS. TYLER: I'd like to - if you do reach  
5 the conclusion that Entergy is relying on that  
6 analysis as the basis for its program, then we need to  
7 provide Dr. Hopenfeld the opportunity to actually  
8 submit testimony, prefiled testimony, about the model,  
9 and I don't think - I don't think you should be asking  
10 him to testify extemporaneously about something that  
11 he hasn't had the opportunity to -

12 JUDGE KARLIN: All right, I think that is  
13 fair enough. But that is not the issue that is before  
14 us here today. And if we devolve into an issue in  
15 this case we may have to deal with that at the time.  
16 But we don't see it as it, so I agree with that.

17 DR. HOPENFELD: Well, I'm sorry if I  
18 strayed off the farm.

19 JUDGE KARLIN: That's fine.

20 JUDGE WARDWELL: I think it's fair for you  
21 to put in perspective what you thought the accuracy of  
22 that stress measurement was.

23 DR. HOPENFELD: That's all I was trying to  
24 do.

25 JUDGE WARDWELL: Okay, we got that. Let's

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1 move on.

2 JUDGE REED: Okay, so let's go back to the  
3 issue, which is detection, monitoring programs, how  
4 you detect loose parts.

5 My understanding is that you monitor  
6 certain plant parameters, and that they go off normal  
7 to some degree, then you call in a plant engineer and  
8 look at the situation and decide whether or not you  
9 have loose parts, failure with the steam dryer.

10 Is that correct?

11 MR. LUKENS: Yes.

12 JUDGE REED: Do you have any loose parts  
13 monitoring system that listens for loose parts?  
14 Anything other that might alert you to the fact, the  
15 system?

16 MR. HOFFMAN: We don't have a loose parts  
17 monitoring system, no, sir. But I think I need to say  
18 that the monitoring - we believe the monitoring will  
19 detect dryer degradation long before we generate a  
20 loose part. Because part of the industry experience  
21 is loose part, if you are going to have a failure  
22 that's going to generate loose parts, it happens  
23 relatively quickly after you change operating  
24 efficiency, as demonstrated by Quad Cities where they  
25 increased their flow rates from high power in the

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1 course of three or four months they had failures.

2 We have right now over two years of  
3 operation, and we'll have an inspection in October.  
4 We haven't had any degradation as a result of our  
5 increase.

6 JUDGE REED: There are several points I  
7 would like to follow up on.

8 What is your statement that you believe  
9 your monitoring system can detect a potential failure  
10 of the dryer, not - before loose parts are generated.  
11 Did I hear that correctly?

12 MR. HOFFMAN: The monitoring program,  
13 checking for the parameter that we monitor, will be  
14 able to determine the development of dryer  
15 degradation. And we do not believe that if that  
16 degradation started to develop that it would progress  
17 rapidly such that we cannot - that we won't be able to  
18 detect and respond prior to the generation of a loose  
19 part.

20 JUDGE REED: So what do you mean by dryer  
21 degradation?

22 MR. HOFFMAN: Perhaps a crack developing,  
23 a crack developing that's allowing some bypass flow  
24 out of the dryer.

25 JUDGE REED: My mental picture of a crack

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1 is a pretty small thing. It might be quite long; it  
2 might be fairly deep; but it's microscopic in width.

3 Is that an erroneous idea of a crack?

4 MR. HOFFMAN: It could be. It could also -  
5 and those would not challenge the integrity of the  
6 dryer. But if you saw - if a crack were to progress  
7 and perhaps for a better word fish mouth, start to  
8 separate a little bit where flow bypass through it,  
9 that's when you would see the change in those plan  
10 parameters.

11 JUDGE REED: That's not really a crack.  
12 That's a hole, isn't it? I mean what - when you say  
13 a crack, to me - you're assuming this crack has opened  
14 up significantly, a matter of inches?

15 MR. HOFFMAN: Or it could be a fraction of  
16 an inch, enough to result in a bypass flow.

17 JUDGE REED: A fraction of an inch? And is  
18 it your position - what - let's talk about sizes. How  
19 big could this postulated crack be that you could  
20 detect? Length? It's presumably all the way through  
21 the metal.

22 MR. HOFFMAN: The study hasn't done - so  
23 far we are looking at several inches of crack length -

24  
25 JUDGE REED: Of length?

1 MR. HOFFMAN: And not even challenging the  
2 integrity of the dryer.

3 JUDGE REED: Yes. But how wide would the  
4 crack be? It'd be completely through whatever metal  
5 structure we are talking about, the crack would have  
6 to, in order to detect it, it would have to penetrate  
7 completely through the metal.

8 MR. HOFFMAN: It would penetrate through;  
9 that's right, sir.

10 JUDGE REED: So it's a full penetration  
11 crack, several inches in length, and how wide?

12 MR. HOFFMAN: It could open a small  
13 fraction of an inch, enough to allow the flow to start  
14 bypassing the dryer and leak out through that crack,  
15 that indication.

16 JUDGE REED: And it is your belief that a  
17 fraction of an inch by a few inches long, that you  
18 could detect a crack of that size and shut the plant  
19 down before a part - a piece of the dryer comes loose?

20 MR. HOFFMAN: What I'm saying is that if  
21 that started to develop, because we know we don't have  
22 high-cycle fatigue, it would not progress rapidly  
23 beyond that point where a failure would develop before  
24 we could shut the plant down.

25 It would be a situation that slowly

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1 developed; it would not be a rapidly propagating  
2 failure, because we don't have - by the demonstration  
3 of our successful operation so far, we don't have the  
4 driving forces to cause that high-cycle fatigue.

5 JUDGE REED: So if you did have high-cycle  
6 fatigue, and this crack developed, your point is that  
7 you would proceed rapidly to failure.

8 MR. HOFFMAN: We would have seen that very  
9 early. If the change in operating conditions due to  
10 power uprate is going to result in a high-cycle  
11 fatigue failure, we would have seen that already,  
12 because we have far exceeded the number in the cycle.

13 JUDGE REED: Okay, so your belief, you are  
14 ruling out high-cycle fatigue, as any consideration in  
15 your dryer maintenance program? You've ruled that out  
16 from consideration, is that what I'm hearing?

17 MR. HOFFMAN: The monitoring program simply  
18 monitors dryer performance during operation coupled  
19 with inspections looking for any cracking or  
20 degradation that might develop.

21 JUDGE REED: I thought I heard you say that  
22 you believe it's impossible to have high-cycle fatigue  
23 cracking on this dryer?

24 MR. HOFFMAN: We don't believe we will have  
25 high-cycle fatigue cracking in the dryer; that's

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1 correct, sir.

2 JUDGE REED: And so your programs for  
3 monitoring the dryer have to do with what kind of  
4 cracking?

5 MR. HOFFMAN: The cracking we've seen so  
6 far has been typically IGSCC cracking that has not  
7 grown very much. It's been either stable, or - Mr.  
8 Lukens could discuss the inspection results better  
9 than I could - but the cracks that we have seen from  
10 one cycle to the next essentially have not changed  
11 length, and where new cracks have been developed  
12 during an operating cycle, they have been very small.  
13 So we are not seeing the development of large cracks  
14 during operating cycle.

15 JUDGE WARDWELL: Can I rephrase it that may  
16 help you? To make sure I understand.

17 Your monitoring program is looking at  
18 operational parameters would indicate some type of  
19 breach in the steam dryer, i.e. an opening, a bypass,  
20 something of that nature, regardless of how it took  
21 place. So it's not focused toward any mechanism that  
22 causes that bypass or opening to occur, but is there  
23 to observe the opening or the bypass, the effects of  
24 the opening or the bypass.

25 MR. HOFFMAN: That's correct, sir; results-

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1 driven and not cause-driven.

2 JUDGE WARDWELL: So whether it's high cycle  
3 or low cycle or just so accidentally during a shut  
4 down punched a hole in it because - whatever reason,  
5 it wouldn't matter, because your monitoring parameters  
6 are intended to detect just a breach or a bypass?

7 MR. HOFFMAN: Right.

8 JUDGE WARDWELL: How would, how big - and  
9 I think this is part of what Judge Reed was trying to  
10 get to, and I want to get back to it, what is your  
11 normal moisture carry-over reading during routine  
12 operations, what is the value of that?

13 MR. HOFFMAN: If I may sir?

14 JUDGE WARDWELL: Yes.

15 MR. HOFFMAN: This morning it was 0.137  
16 percent.

17 JUDGE WARDWELL: 0.137 percent? How big an  
18 opening would you need to increase that? It seems to  
19 me it would be fairly big, considering you have so  
20 much mass of dry steam coming out, and you've got - if  
21 you had just a small crack sitting at one location fo  
22 one vein, and yes, that's bypassing, but there is an  
23 awful lot of other stuff that is going through that  
24 dryer that ain't getting through that little opening  
25 that it would be hard to change that parameter much.

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1           What indications do you have that it is  
2 sensitive enough parameter to detect the smaller  
3 cracks so that you can anticipate taking some action  
4 before the steam dryer actually creates loose parts?  
5 Either of you.

6           MR. HOFFMAN: The way I would answer that  
7 is that if we had a flaw developing, all our  
8 inspections show that the flaws developed very slowly.  
9 So if it got to a point where we saw a change in plant  
10 performance due to a potential degradation of the  
11 steam dryer, and we concluded that the change in say  
12 moisture carry-over level was caused by a potential  
13 degradation of the dryer, it would not progress to the  
14 point of failure in the very short time it would take  
15 to shut the plant down.

16           JUDGE WARDWELL: So another way to  
17 interpret what you just said to me, and correct me if  
18 I'm wrong in using this interpretation, that the  
19 moisture carry-over may not show anything until you  
20 have quite a bit larger crack or a larger number of  
21 cracks at present, but the smaller cracks that  
22 wouldn't be sufficient size to impact moisture carry-  
23 over would be detected during inspections based on  
24 what you ascertain or believe to be the low  
25 propagation of those cracks.

1 MR. HOFFMAN: Yes, sir.

2 JUDGE WARDWELL: What is your basis for  
3 assuming that those cracks propagate slowly?

4 MR. HOFFMAN: Demonstration by having  
5 repeated inspections of the same indications and not  
6 seeing any - in some cases zero change in length.

7 JUDGE WARDWELL: I've had a crack in the  
8 windshield of my car that started off as a little rock  
9 ding, and nothing happened until about two months into  
10 it, and then it started going, and then it started  
11 going fast. So it went many months doing nothing, and  
12 then all of a sudden it started propagating like  
13 crazy.

14 Couldn't that same behavior occur?

15 MR. HOFFMAN: No, sir, the material in the  
16 windshield is a non-ductile material; it's a brittle  
17 material; it can be subject as you said, as I have had  
18 the same unfortunate experiences, very quickly fast-  
19 running flaws. Austenitic stainless steel is a very  
20 ductile material, and you just do not get brittle  
21 fracture fast-running flaws in stainless steel. It's  
22 an extremely ductile material; very very ductile  
23 material.

24 JUDGE WARDWELL: Thank you.

25 JUDGE REED: I still - oh, I'm sorry,

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1 please, you've been trying to ask a question.

2 JUDGE KARLIN: I may be interrupting this,  
3 but if I could refer you to testimony, it helps me  
4 understand where we are. Page 11 again of your dryer  
5 management monitoring program. I am positing there is  
6 an inspection program every time there is a refueling  
7 outage, and there is monitoring that goes on  
8 continuously.

9 And here you are describing - and you say,  
10 and I quote, the status of the steam dryer is assessed  
11 continuously by the plant operators, and then you go  
12 on to say, the following events could be - through the  
13 monitoring of certain plant parameters. And the  
14 following events could be indicative of significant  
15 dryer damage, quote: A, sudden drop in main steam line  
16 flow of greater than 5 percent; B, sudden drop in  
17 steam dome pressure greater than two psig, pounds per  
18 square - gauge.

19 And C, sudden drop in steam dome pressure  
20 greater than ps - I guess, did I miss one in there?

21 MR. HOFFMAN: Yes, the bravo three.

22 JUDGE KARLIN: Yes, bravo, B, greater than  
23 three-inch difference in reactor vessel water  
24 instrument - water level instruments. So that is your  
25 continuous monitoring, right? Those are the three

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1 parameters that you are continuously monitoring?

2 MR. HOFFMAN: Yes, sir.

3 JUDGE KARLIN: And that is the monitoring  
4 program, or at least part of it, that you are talking  
5 about, right?

6 MR. HOFFMAN: Yes, sir.

7 JUDGE KARLIN: And then the next sentence,  
8 quote: in addition, periodic measurements of moisture  
9 carry-over are performed, and changes in moisture  
10 carry-over are evaluated per - and it quotes SIL 644,  
11 closed quote, right?

12 MR. HOFFMAN: Yes.

13 JUDGE KARLIN: I'm with you. So first  
14 there are three parameters that are continuously  
15 monitored, right?

16 MR. HOFFMAN: Yes, sir.

17 JUDGE KARLIN: And another parameter,  
18 moisture carry-over, is periodically monitored, right?

19 MR. HOFFMAN: Yes, sir.

20 JUDGE KARLIN: And periodically, if I think  
21 I remember somewhere, it's twice a day? How often is  
22 the moisture carry-over periodic monitoring?

23 MR. HOFFMAN: Now it's weekly.

24 JUDGE KARLIN: Once a week?

25 MR. HOFFMAN: Once a week.

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1 JUDGE KARLIN: Okay, and so those are - and  
2 that is the plan going forward, aging management  
3 program, to do it once a week?

4 MR. HOFFMAN: Yes, sir.

5 JUDGE KARLIN: Okay, once a week, and that  
6 is the monitoring program. And I guess - let me ask  
7 this on the continuous monitoring of those A, B and C  
8 parameters, are those parameters just automatically  
9 normally measured, monitored in a reactor? Or are  
10 they being especially monitored because of the aging  
11 management program?

12 MR. HOFFMAN: The parameters themselves are  
13 monitored normally. What we are looking for in the  
14 aging management program is anomalies.

15 JUDGE KARLIN: Okay, so that stuff is  
16 monitored anyway. And how about the moisture carry-  
17 over, is that monitored anyway, or is it only  
18 monitored because of this aging management program?

19 MR. HOFFMAN: I don't know the answer to  
20 that, but it was done previously. I know it's done  
21 now weekly.

22 MR. LUKENS: We perform moisture carry-over  
23 measurements prior to uprate. However the frequency  
24 was increased shortly before we went to uprate  
25 conditions.

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1 JUDGE KARLIN: Okay. So the only thing  
2 different you are doing is, your moisture carry-over  
3 is more frequently being monitored, and someone is  
4 paying attention to these values, and there are some  
5 action levels if they exceed the three or the five or  
6 whatever; correct?

7 MR. HOFFMAN: Yes, sir.

8 JUDGE KARLIN: Now on page 16 - I'm sorry,  
9 I believe it is 14 of your testimony, in question #30,  
10 here you talk about that.

11 Question: What happens if abnormal values  
12 are measured?

13 And then you describe certain - if any of  
14 the action levels are reached, procedure requires a  
15 moisture carry-over. So if any of these action levels  
16 that meets with a continuum, what do you do? First  
17 thing you do, are you saying you got to go do a  
18 moisture carry-over measurement?

19 MR. HOFFMAN: Yes.

20 JUDGE KARLIN: So that's the first thing.  
21 And then what happens after that? The personnel  
22 involved - quote, the personnel involved in  
23 determining the significance of the moisture carry-  
24 over and other measured parameters are - apparently  
25 you have someone who makes a judgment call at that

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1 point?

2 MR. HOFFMAN: If you saw a change in the  
3 monitored parameters, the first step would be, get a  
4 moisture carry-over measurement. If that had changed  
5 above normal, which would then be indicative of  
6 potential dryer failure, there are action levels in  
7 that procedure, ON-3178, that I spoke about, which  
8 would involve reporting to plant management; getting  
9 the engineering personnel involved; and starting an  
10 evaluation of what was going on to determine if the  
11 monitoring parameters, which can change for other  
12 reasons, were being caused to change by a potential  
13 dryer failure.

14 JUDGE KARLIN: Okay, I'm with you. And  
15 you've got the three continuously monitored  
16 parameters, which are normally monitored anyway, then  
17 you have moisture carry-over that is periodically -  
18 and we have been talking about cracks and the size of  
19 cracks and two inches and what they are. But what you  
20 are looking at is these four parameters as it were,  
21 three parameters plus moisture carry-over, and then a  
22 judgment call is made if there is some change in those  
23 above these thresholds, somebody has to make a  
24 judgment call whether that involves a problem with the  
25 steam dryer.

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1 MR. HOFFMAN: A technical evaluation would  
2 be multiple people getting involved, and assessing the  
3 data and making a technical determination, is this  
4 indicative of a dryer failure?

5 JUDGE KARLIN: Now are there other things  
6 going on in a nuclear power plant that could also  
7 cause these parameters to change, these values to  
8 change, say, a sudden drop in main steam line flow  
9 over 5 percent?

10 MR. HOFFMAN: It could be, and that's why  
11 the party evaluation is something else potentially  
12 causing that problem or that change.

13 JUDGE KARLIN: And a greater than three-  
14 inch difference in reactor water - vessel water level,  
15 I mean that could be caused by a lot of things,  
16 couldn't it?

17 MR. HOFFMAN: It might be, yes.

18 JUDGE KARLIN: So the parameters being  
19 measured, the changes in them could be caused by a lot  
20 of different things that are going on in a nuclear  
21 power plant, correct?

22 MR. HOFFMAN: There could be other things  
23 than a dryer failure causing changes in those  
24 parameters, and that's what the evaluation -

25 JUDGE KARLIN: Could be a lot of other

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1 things? Is that correct?

2 MR. HOFFMAN: I wouldn't quantify a lot or  
3 a little, but it could be.

4 JUDGE KARLIN: All right. And so someone  
5 has to make a judgment call at that point. Parameters  
6 are exceeded, first thing you do is do a moisture  
7 carry-over analysis. The moisture carry-over  
8 analysis, and the parameters have been taken to some  
9 group of people who make a decision as to whether this  
10 indicates a problem with the steam dryer or a problem  
11 somewhere else, or whatever, and it's a judgment call,  
12 okay, but it's not like somebody has got a periscope  
13 and is looking into the steam dryer and sees a crack  
14 that is two inches long.

15 MR. HOFFMAN: Not at that point, no, sir.

16 JUDGE KARLIN: Okay. And I think a lot of  
17 the questions here are the same question I have is,  
18 what are the resolution power of these parameters, the  
19 measurements you are taking? To what degree is  
20 judgment involved in - it's not like you have a  
21 microscope. How much can you see? Is it a two-inch  
22 crack? A one-inch crack? A ten-foot crack? What are  
23 you seeing?

24 You are seeing - what causes - what in the  
25 steam dryer other than a crack might cause this?

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1     Could the thing bend and cause a problem, or is that -  
2       change in one of these parameters?

3                     MR. HOFFMAN: I think it's the other way  
4     around. Changes in power level, changes in say  
5     feedwater temperature could affect one or more of  
6     those parameters, perhaps moisture carry-over. So it  
7     could be other plant parameter changes that are  
8     causing - or plant operating changes that are causing  
9     changes in those parameters, and that's what that  
10    technical evaluation would sort out.

11                    JUDGE KARLIN: Okay.

12                    JUDGE WARDWELL: Let me add another  
13    question on - along these lines, but worded a little  
14    bit different way. In order to see - if it was - if  
15    the steam dryer was cracked, due to vibration fatigue,  
16    in a number of places, wouldn't it take quite a large  
17    crack to see any steam flow drop of 5 percent, greater  
18    than three-inch difference in reactor vessel water  
19    level measurement, and a drop of two psi in the dome  
20    pressure core?

21                    MR. HOFFMAN: It potentially would. Yes,  
22    sir, it potentially would. And I think that's where  
23    our program is - because we don't have high-cycle  
24    fatigue - the whole problem in the industry arose from  
25    some initial plans that had some high-cycle fatigue

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1 failures. And they saw changes in parameters.

2 So what the industry has done is said,  
3 these folks had problems. They saw changes in these  
4 parameters. Other people should look for those  
5 similar changes in parameters as a precursor to  
6 potential problems.

7 JUDGE REED: Once again, you've said you  
8 don't have high-cycle fatigue. And I just want to  
9 make sure I understand the basis on which you make  
10 that claim. And I believe there are two things.

11 One is your analysis prior to the power  
12 uprate, and the second thing is simply the fact that  
13 you have uprated for, what, approximately three years  
14 now, at the higher power and seen no failure? Is that  
15 -

16 MR. HOFFMAN: It's really the second one.

17 JUDGE REED: It's really the second one?

18 MR. HOFFMAN: We never do this, and you  
19 could conceivably - we could have built a component  
20 and never analyzed it and simply operate it, and  
21 operate it beyond a certain level without a failure  
22 you would conclude without any knowledge of what the  
23 stresses were that it was not subject to high-cycle  
24 fatigue.

25 JUDGE REED: So since it hasn't broken,

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1 it's not going to break?

2 MR. HOFFMAN: That is essentially - high-  
3 cycle fatigue -

4 JUDGE KARLIN: Yes, I agree, but let me  
5 ask: Is your program trying to predict whether it's  
6 going to break or detect whether it's broken?

7 MR. HOFFMAN: The monitoring program is a -  
8 the in-service monitoring would be after the fact.

9 JUDGE KARLIN: Right, and so on page 15 of  
10 your testimony, in answer to question #33, you say,  
11 the question is, will the measurements of moisture, et  
12 cetera, et cetera, for reactor, enable Entergy to  
13 determine whether a dryer crack is about to form?

14 And you say, no. The purpose of the  
15 measurements is to provide early warning that a crack  
16 may have developed. You are not trying to predict a  
17 crack; just trying to detect one that's occurred.

18 MR. HOFFMAN: Detect one that's occurred,  
19 and that has resulted in a change in dryer -

20 JUDGE KARLIN: Because a steam dryer is  
21 not a safety component of the reactor, correct?

22 MR. HOFFMAN: That's correct.

23 JUDGE KARLIN: And the problem is not  
24 whether a steam dryer fails, because that is not a  
25 safety-related component of the reactor, but whether

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1 a steam dryer failure, that is, a piece from the steam  
2 dryer, could cause a failure somewhere else on the  
3 system; right?

4 MR. HOFFMAN: Yes, sir.

5 JUDGE WARDWELL: And a crack, a single  
6 crack, wouldn't cause - it may be a failure of the  
7 steam dryer, it doesn't have an impact on anything  
8 else until it's large enough so it creates a loose  
9 part?

10 MR. HOFFMAN: Yes, sir.

11 JUDGE WARDWELL: And you are also relying  
12 on the slow propagation of cracks that do occur as  
13 part of your plan in order to catch those during the  
14 visual inspections that occur at selected refueling  
15 outages?

16 MR. HOFFMAN: That's correct. If we do it  
17 on high-cycle fatigue, it'd be a slow development of  
18 any flaws.

19 JUDGE WARDWELL: But it wouldn't if it was  
20 a high cycle?

21 MR. HOFFMAN: Yes.

22 JUDGE REED: Dr. Hopenfeld, do you agree  
23 with Entergy's position that we can rule out fatigue  
24 failure of the dryer on the basis that since they've  
25 operated for an extended period of time at the 20

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1 percent increased power, that we would have seen this  
2 failure if it was going to occur?

3 DR. HOPENFELD: No, because the only way  
4 you can show that would be by calculations, just by  
5 the calculations we discussed yesterday. You would  
6 have to show that you are not - where are you as far  
7 as routine endurance. And the only way you can do  
8 that if you knew what the loads on the dryers were.

9 This is just - this is an opinion, a  
10 judgment of somebody, that 18 months is sufficient to  
11 conclude that nothing will happen in the future.

12 If this was the correct situation, if this  
13 was a correct statement, then all the reactors in the  
14 country would have been - we would have never seen any  
15 failure from fatigue, from flow-induced vibration,  
16 from any system after they operated for 18 months.

17 And I realize that I am a little bit vague  
18 here, because each system is different. They may have  
19 something that causes the vibration to change. But  
20 the Vermont Yankee is not an operating room in a  
21 hospital. Things change there, too.

22 JUDGE KARLIN: Can I ask a question, Dr.  
23 Hopenfeld? I'd like to put a little different facet  
24 on the question Dr. Reed was asking.

25 As I understand it, Entergy's position is

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1 a steam dryer is not a safety-related component. Over  
2 the next 20 years there may - they are not saying that  
3 there will never be a chunk or a piece of metal come  
4 off the steam dryer. Let's assume there is. I think  
5 they are not guaranteeing that it will never happen.  
6 What I think they are saying is, look, we are going to  
7 monitor it. We are going to monitor these parameters.  
8 We are going to inspect it every 18 months visually.  
9 And if a chunk falls off, we will detect it pretty  
10 fast, and we will be able to manage it in a way that  
11 no safety problem will arise.

12 Now there is a debate whether a safety  
13 program will arrive, but they are not trying to say  
14 there will never be a chunk come off. They are just  
15 saying, if it happens, we'll catch it and we'll deal  
16 with it. Isn't that right?

17 DR. HOPENFELD: That's exactly what they  
18 are saying. There are two things that are important.  
19 There's the situation where you have a crack and it  
20 hasn't gone through the wall. A bunch of cracks; they  
21 haven't gone through the wall. They may be let's say  
22 five mils from breaching the wall.

23 In the case of sudden large change in  
24 forces on the dryer because of the DBA. And mind you,  
25 DBA, it's not a hypothetical place. This is not a

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1 severe accident. This is something that, it's part of  
2 the what the COB, they are responsible for that. They  
3 have to show you that what this event in the dryer,  
4 this formation of the crack, would extend the DBA.  
5 It's part of DVC 40 and 42, which requires you to  
6 provide protection to the public against events like  
7 that. And I haven't seen anything -

8 JUDGE REED: Can we stop there, and ask the  
9 NRC staff to verify your statement? Is it your belief  
10 that the claim that Dr. Hopenfeld just made is  
11 correct?

12 MR. SCARBROUGH: They are required to  
13 evaluate the dryer for all possible floats, and local  
14 loads and such as that.

15 JUDGE REED: Including design-basis  
16 accidents.

17 MR. SCARBROUGH: Right, yes, sir. And they  
18 did that as far as power uprate, and they evaluated  
19 it. And the loads for - well, the allowable loads are  
20 different for those types of situation. You are  
21 allowed to have some structural deformation of the  
22 dryer, because if you have a LOCA you are shutting the  
23 plant down. It's not a long term fatigue oriented  
24 level that you are looking for in normal operations.  
25 So they did look. They did an evaluation. The

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1 technical staff looked at that, and determined that  
2 the allowable loads were adequate for that dryer.

3 JUDGE REED: So basically you are saying if  
4 you have a LOCA, the dryers are the least of your  
5 worries; it's not something you are concerned about?

6 MR. SCARBROUGH: Yes, sir.

7 JUDGE KARLIN: But I thought Dr.  
8 Hopenfeld's point is, but if you have a LOCA and that  
9 triggers a steam dryer, chunks of metal coming off the  
10 steam dryer, I won't call it a total failure, LOCA  
11 occurs, steam dryer has a failure, chunks come off.  
12 Does that exacerbate the problem, the LOCA then? And  
13 doesn't that have to be - isn't that something that  
14 would have to be considered and dealt with?

15 MR. SCARBROUGH: If those chunks came out  
16 they would be heading out the same hole that all the  
17 steam would be heading out for the LOCA anyway. I  
18 mean you are losing - that is the direct path out of  
19 the -

20 JUDGE KARLIN: Has that been considered by  
21 the applicant and the staff? I mean deciding that the  
22 steam dryer is okay the way it is?

23 MR. SCARBROUGH: I don't know if they have  
24 evaluated that specifically in terms of - their  
25 evaluation was where the stresses are so high that you

1 would exceed the allowable limits of the dryer. In  
2 terms of looking at it beyond that, that is something  
3 that the BWR VIP has looked at.

4 JUDGE KARLIN: You are focusing on the EPU,  
5 right?

6 MR. SCARBROUGH: Yes, sir.

7 JUDGE KARLIN: Okay, so Mr. Hsu, were you  
8 the one who looked at this for renewal?

9 MR. HSU: Yes, we looked for the renewal.  
10 But from the renewal point of view. We are now  
11 looking at an engineering point of view, and we are  
12 looking at monitoring, the monitoring and detection,  
13 that point of view; not look from the engineering  
14 point of view.

15 JUDGE KARLIN: So if I may, you did not  
16 look at, well, if there is a LOCA, and the LOCA causes  
17 the steam dryer to break pieces off, and those pieces  
18 could exacerbate the LOCA and cause different  
19 problems, you did not look at that?

20 MR. HSU: We did not look at that. We only  
21 look at that because of this detection and worry that  
22 it's the best. Normally it's not going to happen.

23 JUDGE KARLIN: So you are saying - no, I'm  
24 not sure, I don't think there is a guarantee it isn't  
25 going to happen. I thought it was, they are not

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1 evaluating prediction. They are just going to detect  
2 it if it does happen, right? Is this right, Mr.  
3 Hoffman? I mean the monitoring program is not to  
4 predict what's going to happen but to detect if a  
5 chunk has come off?

6 MR. HOFFMAN: The monitoring program will  
7 not - cannot predict that a crack may develop to  
8 start. It is there to determine if a degradation has  
9 occurred that challenges dryer integrity, in which  
10 case we would shut the plant down and take corrective  
11 action, so that way.

12 JUDGE KARLIN: Thank you.

13 Now, Mr. Hsu, are you saying you8r  
14 acceptance of this was based on some understanding  
15 that the monitoring program would prevent any of these  
16 things from happening?

17 MR. HSU: The monitoring program would  
18 detect -

19 JUDGE KARLIN: Detect.

20 MR. HSU: - and give you the early warning  
21 before these things happen, because a crack -

22 JUDGE KARLIN: Well, wait a second. Does  
23 the monitoring program detect before a chunk comes  
24 off? Or does it detect that in fact a chunk has come  
25 off?

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1 MR. HSU: Before.

2 JUDGE KARLIN: Now I'm asking Mr. Hoffman,  
3 or that a crack has developed or a hole -

4 MR. HOFFMAN: You are not - it could be  
5 both, sir, in the sense that you have a spectrum of  
6 events. It could be a small piece has come out that  
7 results in a moisture carry-over of a certain failure.  
8 Or it could be a contiguous flaw that has opened up a  
9 little bit and allowed some bypass flow. So it will  
10 not differentiate.

11 JUDGE KARLIN: Okay, let me ask - that is -  
12 that's a question. You talked about, I asked you  
13 about the changes in the main steam line flow and the  
14 difference in the water level. What if it's slow?  
15 Over what timeframe does this change occur, that it  
16 triggers this action? I mean if the sudden - you have  
17 a sudden drop in the main steam line flow of greater  
18 than 5 percent. Define sudden.

19 MR. HOFFMAN: The operators are  
20 continuously scanning the control panel, so we are  
21 talking minutes. They may have looked at the  
22 instrument, then a couple of minutes later they check  
23 it -

24 JUDGE KARLIN: So if it - and -- because  
25 I'm concerned about the difference between creeping

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1 change of little pieces start falling off, and because  
2 they are small they are not detected until some big  
3 chunk finally - the dam breaks or something.

4 Is this going to distinguish - if there  
5 was gradual breaking off of pieces, would there be a  
6 sudden drop in the main steam line flow, would that  
7 pick it up? Or would you miss a gradual increase  
8 resulting from problems with the steam dryer?

9 MR. HOFFMAN: Once again, I don't think -  
10 we don't conclude that there is going to be a gradual  
11 breaking off of pieces, because those would be driven  
12 by high-cycle fatigue failures, which we don't have.  
13 We don't have a high-cycle fatigue situation.

14 JUDGE KARLIN: Yes, but this program is not  
15 telling us that it is never going to happen. I  
16 thought you were saying, we're not telling you it  
17 ain't going to happen. We're just saying if it  
18 happens we are going to detect it.

19 MR. HOFFMAN: If it happens the program  
20 would detect it, but implicit in that is that we don't  
21 believe it's going to happen.

22 So I guess it's hard to answer the  
23 question in that the parameters -

24 JUDGE KARLIN: Well, if we didn't think  
25 anything was going to happen then we wouldn't have to

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1 monitor any of these things. If that was all we  
2 needed, the EPU is granted, everything is fine, no  
3 monitoring program, because it ain't going to happen.

4 But you are monitoring it, and you are  
5 managing it, and this is part of your plan. So I'm  
6 positing that you are doing it for a reason, because  
7 you believe, you want to be careful, and if it happens  
8 you will detect it.

9 But I guess what you are saying is, your  
10 detection program is focused not on the high - what  
11 was the word?

12 MR. HOFFMAN: High cycle.

13 JUDGE KARLIN: Not on the high-cycle  
14 fatigue but on the low-cycle fatigue type of problem.

15 MR. HOFFMAN: Which would happen very  
16 slowly.

17 JUDGE KARLIN: I'm sorry, somewhat of a  
18 digression, but thank you. ;

19 DR. HOPENFELD: I would like to comment on  
20 that, because I really -

21 JUDGE REED: I want to ask you a question,  
22 Dr. Hopenfeld.

23 DR. HOPENFELD: I didn't finish answering  
24 the first one.

25 JUDGE KARLIN: Are you satisfied?

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1 JUDGE REED: Well, I'm going to ask you a  
2 follow up.

3 DR. HOPENFELD: I had two parts to my  
4 answer to the question. And I started with the first  
5 one. I said the crack will go through the wall.  
6 Monitoring is irrelevant. Suddenly, we're talking  
7 about monitoring. That's not what monitoring. In  
8 effect, monitoring --

9 JUDGE WARDWELL: Can I stop you for a  
10 minute?

11 DR. HOPENFELD: Yes.

12 JUDGE WARDWELL: What question are you  
13 answering?

14 DR. HOPENFELD: I was answering a question  
15 about commenting - I was asked I should comment about  
16 the monitoring program, and their perception about the  
17 stresses. That's what I was answering.

18 JUDGE REED: I want to ask you a very  
19 specific question. Earlier you made a point that I  
20 would like to follow up on, which is you believe that  
21 if we could rule out - let's see if I can state this  
22 carefully - Entergy has asserted that they can  
23 eliminate high-cycle fatigue as a cause for cracking.

24 You made a statement that you disagreed  
25 with that.

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1 DR. HOPENFELD: Correct.

2 JUDGE REED: And you gave a reason for  
3 that?

4 DR. HOPENFELD: Correct.

5 JUDGE REED: And I'm going to try to  
6 paraphrase your reason. I think it was that if that  
7 were the case, then we would never have seen a high-  
8 cycle fatigue cracking of a dryer beyond a few months  
9 of operation being your point. Did you make that  
10 statement?

11 DR. HOPENFELD: (No audible response.)

12 JUDGE REED: Pardon me?

13 DR. HOPENFELD: I said 18 months.

14 JUDGE REED: Eighteen months. So you did  
15 make that statement?

16 DR. HOPENFELD: Yes, I said in all the  
17 plants.

18 JUDGE REED: So can you cite for us an  
19 example of a dryer that cracked beyond 18 months as a  
20 result of high-cycle fatigue?

21 DR. HOPENFELD: Sir, I wasn't talking  
22 specifically about dryers. I was more general. I  
23 said you wouldn't see flow-induced vibration wouldn't  
24 be a problem anywhere. Because if he's constant  
25 there, what he was alluding, not just the dryers, he

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1 said, we don't see - what he was saying, as I  
2 understood him, he said, we don't see something happen  
3 up to 18 months it's never going to happen. That  
4 really is not specific to the dryer; it's specific to  
5 anything.

6 JUDGE WARDWELL: So can you cite any  
7 examples where there have been failures at a given  
8 power level several years after the initiation fo that  
9 power level due to vibration -

10 DR. HOPENFELD: There have been many  
11 failures due to vibration in various parts of the  
12 system. I know there have been failures in BWR steam  
13 generators. I am talking generally.

14 JUDGE WARDWELL: It does have something to  
15 do with it, because Vermont Yankee is a BWR.

16 DR. HOPENFELD: No, I understand, but what  
17 I'm talking about -

18 JUDGE WARDWELL: I'm asking you do you  
19 know, can you cite any examples of failures of  
20 components due to vibration fatigue, high-cycle  
21 loadings, several years after a given power level has  
22 been initiated?

23 DR. HOPENFELD: In BWRs?

24 JUDGE WARDWELL: In BWRs.

25 DR. HOPENFELD: I think there was some, but

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1 I don't remember. I think there was some at least  
2 tell me where the feedwater nozzle were, but I don't  
3 remember the BWR. In this case I was just talking in  
4 general.

5 JUDGE REED: Let's ask the other witnesses  
6 the same question. Are you aware of any circumstances  
7 in which a component has failed due to fatigue beyond  
8 18 months following a change in plant conditions?

9 MR. SCARBROUGH: Now for the Quad Cities  
10 plants, we talked about those. They happened very  
11 quickly.

12 JUDGE REED: I'm sorry, what?

13 MR. SCARBROUGH: For Quad Cities Unit #1  
14 and #2, Quad Cities #2, first failure was like 90 days  
15 after it first went up to the EPU, changed power  
16 levels; and then it failed again, and then about a  
17 year later. So about a year operations for Quad  
18 Cities #1 in November of 2003, it failed.

19 And the sister plants for Quad Cities -

20 JUDGE REED: So there is an example of one  
21 year.

22 MR. SCARBROUGH: One year, yes, sir.

23 JUDGE REED: One year. But we haven't  
24 gotten as far as 18 months.

25 MR. SCARBROUGH: In Dresden it was along

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1 that line. I wouldn't say a year or 18 months, but it  
2 was a longer time period. They had actually been  
3 trying to install modifications to the dryer to try to  
4 strengthen it, and what they found was, when they went  
5 in and did inspections, because the Quad Cities had  
6 failed, they went back and looked at those  
7 modifications they had performed for Dresden, and they  
8 found some cracks where they had put those  
9 modifications in.

10 So what they found was the modifications  
11 were not helping too much. So they ended up replacing  
12 the dryers at Dresden as well just to deal with the  
13 issue and get it over with.

14 So that was - if you are looking for  
15 something that was a little bit longer, Dresden was a  
16 little bit longer timeframe than Quad Cities, but the  
17 loading was different, and they ended up putting the  
18 modifications in to try to correct it and actually  
19 found the modifications weren't -

20 JUDGE REED: In the Dresden case was it  
21 attributed to this high-cycle fatigue?

22 MR. SCARBROUGH: Yes, sir, it was the same  
23 phenomenon that happened at Quad Cities where there  
24 was acoustic resonance that was upstream from the  
25 relief valves hitting the resonance and hitting the

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1 dryer. And Quad Cities and Dresden are almost  
2 identical plants in how they are designed, and so they  
3 ended up - it's natural that they would have similar  
4 issues going on. Dresden has a slight different  
5 variations of how the branch lines were connected. It  
6 ended up their loads were occurring at a lower power  
7 level, the resonances were occurring at a lower power  
8 level, and so the levels were not as high.

9 But the net result is, they did fail as  
10 well. So those are the two plants, the two separate  
11 plants, Quad Cities #1 and #2, Dresden #2 and #3, that  
12 had this phenomenon. But those are the only ones that  
13 I know of where there was this longer timeframe  
14 involved.

15 There were places when plants first  
16 started up years ago like Susquehanna where there were  
17 small cracks that they found in the dryer as they  
18 started the plants up.

19 JUDGE WARDWELL: Can you explain the  
20 mechanism again of how Dresden and Quad Cities failed?  
21 You said it, and you said it fast.

22 MR. SCARBROUGH: The steam lines - the  
23 flows in fact put forth for this case, there are  
24 various mechanisms that can occur and cause  
25 vibrations. But the mechanisms that were the severe

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1 mechanisms for Dresden and Quad Cities, the ones that  
2 we're most concerned about, are where you have steam  
3 flow down the line after the branch opening for a  
4 relief valve, for a branch line, or something. When  
5 it passes over that there will be vortices shed across  
6 that branch opening. And when that vortices matches  
7 the standing wave for - you may get an acoustic  
8 resonance, get a reinforcement. And that will travel  
9 back upstream through, and then strike the face of the  
10 dryer. The face of the dryer is facing that main  
11 steam line opening, and travels up and strikes that.  
12 And that was what was obvious at Quad Cities when they  
13 instrumented the steam lines. You could see that at  
14 Dresden, as well when they implemented the replacement  
15 dryers at Quad Cities, one of them was instrumented to  
16 see actually what was happening. And that confirmed  
17 what we were seeing downstream.

18 JUDGE REED: Was there a calculation done  
19 to confirm that the vibrational frequency of the dryer  
20 component that broke was essentially the same as - was  
21 it in resonance with this acoustic -

22 MR. SCARBROUGH: My understanding was, the  
23 forces coming back were just so high they exceeded the  
24 fatigue limit. So when they did the calculations they  
25 saw, that yes, it should fail, and it did fail,

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1 because those forces striking the dryer were above the  
2 fatigue limit so it was a very high cycle. It happened  
3 very quickly.

4 JUDGE REED: so it didn't really need to be  
5 in resonance you are saying.

6 MR. SCARBROUGH: No, sir.

7 JUDGE WARDWELL: In fact it's almost like  
8 a static, where your high enough cycles that you are -  
9 it's almost like a static load on, or a continuing  
10 load on it.

11 MR. SCARBROUGH: Yes, it was very periodic.

12 JUDGE REED: So Dr. Hopenfeld has  
13 postulated a possible resonance effect here. Is it -  
14 what is your opinion about that with regard to this  
15 particular plant, Vermont Yankee?

16 MR. SCARBROUGH: The steam dryers, as the  
17 flow comes out and goes over the steam dryers out the  
18 relief lines, or the main steam lines, there are  
19 vortices shed across the edges of the dryer as it  
20 rolls down. And there is a potential there for  
21 resonance to occur with that structure.

22 What we found is, those types of issues  
23 are not of concern. The reason concern was this  
24 acoustic resonance traveling back upstream. That's  
25 where the real heavy loads were.

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1 JUDGE KARLIN: The what kind of resonance?

2 MR. SCARBROUGH: Acoustic resonance.

3 JUDGE KARLIN: Acoustic? Okay.

4 MR. SCARBROUGH: And so there is that  
5 potential, and that was looked at very closely back  
6 when the first failures at Quad Cities occurred.  
7 Because the - one of the cover plates that failed was  
8 a quarter-inch thick; very thin. It failed off Quad  
9 Cities Unit #2. And so there was a lot of discussion  
10 of, could it be these vortices coming off, which shed  
11 very low frequencies, below 100 Hertz, where these  
12 acoustic resonance coming upstream are much higher  
13 frequencies.

14 And so there was a lot of discussion of  
15 where that was occurring. So that is possible, but  
16 the concerns that we have now for this acoustic  
17 resonance are the higher frequencies that come from  
18 these lines downstream. But that was something that  
19 was looked at and was evaluated.

20 At Vermont Yankee they did two types of  
21 analyses to evaluate what would happen.

22 JUDGE KARLIN: With regard to the uprate?

23 MR. SCARBROUGH: Yes, sir.

24 JUDGE KARLIN: All right.

25 MR. SCARBROUGH: They did a computation

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1 fluid dynamics -

2 (Simultaneous voices)

3 JUDGE REED: But it did take place?

4 JUDGE KARLIN: It took place in fact. If  
5 you start - go ahead.

6 JUDGE REED: I thought we were going to  
7 listen to why it is important.

8 MR. SCARBROUGH: But they did look at that.  
9 That was an area they looked at. But in terms of the  
10 concern, the dryers have operated many many years in  
11 the power plants without any significant failures that  
12 we saw in Quad Cities due to cracking. And the cause  
13 of that severe problem was this sort of acoustic  
14 resonance that was occurring downstream; a very high  
15 frequency that was occurring. And that was the  
16 concern.

17 JUDGE REED: And that was - in both cases  
18 Quad Cities and Dresden, was caused by a recent  
19 uprate?

20 MR. SCARBROUGH: Yes, sir. Both of them  
21 occurred in the operating time before that.

22 JUDGE KARLIN: Yes, my colleagues have  
23 pointed out that it is lunch time, and this panel has  
24 been on this hot seat for over two hours, or about two  
25 hours, so I think we ought to give them a break too.

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1 So we will take an adjournment until let's  
2 say 1:15. We will stand adjourned. Thank you.

3 (Whereupon at 12:04 p.m. the proceeding  
4 in the above-entitled matter was  
5 adjourned until 1:15 p.m.)

6 JUDGE KARLIN: May I remind the witnesses  
7 that you're still under oath, so recognize that. I  
8 think absent anything from the parties at this point,  
9 we'll just continue with the questioning related to  
10 Contention Three. Dr. Reed.

11 JUDGE REED: Thank you. We find ourselves  
12 still a little puzzled about the monitoring program,  
13 and what you're able to detect. Would you please  
14 confirm your earlier statement that you believe that  
15 you can detect -

16 JUDGE KARLIN: And you're addressing this  
17 to?

18 JUDGE REED: I'm sorry. This is to Mr.  
19 Hoffman. Would you please confirm your earlier  
20 statement that you believe that you can detect a crack  
21 prior to any major failure of the dryer through your  
22 monitoring program.

23 MR. HOFFMAN: Yes. The basis for my  
24 statement on that was that we have observed that flaw  
25 growth, if it's taking place in the dryer, is very

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1 slow, so that if we have a situation that occurs that  
2 results in a bypass of the dryer through a defect or  
3 something that has begun to develop because the flaw  
4 growth rate is slow, we will have time to evaluate  
5 that condition. And if we determine that the change  
6 in parameters is due to a dryer degradation, we would  
7 be able to shut the plant down before that propagated  
8 to a failure.

9 JUDGE REED: Can you be more specific as  
10 to the size crack that you believe you can detect?  
11 What's the minimum size crack? What's the resolution,  
12 I think Judge Karlin put it that way earlier, what's  
13 the resolution of this monitoring program in terms of  
14 the size crack that you believe you can monitor and  
15 detect?

16 MR. HOFFMAN: When you're saying  
17 monitoring program, you mean the online monitoring or  
18 the inspection part?

19 JUDGE REED: I'm talking about the online  
20 monitoring program.

21 MR. HOFFMAN: I cannot quantify that, sir.

22 JUDGE WARDWELL: Could you roughly guess?  
23 Would it be a six inch crack opened up a quarter of an  
24 inch, would it be a six foot crack opened up a foot?

25 MR. HOFFMAN: Can't quantify that.

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1 JUDGE WARDWELL: Do you believe the  
2 parameters that you're monitoring are sensitive enough  
3 to detect a six inch crack opened up a quarter of an  
4 inch? One six inch crack opened up a quarter of an  
5 inch.

6 MR. HOFFMAN: I could not answer that.

7 JUDGE WARDWELL: You have no feeling on  
8 whether it could or couldn't.

9 MR. HOFFMAN: No, sir.

10 JUDGE REED: Could we turn to the NRC, for  
11 a moment, Mr. Scarbrough. Do you have any opinion  
12 with regard to the ability of a monitoring program -  
13 now, we're not talking inspection, but monitoring  
14 these plant parameters, the particular parameters that  
15 have been laid out in the testimony by Entergy, or  
16 sudden drop in main steam line flow, difference in  
17 reactor vessel water level instruments, and sudden  
18 drop in steam dome pressure, do you believe that those  
19 parameters would indicate a crack of the size that Dr.  
20 Wardwell just specified?

21 MR. SCARBROUGH: I'm not familiar with the  
22 crack size in terms of what -- I know at Quad Cities  
23 Unit 1, they had a crack appear, and that was one of  
24 the diagrams that's in the SIL 644 where they showed  
25 that event, where the crack was rather long, and a

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1 couple of inches, I guess, in size. And you could  
2 tell from the plant parameters the moisture carried  
3 over the changed air and the distribution of flow  
4 within the steam lines changed from that. And from  
5 that, they were able to recognize they had issues  
6 going on and they shut the plant.

7 JUDGE KARLIN: How do you know that? I  
8 mean, did you work at Quad Cities, or are you reading  
9 a report?

10 MR. SCARBROUGH: No, I was part of the  
11 group, when the information came in, because I was  
12 assigned to steam dryer program. And so as it came  
13 in, we got a report like the Region saying that the  
14 parameters were changing, and we got involved, and  
15 within a few days they shut the plant down, opened up  
16 the -

17 JUDGE KARLIN: So you were part of the NRC  
18 team that was involved with the Quad Cities incident.

19 MR. SCARBROUGH: Yes, sir.

20 JUDGE KARLIN: Okay. Great.

21 JUDGE WARDWELL: And what size did you  
22 say, again, about?

23 MR. SCARBROUGH: It's -- the diagram is in  
24 the 644 -

25 JUDGE WARDWELL: Yes, I don't need that.

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1 MR. SCARBROUGH: It looks like it was a  
2 couple of inches wide, and several feet long in terms  
3 of the length.

4 JUDGE WARDWELL: A couple is like six to  
5 eight.

6 MR. SCARBROUGH: Yes. It's hard to tell  
7 from the diagram what it exactly was, but it was --  
8 the whole plate was not missing. It was a crack.

9 JUDGE KARLIN: But are you saying -- okay,  
10 so there was a crack there. Were they monitoring  
11 according to the parameters that Dr. Wardwell just  
12 gave you?

13 MR. SCARBROUGH: They were monitoring -- I  
14 know they saw the change in flow distribution, and  
15 that's one of the parameters that -

16 JUDGE KARLIN: No, but what we're trying  
17 to figure out is, this particular protocol, three  
18 parameters being continuously monitored, would that  
19 have detected this crack, the crack you just  
20 described?

21 MR. SCARBROUGH: I don't -

22 JUDGE KARLIN: They weren't doing that  
23 monitoring.

24 MR. SCARBROUGH: I don't remember if those  
25 parameters also were changing. All I do remember was

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1 the flow distributions in the steam -

2 JUDGE KARLIN: Well, that's a different  
3 parameter.

4 MR. SCARBROUGH: Yes, sir.

5 JUDGE KARLIN: It's not even going to be  
6 monitored here.

7 MR. SCARBROUGH: Well, it's one of the  
8 parameters that sits in the 644 document, if you look  
9 at flow distributions and such.

10 JUDGE KARLIN: But it's not in what  
11 Entergy testified that they were going to be doing.  
12 Is it?

13 MR. SCARBROUGH: It's not one of the ones  
14 they call out.

15 JUDGE WARDWELL: So what you're saying is  
16 the distribution of flow is also a monitoring device -  
17 device is the wrong word. I don't want to use  
18 "parameter" either. Well, I could use parameter, and  
19 it just doesn't have any critical limits on it. You  
20 just look at that distribution, and if it seems  
21 different than it was during normal operations, that  
22 would indicate a potential problem.

23 MR. SCARBROUGH: Yes, the trending is very  
24 important, because everything should stay relatively  
25 normal and constant. When you see a change like that,

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1 operators pay attention and try to determine what's  
2 happening.

3 JUDGE KARLIN: Well, that's all fine and  
4 well, but on page 11 of NRC Entergy's testimony, they  
5 say they're monitoring three things. They're not  
6 monitoring that. Please describe the monitoring  
7 program? They say the following events could be  
8 indicative, they didn't say will be indicative, of a  
9 significant -- A, B, C. So I guess what we're trying  
10 to find out is what's the resolution of that program.

11 MR. SCARBROUGH: Right. I do not know how  
12 closely the -

13 JUDGE KARLIN: Okay.

14 MR. SCARBROUGH: Identify that issue.

15 MR. HOFFMAN: May I just clarify one  
16 issue? A sudden drop in main steam line flow, there  
17 are four main steam lines, so a sudden drop in a main  
18 steam line flow would be indicative of a mismatch. If  
19 you saw one steam line flow drop, that would be  
20 indicative of a mismatch with the other three,  
21 potential.

22 JUDGE WARDWELL: Mr. Scarbrough, I thought  
23 I heard earlier today that at Quad Cities they saw a  
24 difference in the moisture carry-over, also. Do you  
25 remember anything with regard to -

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1 MR. SCARBROUGH: Yes, they did say -

2 JUDGE WARDWELL: And that was prior --  
3 that was several weeks or days, or months before they  
4 shut down that they noticed this?

5 MR. SCARBROUGH: Well, this was actually -  
6 the event I am familiar with that I was involved with  
7 with Quad Cities Unit 1, which is later than the  
8 earlier two Quad Cities, too. And there, because of  
9 the past experience, when they saw moisture carry-over  
10 change, and this flow distribution change, and  
11 probably other parameters, as well, that's the only  
12 one I recall, but from that, they knew something was  
13 happening and they shut down very quickly, within a  
14 week or so, they found the dryer was cracked.

15 JUDGE WARDWELL: Mr. Hoffman, did you  
16 design this monitoring program that's presented on  
17 page 11 in Answer 24 in order to detect a single crack  
18 that is six inches long by a quarter inch wide?

19 MR. HOFFMAN: I did not develop this  
20 monitoring program, no.

21 JUDGE WARDWELL: Okay.

22 JUDGE KARLIN: If I can understand the  
23 process of - this is for Mr. Hoffman, I think - these  
24 three parameters will be monitored continuously. If  
25 a trigger occurs, as you've defined them, then what

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1 happens? Someone goes and does a moisture analysis.

2 MR. HOFFMAN: If any of those parameters  
3 fall outside the range, then the first step would be  
4 the operators would request a moisture carry-over  
5 measurement be taken.

6 JUDGE KARLIN: Okay. So first thing, any  
7 of these triggers hit, moisture carry-over analysis is  
8 done.

9 MR. HOFFMAN: Right. Then they would  
10 assess -- they would get the results of the moisture  
11 carry-over measurement.

12 JUDGE KARLIN: And then in Question 32,  
13 "Will the plant continue to operate if values of  
14 moisture carry-over or other parameters indicate that  
15 steam dryer cracking may have occurred?" And you  
16 answer, "No." That's correct. Right?

17 MR. HOFFMAN: That's correct.

18 JUDGE KARLIN: Of course, I think that  
19 question hides a key question in there. What will be  
20 the criterion by which it's determined whether the  
21 moisture carry-over data indicates that a steam dryer  
22 cracking may have occurred?

23 MR. HOFFMAN: Yes.

24 JUDGE KARLIN: I mean, presume the  
25 conclusion, which is if the data indicates a crack may

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1 have occurred, no, it won't continue operating. But  
2 what is the criterion by which one looks at the  
3 moisture content and say oh, this indicates a cracking  
4 may have occurred, this doesn't indicate a cracking  
5 may have occurred. There's no objective criterion for  
6 that, is there?

7 MR. HOFFMAN: If the change in moisture  
8 carry-over cannot be attributed to a known plant  
9 event, or operating mode change, or any of the  
10 parameters with moisture carry-over, as well, that  
11 would be caused by a known event, we would then get  
12 into our operability, or Entergy's operability  
13 evaluation process, which brings to bear technical  
14 experts on the site, technical experts on other  
15 Entergy sites, if necessary, outside consultants would  
16 look and see -

17 JUDGE KARLIN: Well, if it can't be  
18 explained by any other mechanism, then you'll shut  
19 down the plant.

20 MR. HOFFMAN: If the conclusion is that we  
21 cannot explain it, then the process would be shut the  
22 plant down. If it cannot be ruled out that dryer  
23 damage has occurred, you would shut the plant down, in  
24 an orderly shut down as described.

25 JUDGE KARLIN: There's no -- can you cite

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1 me to any document or criteria that says here is when  
2 you shut down the plant, and here's when you don't?

3 MR. HOFFMAN: As far as -

4 JUDGE KARLIN: It's a judgment call.

5 MR. HOFFMAN: As far as moisture carry-  
6 over?

7 JUDGE KARLIN: Yes, sir.

8 MR. HOFFMAN: It would not be spelled out  
9 as a number, because it would need to be evaluated.

10 JUDGE KARLIN: Okay.

11 JUDGE WARDWELL: Is that procedure spelled  
12 out somewhere?

13 MR. HOFFMAN: That procedure is a spelled  
14 out procedure, yes.

15 JUDGE WARDWELL: In the -

16 JUDGE KARLIN: Well, here's -

17 MR. HOFFMAN: In the ON-3178 then directs  
18 to the other procedure, yes.

19 JUDGE WARDWELL: Okay. There it is. Yes.

20 JUDGE REED: I would like to follow up a  
21 little on this large crack that Mr. Scarbrough  
22 mentioned. Can you estimate how long it would have  
23 taken that dryer to fail if the reactor had continued  
24 to operate?

25 MR. SCARBROUGH: Well, the dryer had -- in

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1 the sense of -- there was flow through -

2 JUDGE REED: I'm sorry. No loose parts  
3 generated though.

4 MR. SCARBROUGH: Okay. Now, the event that  
5 I was involved with, the specific event with Quad  
6 Cities Unit 1, November '03. And, actually, that grew  
7 out to where there was a loose part, and that was in  
8 November 2003; and there was a loose part that came  
9 loose with that. So with that event, there was enough  
10 flow and such that there was a piece, it was like six  
11 inches by nine inches came off and escaped into the  
12 main steam system.

13 JUDGE REED: You described a crack that  
14 was about a foot and a half long by several inches  
15 wide?

16 MR. SCARBROUGH: Yes, but -

17 JUDGE REED: Did I misunderstand -

18 MR. SCARBROUGH: Yes. I misspoke in terms  
19 of the event. The event that we're -- the November  
20 2003 event was a situation where it grew out, and then  
21 there was a section that did come loose, so there was  
22 -- the November '03 event was Quad Cities Unit 1, and  
23 there was a loose part that came out of that.

24 JUDGE KARLIN: Can you tell us -- the  
25 court reporter can't see where your hands are.

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1 MR. SCARBROUGH: Yes.

2 JUDGE KARLIN: How many inches?

3 MR. SCARBROUGH: It was a six by nine inch  
4 piece. Six by nine.

5 JUDGE KARLIN: And how about the crack,  
6 how big was that?

7 MR. SCARBROUGH: The crack was several --  
8 it started small and then grew, so it was several  
9 feet total.

10 JUDGE KARLIN: Okay.

11 JUDGE REED: Is this another crack on  
12 another part of the steam dryer, or was this  
13 associated with the piece that broke off?

14 MR. SCARBROUGH: This piece led from an  
15 edge over to the sort of middle part of the dryer that  
16 faces the main steam line exits, and so it came off on  
17 that piece.

18 JUDGE REED: So a piece was broken off  
19 adjacent to this crack that you mentioned. Is that  
20 correct?

21 MR. SCARBROUGH: Yes. The crack grew, and  
22 then as it got to the center point of the dryer plate  
23 outer hood, a piece did peel off from that location.

24 JUDGE WARDWELL: And the void left by that  
25 piece coming off was part of the size of the crack you

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1 described, or was it a piece that was appended to it,  
2 and didn't create any more void, or was it another  
3 void created?

4 MR. SCARBROUGH: It's sort of all one  
5 continuous void. It started small, then grew at the  
6 middle, and then the middle piece came out.

7 JUDGE WARDWELL: That's part of the  
8 description of your several feet by six to eight  
9 inches. In the middle portion of that, a solid piece  
10 had been removed and went off as a loose part.

11 MR. SCARBROUGH: Yes.

12 JUDGE REED: So what we're interested in  
13 is how rapidly we can go from initiation of a crack to  
14 failure of the dryer with loose parts being generated.  
15 In your estimation, if the cause is fatigue, what's  
16 that period?

17 MR. SCARBROUGH: If it's fatigue, it  
18 happens very quickly from -

19 JUDGE REED: Very quickly -

20 MR. SCARBROUGH: In terms of Quad Cities  
21 was 90 days, when they went up in power for their EPU,  
22 they passed the point where that acoustic resonance  
23 was causing the fatigue limit to be exceeded on the  
24 dryer plates, and so it happened very quickly. And  
25 then they did some repairs, strengthened it, went up

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1 again, and within a year it failed again, Quad Cities  
2 Unit 2. Quad Cities Unit 1 operated for about a year  
3 at EPU conditions, and it failed, so it happens very  
4 quickly. If you're above those fatigue limits, it  
5 occurs very quickly, within a year.

6 JUDGE REED: Okay. And what's the  
7 possibility of a crack being initiated through some  
8 other mechanism, and then being amplified and leading  
9 to failure through fatigue? Is that a possibility, or  
10 is that considered?

11 MR. SCARBROUGH: You do usually start a  
12 fatigue crack in some location that has a high stress  
13 riser, and that was part of the problem with Quad  
14 Cities, is they had these braces inside that caused a  
15 stress riser. It helped initiate the crack and get it  
16 moving. But you still have to be above the fatigue  
17 limits for the dryer to occur. And you have little  
18 weld issues and such all -- in the dryer, this big  
19 device, this component, you're going to have little  
20 places where there's higher stresses than other  
21 places, and those could be potential sites to begin a  
22 crack. So if you're above the fatigue limit, you're  
23 going -- it's going to find a site to go ahead and  
24 start propagating. And here, the analysis was shown  
25 that they were below the fatigue limit with additional

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1       uncertainties included. And then they'd be monitoring  
2       every outage looking to see if there's any issues  
3       happening in the dryer, and so far as the last one  
4       they had seen. So that's part of the extra  
5       conservatism of making sure that all of those analyses  
6       were reasonably accurate. We know there's  
7       uncertainties, but we want to make sure that they're  
8       still below the fatigue limit, and they see that  
9       through the inspection.

10                JUDGE REED: So may I take what you just  
11       said as supportive of the contention that Entergy put  
12       forward earlier today, that since they've operated for  
13       - how long - two years?

14                MR. HOFFMAN: A little bit over two years.

15                JUDGE REED: A little over two years at  
16       the 20 percent uprate, it's very unlikely that a  
17       fatigue -- it's very likely that if they had had a  
18       situation where a crack was going to develop due to  
19       fatigue, it probably would have already developed in  
20       that two-year period. Is that correct?

21                MR. SCARBROUGH: Yes, sir.

22                JUDGE REED: So you confirm their -

23                MR. SCARBROUGH: Yes, sir. Their finding  
24       small little -- they had been in there in the past and  
25       they have not grown, and so this was the additional

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1 confirmation that the analyses, that they really are  
2 below the fatigue limit for the material.

3 JUDGE REED: Dr. Hopenfeld, did you have -

4  
5 DR. HOPENFELD: Yes. I gave one example  
6 before, but maybe too general about why, the rationale  
7 that -

8 JUDGE REED: I'm having trouble hearing  
9 you.

10 DR. HOPENFELD: I gave one example before  
11 as to why the rationale that one inspection is not  
12 sufficient without doing, without showing the  
13 calculations. It's not sufficient to demonstrate that  
14 you are not going to have failure later on. The only  
15 way that one can do that, because so many parameters  
16 coming into this, is very, very plant-specific. The  
17 only way you can do that is by doing the calculations,  
18 or instrumenting the dryer. But let me give you  
19 another example, because I gave you a very general  
20 example.

21 Suppose that the requirements was that you  
22 inspect the dryer every three months, so you inspect  
23 it the first three months, and you look at it and say  
24 well, nothing happened. Would you be able to conclude  
25 without anything else that nothing is going to ever

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1       happen forever? Obviously, not. Then you go to the  
2       six month, where do you draw the line? The only way  
3       you can draw the line is with calculations. There's  
4       no other way of doing it, because so many -- what you  
5       have, you have the natural vibration of the different  
6       components of the dryer, the location, the different  
7       possibility of sources, and the different designs.  
8       This design is different. Plus, there were  
9       modifications in the dryer, also. So you just can't -  
10      - I mean, it's impossible to take one situation that  
11      happened in November and say well, I can conclude  
12      that's the time scale.

13                   JUDGE KARLIN: But, Dr. Hopenfeld, I still  
14      am troubled by this. It's my understanding that  
15      they're not trying to say it will never happen. The  
16      program is there to detect if it does happen, so that  
17      action can be taken in some time frame to shut the  
18      facility down, or do whatever is necessary. They're  
19      not trying to say it won't happen. They're trying to  
20      detect it if it does, and then take action.

21                   DR. HOPENFELD: Okay. I was addressing  
22      the first part, now let me address this one. General  
23      Electric concluded in SIL NO-644 on page 6, they  
24      concluded from the November 2003 experience that the  
25      failure -- they're referring to the November 2003

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1 experience, that monitoring steam moisture content and  
2 other reactor parameters does not consistently predict  
3 imminent dryer failure.

4 JUDGE KARLIN: Yes, sir.

5 DR. HOPENFELD: Does not. And that's -- I  
6 don't know what else he's going to say.

7 JUDGE KARLIN: I agree. I had that very  
8 provision on page 6 of SIL 644 underlined. The  
9 November 2003 hood failure - is this the one you're  
10 referring to, Mr. Scarbrough?

11 DR. HOPENFELD: Yes.

12 JUDGE KARLIN: Mr. Scarbrough?

13 MR. SCARBROUGH: Right. Yes, sir.

14 JUDGE KARLIN: That's the one you were  
15 involved in. "Demonstrated that monitoring steam  
16 moisture content and other reactor parameters does not  
17 consistently predict imminent dryer failure. My  
18 question is they're not trying to predict. They're  
19 trying to detect it, so that action can be taken.

20 DR. HOPENFELD: No, it says it doesn't  
21 detect it either.

22 JUDGE WARDWELL: Where does it say that?

23 DR. HOPENFELD: Well, it doesn't need the  
24 work, the indication it doesn't detect.

25 JUDGE KARLIN: Well, I think, as I

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1 understand it, Entergy is positive that they're not  
2 trying to predict, they're trying to detect. So is  
3 this a non-issue?

4 DR. HOPENFELD: Well, if that's the case,  
5 then what they would have to do - this is a general  
6 statement off the detection co-exhibit, because if you  
7 detect, you know -- maybe they need to fill out --

8 JUDGE KARLIN: Well, let me back up. As  
9 I understand your counsel's position, your position is  
10 they need to predict it.

11 DR. HOPENFELD: Correct.

12 JUDGE KARLIN: They're saying they don't  
13 need to predict it. They just need to detect it.

14 DR. HOPENFELD: Well, if that's the case,  
15 sir, I believe that they should be able to answer the  
16 question that was brought here, is to tell me what is  
17 the size of a crack, the minimum size of a crack and  
18 its location. You have to realize, there are many,  
19 many locations these cracks can happen, and that may  
20 be a long time for that steam to find itself somewhere  
21 you could measure it, or you need to see a level  
22 change, so you have to do a parametric study,  
23 sensitivity study to show me. I haven't seen any of  
24 that, and I don't believe that you have seen any of  
25 that. So all we hear with the gentleman just talking,

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1 I mean, they're giving you an opinion completely based  
2 on their feel. They don't -- I mean, this is not  
3 engineering. You know, this is just not engineering  
4 what you're hearing here.

5 JUDGE KARLIN: Well, let me ask, what are  
6 we trying to predict, what are we trying to detect?  
7 It seems to me that we're not -- there's something  
8 between dryer failure and a crack. It's not either  
9 one of those, it seems to me. It seems to me what  
10 we're concerned about is a threat, or a problem with  
11 regard to the safety. And as I understand it, if such  
12 a problem would arise, if a piece breaks off, drops  
13 down, gets into some valve somewhere and causes a  
14 problem, so that's not a crack, that's a piece  
15 breaking off. And it's not failure of the whole steam  
16 dryer either. It's something in between there.

17 DR. HOPENFELD: Correct.

18 JUDGE KARLIN: And so the fact that they  
19 can't detect a crack of X amount, or a steam dryer  
20 total collapse failure, I don't know what the  
21 definition of failure is. There's more -- are they  
22 going to be able to detect a piece dropping off such  
23 that if it -- anything that might affect safety,  
24 something -

25 DR. HOPENFELD: I'll tell you, if somebody

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1 gave me a job, I was making some time to do that, and  
2 somebody would ask me okay, just answer that question.  
3 I'll start with a piece of paper. I'll start with  
4 this a different size of crack, different location,  
5 and then find out how many of those do I need, what's  
6 the total surface, I mean opening area that I need for  
7 me to detect it at Point A, B, and C, whatever,  
8 whatever they detect. The next thing I'm going to do  
9 is take a look at these cracks and see what kind of  
10 geometry configuration or topography I need for these  
11 things to cause a loose part. If I have a little part  
12 here, and a little crack somewhere far away, maybe  
13 this is a single crack, maybe that's not going to  
14 cause any rupture. Maybe that by itself, you detect  
15 it, that's fine. I'd like to tell you that everything  
16 was -- they say doesn't make sense. Some of it does,  
17 because it does a certain amount of that, but that's  
18 not how you look at safety.

19 JUDGE WARDWELL: How are your calculations  
20 going to result in anything better in regards to -

21 DR. HOPENFELD: Well, because I'll tell  
22 you, what -

23 JUDGE WARDWELL: -- any prediction,  
24 because it's just supposition of where you happen to  
25 select the -

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1 MR. HOFFMAN: Right. But that's all you  
2 can do. I mean, then you say look, you're going the  
3 probability, probabilistic basis on that. You would  
4 say well -

5 JUDGE WARDWELL: What then would you use  
6 to support the probability of a failure occurring, a  
7 crack in a given location?

8 DR. HOPENFELD: You have to see what's the  
9 minimum amount of cracks they need -

10 JUDGE WARDWELL: What data are you going  
11 to use to select -- to indicate the probability at a  
12 given location? You don't have any, do you?

13 DR. HOPENFELD: Yes, I have -- well, what  
14 data are you asking me? I haven't started working on  
15 that problem. I believe that's their job.

16 JUDGE WARDWELL: Yes, but think about it.

17 DR. HOPENFELD: What data?

18 JUDGE WARDWELL: You would need some  
19 observational data -

20 DR. HOPENFELD: You need calculation to  
21 see how fast these cracks grow, and how they form.

22 JUDGE WARDWELL: You can't make up the  
23 calculations in a void in a probability risk  
24 assessment. You have to -

25 DR. HOPENFELD: No, no, but stuck with

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1 crack, you come up with some assessment. You're going  
2 to look at how you stress the area to begin with.  
3 You're going to look at existing cracks. That's how  
4 you're going to start.

5 JUDGE KARLIN: Doctor, may I just -- let's  
6 just double check here. Mr. Scarbrough, perhaps I  
7 could ask you if you agree with this, which is the  
8 statement out of SIL 644, page 6. It was quoted  
9 earlier. I won't read it. I'll quote, "The November  
10 2003 BWR-3 hood failure demonstrated that monitoring  
11 steam moisture content and other reactor parameters  
12 does not consistently predict imminent dryer failure,  
13 nor will it preclude the generation of loose parts."  
14 Do you agree with that statement?

15 MR. SCARBROUGH: Yes, I agree with that  
16 statement.

17 JUDGE KARLIN: Okay. Mr. Hoffman from  
18 Entergy, or Mr. Lukens, do you agree with that  
19 statement?

20 MR. HOFFMAN: Yes, sir.

21 MR. LUKENS: Yes.

22 JUDGE KARLIN: Okay. The next statement  
23 is, "Monitoring is still useful in that it does allow  
24 identification of a degraded dryer, allowing  
25 appropriate action to be taken to minimize the damage

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1 to the dryer and the potential for loose parts  
2 generation." Do you agree with that, Mr. Hoffman?

3 MR. HOFFMAN: Yes, sir.

4 JUDGE KARLIN: Mr. Scarbrough?

5 MR. SCARBROUGH: Yes, I do.

6 JUDGE KARLIN: Dr. Hopenfeld?

7 DR. HOPENFELD: In general, yes.

8 JUDGE KARLIN: You agree with that. So  
9 we're all in agreement.

10 DR. HOPENFELD: In general, yes.

11 JUDGE KARLIN: Okay.

12 JUDGE REED: Okay. I would like to focus  
13 now on the inspection component of this program. I  
14 don't know whether you consider inspection as part of  
15 the monitoring program, or separate.

16 MR. LUKENS: There's probably some  
17 confusion about that, because what we referred to as  
18 the steam dryer monitoring plan contains both online  
19 monitoring and inspection.

20 JUDGE REED: I see. Okay. So, to date,  
21 we've been talking about the online monitoring.

22 MR. LUKENS: Yes, sir.

23 JUDGE REED: I would now like to talk  
24 about the visual inspections that you do. Before we  
25 begin, maybe we should talk about existing cracking of

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1 the dryer. It's my understanding that cracks have  
2 been observed in the dryer, and been repaired. Is  
3 that correct?

4 MR. LUKENS: Yes, sir.

5 JUDGE REED: Could you briefly describe  
6 what the -

7 MR. LUKENS: A brief history?

8 JUDGE REED: Yes.

9 MR. LUKENS: The first comprehensive  
10 examination of the dryer was in 2004 in anticipation  
11 of power uprate. That examination found 20  
12 indications by visual examination. Of those 20, two  
13 were determined that they needed repairs. We ground  
14 them out and re-welded them.

15 JUDGE REED: Well, why would a particular  
16 crack need repairing and another one would not?

17 MR. LUKENS: The decision about whether a  
18 crack needs to be repaired or not goes to how big is  
19 the section that it's in, and what is the critical  
20 size for a flaw in that location, and how fast using  
21 standard methodology, how fast will that crack grow,  
22 and how big will it be at the end of 18 months, the  
23 next refueling outage?

24 JUDGE REED: So what kind of methodology  
25 would predict that rate of crack growth?

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1 MR. LUKENS: The rate of crack growth  
2 inter- granular stress corrosion cracking, IGSCC, the  
3 industry-accepted number is 5 times 10 to the minus  
4 5<sup>th</sup> inches per hour, which roughly translates to  
5 something on the order of half an inch a year.

6 JUDGE REED: So you assumed that all of  
7 the cracking that was observed was inter-granular  
8 stress corrosion cracking?

9 MR. LUKENS: No, sir, we did not assume  
10 that it was inter- granular stress corrosion cracking,  
11 we observed that. It is possible.

12 JUDGE REED: What are the characteristics  
13 -

14 JUDGE WARDWELL: It's possible what?

15 MR. LUKENS: To determine by visual  
16 examination whether a crack is IGSCC or petite.

17 JUDGE WARDWELL: And what is that visual  
18 indication?

19 MR. LUKENS: IGSCC typically occurs in  
20 the heat affected zone adjacent to a weld, because  
21 that's the area that's been sensitized. IGSCC requires  
22 stress and the right material properties, and the  
23 right environment to cause it to propagate. The heat  
24 affected zone adjacent to a weld in austenitic  
25 stainless steel typically has the right material to

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1 propagate an IGSCC crack.

2 The dryer was essentially cold formed and  
3 welded together, so that there are very large residual  
4 manufacturing stress, so we anticipate finding IGSCC  
5 cracks in the dryer, and we did. A petite crack - let  
6 me characterize an IGSCC crack.

7 Inter-granular stress corrosion cracking  
8 goes between grain boundaries, therefore, the  
9 appearance of an IGSCC crack is going to be jagged.  
10 A petite crack tends to be a straight line, and based  
11 on where the crack is; that is, is it in a high-  
12 stress, low-stress area, is it in heat affected zone,  
13 is it crooked or is it straight? We can tell whether  
14 a crack is IGSCC or petite.

15 JUDGE WARDWELL: And all of these were?

16 MR. LUKENS: All of these were IGSCC.

17 JUDGE WARDWELL: IGSCC.

18 MR. LUKENS: Yes, sir.

19 JUDGE WARDWELL: Did any of them penetrate  
20 the entire thickness?

21 MR. LUKENS: IGSCC cracks are typically  
22 very tight so that we can't actually determine depth.  
23 For purposes of analysis to determine whether it's  
24 acceptable to run another 18 months, we assume the  
25 crack goes all the way through.

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1 JUDGE REED: Okay. You were in the process  
2 of doing -

3 MR. LUKENS: I'm sorry, yes. That was  
4 2003. 2005, we did an augmented partial examination.  
5 We had not yet reached uprate conditions.

6 JUDGE KARLIN: May I stop you for a  
7 moment?

8 MR. LUKENS: Yes, sir.

9 JUDGE KARLIN: If I may, and say maybe we  
10 could -- while you're talking, I'm reading your  
11 testimony on this.

12 MR. LUKENS: Yes.

13 JUDGE KARLIN: This is page 22 of your  
14 staff exhibit, or Entergy Exhibit 01, which is now, of  
15 course, in the record. I'm following your testimony,  
16 page 23, we're at the 2005 refueling outage.

17 MR. LUKENS: Yes, sir.

18 JUDGE KARLIN: Fall of 2005.

19 JUDGE WARDWELL: We've been under the  
20 power uprate now for -

21 MR. LUKENS: The outage of 2005 was prior  
22 to uprate. We had not -

23 JUDGE WARDWELL: Prior to.

24 MR. LUKENS: -- yet achieved uprate  
25 conditions.

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1 JUDGE WARDWELL: And what number was this?

2 MR. LUKENS: This was RFO-25.

3 JUDGE WARDWELL: Okay.

4 MR. LUKENS: We did an augmented  
5 examination of the dryer; that is, it was larger than  
6 the required scope by the BWR VIP, but it was less  
7 than all accessible susceptible areas because we had  
8 just done one of those the previous outage. And since  
9 we hadn't achieved uprate conditions, nothing had  
10 changed, so we performed the examinations. We found  
11 66 indications in the dryer in that examination. It's  
12 worth pointing out that we found 66 indications, even  
13 though the actual number of exams was significantly  
14 less than it had been in 2004. The reason for that is  
15 that the examination quality in 2005 was superior to  
16 what we got in 2004.

17 A VT-1 examination, which is what we do,  
18 has a specific resolution requirement to meet the --  
19 to be called a VT-1. The examinations in 2004 met  
20 that requirement. The examinations in 2005 exceeded  
21 that requirement. And, as a result, their resolution  
22 was much better than the resolution in 2004, and we  
23 found a lot of indications.

24 JUDGE REED: Do you recall off the top of  
25 your head what is the resolution requirement of a VT-

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1 1?

2 MR. LUKENS: VT-1 requires, and this is  
3 also in testimony, VT-1 -

4 JUDGE REED: I've listened to the  
5 testimony but I've forgotten.

6 MR. LUKENS: VT-1 requires that we be able  
7 to distinguish a point zero or four inch lower case  
8 character without ascenders or descenders. That would  
9 be, for example, an A, an O, an E.

10 JUDGE REED: Yes.

11 JUDGE WARDWELL: .044, 44 thousandths?

12 MR. LUKENS: 44 thousandths of an inch,  
13 and I struggled before these hearings began to try to  
14 make that mean something. It turns out that 44  
15 thousandths of an inch is slightly larger than the  
16 micro engraving on a dollar bill.

17 JUDGE KARLIN: So the difference between  
18 the 2004 and 2005 detection of indications was not a  
19 function -- I thought 2004 was a VT-3 exam, and the  
20 2005 was a VT-1.

21 MR. LUKENS: No, sir.

22 JUDGE KARLIN: No, they're both VT-1s?

23 MR. LUKENS: They were both VT-1s.

24 JUDGE KARLIN: But this was sort of VT-1  
25 plus, even better than -

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1 MR. LUKENS: Yes, sir. That's a good way  
2 to characterize it.

3 JUDGE KARLIN: Okay.

4 JUDGE REED: Is the surface condition of  
5 this dryer after 30 something years of operation such  
6 that you can see cracks, or is the surface rather  
7 eroded, or is it hard to see a crack? Is it a nine  
8 shiny surface and you can see a crack, or -

9 MR. LUKENS: There are places that are  
10 nice and shiny. There are places where there are  
11 corrosion products, and more recently, some residue  
12 from noble metals treatment, which in some cases makes  
13 a surface examination a little more difficult.  
14 However, despite that, using the VT-1 plus, if I may,  
15 we found a lot ore indications in 2005 than we did in  
16 2004. We found all of the 2004 indications, and none  
17 of them had grown. We also examined the modifications  
18 made in 2004, and the two repairs that we made in  
19 2004, and there were no indications.

20 In 2007, we did another comprehensive exam  
21 of all susceptible areas, so this was the same scope  
22 as the 2004 exam. Under the resolution requirements  
23 that we achieved in 2005, we specified to the  
24 examiners that they had to be able to see as well in  
25 2007 as they did in 2005. We weren't going to take a

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1 sort of bottom acceptable VT-1. We'd already seen  
2 what we can get with a better exam, and we wanted it.

3 We got 66 indications, 66 relevant  
4 indications in 2007. We found 48 of the previous  
5 indications, none of them had grown. We found 28 new  
6 ones, which were all IGSCC, and were all  
7 dispositioned, use as-is, and there were 9 indications  
8 from 2005 that were determined in 2007 to be non-  
9 relevant indications.

10 (Clock chime.)

11 JUDGE REED: -- as a non-relevant -

12 MR. LUKENS: A non-relevant indication is  
13 something that does not produce a surface irregularity  
14 within the resolution of a VT-1 examination. What  
15 that really means is they went to the location where  
16 there had been an indication the previous outage. But  
17 one indication that I'm particularly familiar with,  
18 they illuminated it from the left-hand side, and it  
19 looked just like it had in the previous outage. They  
20 illuminated it from the right-hand side, and the  
21 indication went away. It was a shadow, so that became  
22 a non-relevant indication.

23 JUDGE KARLIN: You talked in your  
24 testimony, sir, written testimony about recordable.  
25 Is that the same as -- when you say "relevant", it

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1 seems like a new term to me, as opposed to  
2 "recordable". Is it the same or different?

3 MR. LUKENS: Relevant is the correct  
4 terminology in non-destructive examination. All  
5 relevant indications must be recorded. In addition,  
6 we may record indications that turn out to be not  
7 relevant. And I apologize for the confusion.

8 JUDGE KARLIN: No, I was just confused,  
9 because on page 20 you testified that "an indication  
10 is classified as recordable or relevant if it is  
11 visible to the resolution of the examination  
12 technique."

13 MR. LUKENS: That is correct.

14 JUDGE KARLIN: Okay. And so those are  
15 interchangeable terms in this sense?

16 MR. LUKENS: Yes, they are.

17 JUDGE KARLIN: Recordable and relevant?

18 MR. LUKENS: Yes.

19 JUDGE KARLIN: All right.

20 JUDGE REED: So what's a VT-3 inspection,  
21 and when would you use that?

22 MR. LUKENS: A VT-3 inspection does not  
23 have the same resolution requirements as VT-1. VT-3  
24 is a more general examination for looking at material  
25 condition, and it is typically used in visual

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1 examination of other reactor internal components other  
2 than the steam dryers. In earlier times, the dryer  
3 was examined by VT-3, but in the recent past,  
4 certainly the last three outages at Vermont Yankee,  
5 dryer examinations have been by VT-1.

6 JUDGE REED: Are all the locations on the  
7 steam dryer where cracks could potentially form  
8 subject to inspections? Can you see everywhere that  
9 you need to see?

10 MR. LUKENS: Yes, sir, you can. The areas  
11 most susceptible to failure are the outer surfaces of  
12 the steam dryer, vertical, the sides, cover plates.  
13 Those are all on the exterior, and they are easily  
14 accessible, so all of the susceptible areas are  
15 accessible.

16 JUDGE REED: All right.

17 JUDGE KARLIN: So there's only been --  
18 since the uprate, there's only the Spring 2007 visual  
19 inspection event?

20 MR. LUKENS: That's correct. Spring 2007  
21 was the first inspection -

22 JUDGE KARLIN: The next one is due?

23 MR. LUKENS: -- following uprate. We'd  
24 been operating about a year.

25 JUDGE KARLIN: And the only one since the

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1 uprate.

2 MR. LUKENS: And the only one so far.

3 JUDGE KARLIN: Okay.

4 MR. LUKENS: The next one will be in  
5 October this year.

6 JUDGE KARLIN: Okay.

7 JUDGE WARDWELL: Referring to the SIL 644,  
8 page 6, A-1(c).

9 MR. LUKENS: Yes, sir..

10 JUDGE WARDWELL: It says, "Flaws left as-  
11 is should be inspected during each scheduled refueling  
12 outage until it has been demonstrated that there are  
13 no further crack growth and the flaws have been  
14 stabilized."

15 MR. LUKENS: Yes.

16 JUDGE WARDWELL: Are all of these crack  
17 detections considered flaws?

18 MR. LUKENS: Yes. We do not distinguish  
19 between -- for the purposes of complying with the SIL,  
20 we don't make a distinction between an indication, a  
21 flaw, and a crack. If it's big enough to see in a VT-  
22 1, we record it as relevant and we track it to verify  
23 that it's not growing.

24 JUDGE WARDWELL: What is the definition of  
25 a demonstration that no further crack growth is

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1 occurring, and the flaws are stabilized?

2 MR. LUKENS: Our position, which is  
3 consistent with ASME and the industry, is that if a  
4 crack is shown not to be growing in the two  
5 inspections following its initial discovery, it's not  
6 growing, and need not be inspected.

7 I point of fact, we haven't even had a  
8 discussion about not looking at old indications,  
9 because all of -- since we're doing comprehensive  
10 dryer examinations, we're going to be there anyway, so  
11 we just continue to look for those indications, record  
12 their size, and compare them to what they were.

13 JUDGE REED: Is there any role for  
14 ultrasonic testing? I know this is done -- we talked  
15 earlier in this hearing about testing of a feedwater  
16 nozzle, and completely different techniques are used.  
17 I just would like to know why on some locations in the  
18 reactor you use different techniques to look for  
19 cracks. Why here is it strictly visual?

20 MR. LUKENS: Ultrasonic techniques are  
21 typically used on pressure-retaining components, like  
22 feedwater nozzles and reactor cooling system lines.  
23 The steam dryer is a non-pressure-retaining component.

24 JUDGE REED: What's the reason for that?  
25 Is it more sensitive, a higher resolution, can it

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1 detect the depth of a crack, or -

2 MR. LUKENS: Ultrasonic can do a lot of  
3 things, but it's not an unmixed blessing. It may show  
4 things in a piece of stainless steel that are not  
5 flaws, they're called reflectors.

6 JUDGE REED: So you get false positives?

7 MR. LUKENS: We get false positives. And  
8 the consensus is that visual examination at the VT-1  
9 standard is the right test for determining dryer  
10 integrity.

11 JUDGE REED: And when you talk about crack  
12 growth, you can't see the depth of the crack, so  
13 you're really talking about the longitudinal -

14 MR. LUKENS: That's correct. The only  
15 visual we have is length. We assume that it's all the  
16 way through.

17 JUDGE REED: Okay.

18 JUDGE KARLIN: Can I ask a question? On  
19 page 25 of your testimony, this is part of the  
20 testimony I think you corrected.

21 MR. LUKENS: Yes.

22 JUDGE KARLIN: But my question is not  
23 directed to any of the corrections, I don't think.  
24 And you discussed earlier in your testimony that the  
25 total number of examinations that you conducted in the

1 2007 inspection were greater.

2 MR. LUKENS: Yes.

3 JUDGE KARLIN: Significant, 463, than the  
4 total number of dryer exams in 2005, which is 113, and  
5 2004, which is 287. Presumably, is it laid out  
6 somewhere, how many -- can you just do as many as you  
7 feel like, or what's the standard for how many dryer  
8 exams will be done each time there's a refueling  
9 outage?

10 MR. LUKENS: The standard for how many  
11 dryer exams will be done, if I may simply address the

12 -

13 JUDGE KARLIN: Well, obviously, you have  
14 to look at the cracks that were existing before to see  
15 if they're grown.

16 MR. LUKENS: That's correct.

17 JUDGE KARLIN: But maybe that's sort of a  
18 baseline, and then -

19 MR. LUKENS: That's actually a small  
20 piece.

21 JUDGE KARLIN: Yes.

22 MR. LUKENS: The fundamental scope using  
23 SIL 644 is all the accessible susceptible areas. And  
24 the SIL shows in color diagrams where the susceptible  
25 areas are. However, the SIL is somewhat generic in

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1 its reference to weld numbers, so it is the job of the  
2 program engineer to take those diagrams and distill  
3 out of them all of the weld numbers in our dryers.  
4 It's a very site-specific number. All of the weld  
5 numbers in our dryer need to be examined.

6 JUDGE KARLIN: But then shouldn't this  
7 number be the same for each one of the exams, because  
8 the non-relevants aren't going to change for Vermont  
9 Yankee.

10 MR. LUKENS: That's correct. The 2005  
11 exam, as I said, was not a comprehensive exam. It was  
12 an augmented exam, but not comprehensive. And the  
13 difference between 2004 and 2007, we both had the same  
14 requirement of accessible susceptible.

15 JUDGE KARLIN: Oh, yes.

16 MR. LUKENS: The difference between those  
17 is that different companies perform those two sets of  
18 exams, different people count an exam a different way,  
19 and in one case one weld may be one examination, in  
20 another case a weld may be two examinations, and so it  
21 -- we have struggled with this. And with experience,  
22 we have identified by examination number all of the  
23 welds that are in the scope. And I would expect in  
24 this fall that that number that we examined in 2005,  
25 463, very, very close to the actual count in 2007.

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1 JUDGE KARLIN: And you have this done by  
2 an outside contractor, I think your testimony,  
3 typically.

4 MR. LUKENS: Typically do, yes.

5 JUDGE KARLIN: Did you change your  
6 contractors between the -

7 MR. LUKENS: Yes, we did.

8 JUDGE KARLIN: -- two events, 2005, 2007?

9 MR. LUKENS: And we changed again between  
10 2005 and 2007.

11 JUDGE KARLIN: Okay.

12 MR. LUKENS: But the burden of  
13 establishing the scope and deciding what gets looked  
14 at is our's. That's the program engineer's job.

15 JUDGE KARLIN: All right.

16 MR. LUKENS: The company that we call in  
17 to do the exam simply performs the exams we tell them  
18 to do.

19 JUDGE KARLIN: It doesn't seem like it  
20 should change that much.

21 MR. LUKENS: It doesn't seem like it  
22 should change that much, 100 percent should be 100  
23 percent.

24 JUDGE KARLIN: Yes.

25 JUDGE WARDWELL: Can you comment somewhat

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1 in regards to the potential for the IGSCC cracks to  
2 provide a basis, or a logical location for additional  
3 cracking and crack growth associated with fatigue?

4 MR. LUKENS: Yes. For an IGSCC crack to  
5 become a site for fatigue failure, it has to occur in  
6 a high-stress area. It has to occur in an area that  
7 had been subject to cyclic stress loads that exceed  
8 the endurance limit. To-date, we have never found an  
9 indication in a high-stress area of the dryer. IGSCC  
10 indications we have found have been in low-stress  
11 areas of the dryer, which is another way of confirming  
12 that, in fact, they're not really -

13 JUDGE WARDWELL: May I refer you to NEC  
14 JH-68, which is -

15 MR. LUKENS: Yes, sir.

16 JUDGE WARDWELL: It's probably some other  
17 number, but it's your condition report of May 28<sup>th</sup>,  
18 '07, 2133 did you say?

19 MR. LUKENS: Yes.

20 JUDGE WARDWELL: Yes, that's the CRB VTY  
21 2007-002133.

22 MR. LUKENS: That's correct.

23 JUDGE WARDWELL: Yikes, a quarter of inch  
24 of pages into that - I can't go any further - where  
25 it's evaluation of steam dryer indications.

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1 MR. LUKENS: Yes, sir.

2 JUDGE WARDWELL: It's probably the first  
3 real page of text, full text.

4 MR. LUKENS: Yes. Let's see.

5 JUDGE WARDWELL: Probably going to guess  
6 my question.

7 MR. LUKENS: I hope so.

8 JUDGE WARDWELL: And I'm looking at the  
9 section that's entitled, "Evaluation of indications",  
10 the third section down, "Introduction, Discussion, and  
11 Evaluation of Indications." The first paragraph, one,  
12 two, three, four, five, six, seven, eight lines -  
13 seven lines down, one word in, the sentence starts,  
14 "However, continual growth by fatigue cannot be ruled  
15 out in regards to these", I assume it's in the -

16 MR. LUKENS: Yes, that's what it says.

17 JUDGE WARDWELL: Would you like to comment  
18 on what does that mean? That seems to indicate to me  
19 that you found something, an IGSCC that you referred  
20 to in the first sentence of this evaluation.

21 MR. LUKENS: This wording was part of what  
22 became a -- part of a draft that became a signed  
23 issued report. This page is not part of a signed  
24 report. This page was used to clear an outage  
25 constraint so that this indication would not cause us

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1 to delay start-up. The standard of rigor for what it  
2 takes to clear an outage restraint is different than  
3 the standard of rigor that it takes to perform the  
4 actual investigation and corrective action for a  
5 condition report. And that standard of rigor was met  
6 in the corrective action to investigate and correct  
7 this. And the document that did that is - actually,  
8 it's in front of the page that we're reading from -  
9 the document that did that is VY-RPT-07-00011. That  
10 is the -

11 JUDGE WARDWELL: You lost me on where this  
12 document is.

13 MR. LUKENS: Yes. About a 16<sup>th</sup> of an inch  
14 ahead of where you are.

15 JUDGE WARDWELL: Hah-hah, something I  
16 understand.

17 (Laughter.)

18 JUDGE WARDWELL: I gotcha. Yes.

19 MR. LUKENS: That's the final report, an  
20 engineering report by Vermont Yankee, that  
21 dispositioned this indication. The phrase that  
22 appeared in the draft does not appear in the final  
23 report, and the reason that phrase does not appear is  
24 because that phrase added no engineering or technical  
25 value to the conclusions in that report.

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1 JUDGE WARDWELL: But yet, someone made  
2 this statement, and is it a false statement?

3 MR. LUKENS: It's not false in the sense  
4 that there are millions of things that could not be  
5 ruled out. It raises a question that didn't exist.

6 JUDGE WARDWELL: Because of your previous  
7 testimony that this crack or cracks that this was  
8 referring to was not in a location for high -

9 MR. LUKENS: That is correct.

10 JUDGE WARDWELL: -- stresses.

11 MR. LUKENS: That sentence lended an air  
12 of ambiguity that the engineering evaluation did not  
13 support. We knew that these were IGSCC cracks.

14 JUDGE WARDWELL: Clarify for me then,  
15 again, why was it in the draft, that it was just a  
16 stream of consciousness writing that someone just  
17 added that, or was it something else?

18 MR. LUKENS: That occurred on the first of  
19 June. That's the date that the corrective action was  
20 cleared.

21 JUDGE WARDWELL: What year?

22 MR. LUKENS: 2007. This was actually  
23 during the outage. And I simply don't recall  
24 conversations that we had around that time.

25 JUDGE WARDWELL: How come it's not marked

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1 "draft" anywhere, or is it? Point to me where it is.

2 MR. LUKENS: It's actually not marked at  
3 all. It is simply a piece of paper that was attached  
4 to a corrective action to close it, and that was  
5 accepted by flight management as adequate  
6 justification to clear that outage. But it is not, in  
7 any sense, an engineering evaluation.

8 JUDGE WARDWELL: Are you all done? Yikes,  
9 now we're not going to be as organized as Dr. Reed.  
10 I'd like to go back, if we could, to talk about the  
11 practicality of measuring stress loads directly on the  
12 steam dryer.

13 MR. LUKENS: Yes, sir.

14 JUDGE WARDWELL: Is that a feasible thing  
15 to do?

16 MR. LUKENS: Not in our view. No, sir.

17 JUDGE WARDWELL: And why not?

18 MR. LUKENS: It would involve attaching  
19 strain gauges to the dryer, and those strain gauges  
20 would have to be attached by welding, so if the  
21 attachment of the strain gauges introduces high-stress  
22 areas in the dryer that didn't exist before, then the  
23 electrical wires from those strain gauges have to be  
24 led out of the reactor vessel. All of that  
25 paraphernalia becomes potentially loose parts.

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1 JUDGE WARDWELL: But there is internal  
2 monitoring of the core, isn't there, within there, and  
3 they have that same challenge, don't they, in regards  
4 to getting wiring out of the -

5 MR. LUKENS: Core monitoring that involves  
6 instruments that have wires coming out of the reactor  
7 vessel is nuclear instrumentation. And nuclear  
8 instrumentation goes in from the bottom of the vessel,  
9 and the wires come out the bottom. And those  
10 detectors are not in the steam flow path, and we don't  
11 have to put tack welds on components to get them  
12 installed.

13 JUDGE WARDWELL: Are those the only  
14 instruments that are inside the reactor vessel, are  
15 those core detectors that have external leads coming  
16 out?

17 MR. LUKENS: Those are the only ones that  
18 I can think of. Pressure and level detectors are a  
19 different set of instruments, and they don't have any  
20 analog to nuclear instrumentation, or to strain  
21 gauges.

22 JUDGE WARDWELL: But how do they work?

23 MR. LUKENS: Well, the way they work is -

24 JUDGE WARDWELL: This is the other ones,  
25 the pressure levels, or the water levels?

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1 MR. LUKENS: Pressure level, essentially,  
2 we -- well, pressure, we have a little pipe that comes  
3 out of the side of the reactor, and we put a pressure  
4 gauge on it, very simple.

5 JUDGE WARDWELL: So that's external.

6 MR. LUKENS: External. Water level, we  
7 essentially do that twice. We do it once low, and  
8 once high, and -

9 JUDGE WARDWELL: It's a manometer.

10 MR. LUKENS: And it's a manometer.

11 JUDGE WARDWELL: Mr. Hoffman?

12 MR. HOFFMAN: The nuclear instrumentation  
13 that goes in the bottom of the vessel doesn't enter  
14 the water. It's in what they call a dry tube. It  
15 goes up and down, so it's not exposed to reactor  
16 temperature or reactor pressure.

17 JUDGE WARDWELL: These difficulties are  
18 circumvented by measuring within the steam line, is  
19 what you did during the power uprate.

20 MR. LUKENS: That's correct.

21 JUDGE WARDWELL: That is feasible to do,  
22 because you did it already.

23 MR. LUKENS: We did it. Yes, sir.

24 JUDGE WARDWELL: The drawback is now you  
25 have to have some type of mechanism to extrapolate

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1 that data into what the pressures would be in at the  
2 steam dryer. With that information, you'd have to --  
3 from that monitoring, from that information, you'd  
4 have to extrapolate to what the measurements would be  
5 in at the steam dryer in order to be of any use.

6 MR. LUKENS: That's the process that was  
7 used during power extension. Yes, sir. Strain gauge  
8 data was manipulated into ultimately cyclic pressure  
9 sources.

10 JUDGE WARDWELL: And if one was to  
11 consider augmenting an aging management plan to  
12 include some type of mechanism to determine the  
13 stresses on the dryer, and were going to conclude that  
14 the only reasonable way to do it was to remotely  
15 measure them in the steam line, and then extrapolate  
16 to what they would be in the steam dryer, you'd have  
17 to come up with a mechanism to do that extrapolation.

18 MR. LUKENS: Yes, sir, we would. I think  
19 that assumes that we need to.

20 JUDGE WARDWELL: Correct. That was where  
21 I was going with the next question. Dr. Hopenfeld, of  
22 what use would these stress measurements be on the  
23 steam dryer as an aging management plan to -- what  
24 incremental use would there be of this?

25 DR. HOPENFELD: Would be tremendous

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1 incremental use because, to answer the question of  
2 being able to -

3 JUDGE WARDWELL: Speak up.

4 DR. HOPENFELD: It would answer the  
5 question where are you with respect to the endurance -

6  
7 JUDGE WARDWELL: Don't the inspections do  
8 that for us?

9 DR. HOPENFELD: No, they don't.

10 JUDGE WARDWELL: Let me finish. Let me  
11 finish my question so that you can know what you're  
12 answering.

13 DR. HOPENFELD: Yes.

14 JUDGE WARDWELL: Do not the inspections do  
15 that if they demonstrate that, in fact, there are no  
16 fatigue cracks?

17 DR. HOPENFELD: No.

18 JUDGE WARDWELL: That the endurance level  
19 hasn't been exceeded?

20 DR. HOPENFELD: No, they do not, because  
21 it depends on the number of cycles, and it depends on  
22 the load.

23 JUDGE WARDWELL: How many cycles are  
24 needed?

25 DR. HOPENFELD: Well, I couldn't answer

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1 how many cycles, it depends on the load. It depends  
2 on what the -- the intensity of the pressure in the  
3 dryer.

4 JUDGE WARDWELL: How long, in your  
5 professional opinion, do you think stress loads would  
6 have to be monitored - I mean, sorry - strike that -  
7 how long, in your opinion, do you believe that  
8 observations of no cracking associated with vibration  
9 fatigue would have to occur before you would be  
10 comforted that, in fact, the endurance limit is not  
11 being exceeded under the normal power uprate that now  
12 exists?

13 DR. HOPENFELD: I thought a lot about that  
14 question myself before I -

15 JUDGE WARDWELL: Well, you must have an  
16 answer then.

17 DR. HOPENFELD: Yes, well, I don't. I'll  
18 tell you, because I could give you the answer that I  
19 want, that the problem is -- first you have to realize  
20 you're not talking -

21 JUDGE WARDWELL: I don't want any answer  
22 I want, I would like to know what is your professional  
23 opinion.

24 DR. HOPENFELD: I do not have one.

25 JUDGE WARDWELL: Anyone from the staff who

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1 feels they wish to answer that question, feel free to.

2 MR. SCARBROUGH: Well, in the power uprate  
3 license condition, we require three consecutive  
4 inspections to look for any cracking that might occur  
5 from a fatigue, or any type cracking. But they had to  
6 do three full inspections, and that was the license  
7 condition that we had.

8 JUDGE WARDWELL: So to translate that  
9 indirect answer, you believe a time frame over which  
10 three inspections could take place would be sufficient  
11 to comfort the staff that fatigue -- that the stress  
12 loads are below the endurance limits if there's no  
13 fatigue cracking.

14 MR. SCARBROUGH: Yes. And then you go  
15 into the long-term program after that, like the SIL,  
16 more graded approach. But every outage, the first  
17 three they have a look, and then after that they go  
18 into something, a longer -

19 JUDGE WARDWELL: Under the current steam  
20 dryer management program, Rev. 3, steel trap mind,  
21 what action would take place if, in fact, some fatigue  
22 cracking is observed over the next two cycles? So  
23 there's two more cycles left to go. Right? They've  
24 done one.

25 MR. SCARBROUGH: Yes, sir. That would

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1 initiate an engineering evaluation of what the source  
2 of that fatigue crack was, because they should not be  
3 seen. And if they did, they would have to evaluate  
4 that before they started the plant back up. They need  
5 to determine what that was, see if they need to do  
6 repairs in the dryer. And it would reopen that whole  
7 question, because they should not be seeing any  
8 fatigue-type cracks. And if they did, that would open  
9 up -

10 JUDGE WARDWELL: Have you reviewed the  
11 2006, is it, results, refueling outage 26?

12 MR. SCARBROUGH: 2007?

13 JUDGE WARDWELL: Yes, 2007, the most  
14 recent.

15 MR. SCARBROUGH: Yes, the most recent one.  
16 Yes, they presented those to a team of staff and our  
17 consultants, and we looked through all of those, and  
18 discussed those with them, and the NRC staff decided  
19 that there was no significant issues, and there were  
20 the small little things that they saw. But it was  
21 very typical. You see that typical when you do steam  
22 dryer inspections, there was nothing there that showed  
23 any type of fatigue related to a power uprate.

24 JUDGE WARDWELL: Okay. Did the staff have  
25 any concerns with regards to the statement that this

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1 draft condition report that stated "fatigue cracking  
2 at these locations of inter-granular stress corrosion  
3 cracking cannot be ruled out." Did that create any  
4 concerns for the staff?

5 MR. SCARBROUGH: No. From the  
6 discussions, we do not have a concern with that. And  
7 from the final decision, that there was nothing  
8 significant going on in terms of the discussion.

9 JUDGE WARDWELL: The discussions you had  
10 were similar to what was presented to this Board this  
11 afternoon -

12 MR. SCARBROUGH: Yes, sir.

13 JUDGE WARDWELL: -- in regards to the -

14 MR. SCARBROUGH: They would go through  
15 every indication, and the staff would look at them,  
16 and discuss them with the licensee.

17 JUDGE WARDWELL: Turning to Entergy, I  
18 assume you agree that certainly no more than three are  
19 needed. Is that correct?

20 MR. SCARBROUGH: Yes, sir.

21 JUDGE WARDWELL: You may take an even more  
22 liberal position, but you certainly don't feel more is  
23 needed.

24 DR. HOPENFELD: Could I continue in part  
25 to answer your question.

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1 JUDGE WARDWELL: I thought you answered  
2 it.

3 DR. HOPENFELD: Well, I didn't really  
4 complete it.

5 JUDGE WARDWELL: You answered to my  
6 satisfaction. Go ahead.

7 MR. HOFFMAN: I didn't give a complete  
8 answer, because if there was a simple answer to your  
9 question, sir, then I don't think that GE would be  
10 considering instrumenting their dryer and the steam  
11 lines at the same time in their advanced reactor on  
12 their prototype, because they may have a different  
13 design. I'm not familiar with the design. But the  
14 issue that was brought up about loose parts can be  
15 there, no matter what the design, and I was going to  
16 get to there, but I -

17 JUDGE WARDWELL: Thank you. Dr.  
18 Hopenfeld, in your engineering experience,  
19 specifically outside of the nuclear field, if you have  
20 any interactions with other engineers or understand  
21 what they do, if you ever heard of monitoring for  
22 stress conditions as a tool to evaluate the  
23 performance to insure it's consistent with design of  
24 an engineered facility.

25 DR. HOPENFELD: Well, one of them -- I

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1 think probably a lot of them, I know -- I think it  
2 should be here for the University of Vermont had a  
3 fiber optic program for installing fiber optic cables,  
4 fiber optic monitors to monitor fatigue and structure  
5 integrity. That's one sense. The problem is that the  
6 number of places these people -- really, that's very  
7 important. But that's one, done on a large industrial  
8 basis.

9 JUDGE WARDWELL: Thank you. Dr. Hoffman,  
10 can I refer you to NEC JH-63 at 34, and I think it's  
11 in relationship to ACRS questioning.

12 DR. HOPENFELD: Are you talking to me?

13 JUDGE WARDWELL: No, no, I'm sorry. Mr.  
14 Hoffman. We have way too many H witnesses.

15 MR. HOFFMAN: Could you repeat the page  
16 for me, sir?

17 JUDGE WARDWELL: 63.

18 MR. HOFFMAN: Yes.

19 JUDGE WARDWELL: At 34.

20 MR. HOFFMAN: 34.

21 JUDGE WARDWELL: I hope I don't surprise  
22 myself.

23 DR. HOPENFELD: What page?

24 JUDGE WARDWELL: I've got to find it now.  
25 I've got the wrong reference. Dr. Hopenfeld, do you

1 know where your JH-63, where I would find JH-63 again?

2 DR. HOPENFELD: Well, maybe Marcia -

3 JUDGE WARDWELL: Here it is. I got it.

4 It's attached to the rebuttal, the June 6<sup>th</sup> rebuttal.

5 JUDGE KARLIN: We've got it, Marcia.

6 JUDGE WARDWELL: At page 34.

7 MR. HOFFMAN: Thirty-four?

8 JUDGE WARDWELL: Strike that question  
9 entirely. I see this has been redacted. It's not  
10 crucial.

11 As a general comment, while I think of it,  
12 especially I think for tomorrow so I don't forget  
13 tomorrow when we start NEC-4, I'm sure Entergy is  
14 aware of that, but if we start getting into  
15 proprietary questions accidentally, I'm sure you will  
16 notify us. Good. Thank you very much. We would  
17 appreciate the help with that, because we're liable to  
18 get excited, and get on a roll, and not realize where  
19 we are.

20 Dr. Hopenfeld, besides stress levels on  
21 the steam dryer, are there any other parameters that  
22 you think should be added to the monitoring program  
23 that would practically, and -

24 DR. HOPENFELD: The steam lines.

25 JUDGE WARDWELL: That would be of

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1 practical use, and significantly improve the aging  
2 management of that -

3 DR. HOPENFELD: I don't think so.

4 JUDGE WARDWELL: Thank you. Continuing on  
5 with NEC JH-63, page 24, either Mr. Hoffman or Mr.  
6 Lukens, whoever feels interested in responding to  
7 this, Dr. Hopenfeld presents a quote from the PNL,  
8 Pacific Northwest National Labs that says under Answer  
9 36 on that page, "Unlike the previously discussed  
10 mechanism (corrosion) vibration fatigue does not lend  
11 itself to periodic in-service examinations,  
12 volumetric, surface, et cetera, as a means of managing  
13 this degradation mechanism." And he goes on to then  
14 quote, "Once a crack initiates, failure quickly  
15 follows."

16 What's your reaction to that statement by  
17 the National Lab in regards to -

18 MR. LUKENS: Your Honor, I would like to  
19 put that statement in the context of the document from  
20 which it was quoted.

21 JUDGE WARDWELL: Please do.

22 MR. LUKENS: The title of the document is  
23 "Life prediction and monitoring of nuclear power plant  
24 components for service-related degradation", and it  
25 discusses at some length the methods used by the

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1 nuclear industry to address aging effects in power  
2 plant components.

3 The quote that Dr. Hopenfeld provided in  
4 his exhibit, page 62 of the document from which it  
5 comes, it is page 4 of the exhibit.

6 JUDGE KARLIN: Which exhibit number are we  
7 talking about now? I mean, for the record, I'm lost.

8 MR. LUKENS: This is NEC JH-69.

9 JUDGE KARLIN: Okay. Thank you. I'm  
10 sorry.

11 MR. LUKENS: In the first-hand column  
12 about halfway down there's a paragraph entitled, "High  
13 cycle mechanical vibration fatigue." And it states,  
14 and I quote, "More and more attention has recently  
15 been paid by operating plants to prevent unexpected  
16 piping failures due to high cycle vibration fatigue.  
17 Small bore pipe, less than one inch nominal pipe size,  
18 socket welded vent and drain connections in the  
19 immediate proximity of vibration sources tend to be  
20 most susceptible to this failure mechanism." The next  
21 sentence is the one Dr. Hopenfeld quoted, so this  
22 paragraph is talking about socket welded vent and  
23 drain connections less than one inch in power plants.  
24 This statement has nothing to do with steam dryer in  
25 boiling water reactors.

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1 JUDGE WARDWELL: Dr. Hopenfeld, how do you  
2 extrapolate this particular statement to a steam dryer  
3 and boiling water reactor at Vermont Yankee?

4 DR. HOPENFELD: I don't think this  
5 statement used strictly for that very specific welding  
6 of piece of equipment. Looking at physically, it was  
7 stated before, they want you to get a fatigue drawing  
8 with those very facts, and to draw in between the time  
9 that you have inspected. It's not restricted to that  
10 particular thing. There's nowhere there it's -- this  
11 was an example. Even forgetting about that, just  
12 going to the mechanism of particular observation, and  
13 I think in the context, if you really want to say, I  
14 think there's somewhere in that paper where PNL says  
15 well, you can spend most of your life in indication of  
16 fatigue, you can spend most of your life in initiation  
17 process, but once it gets started, it goes. So I  
18 don't think that's really restricted to that. It was  
19 written in that context, but -- I mean, that  
20 paragraph, that's not restricted -

21 JUDGE WARDWELL: I don't have the  
22 reference in front of me, and rather than take the  
23 time to get it, maybe you can lead to this. I know  
24 there's testimony in it, but this is directed to, I  
25 think, Mr. Hoffman, would be the best, if my

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1 recollection is correct, to describe, if you could,  
2 the qualifications of the individuals that will be  
3 assessing the results of the parameters that you are  
4 monitoring for, and the qualifications of the people  
5 that are making decisions to verify that, in fact, you  
6 are having qualified people in that management program  
7 that is driving it.

8 MR. HOFFMAN: As I stated earlier, just  
9 for a basis, if the off and on procedure requires an  
10 engineering evaluation, it gets sent to the  
11 engineering organizations. All of the engineers at  
12 Entergy, in order to perform independent work, need to  
13 be qualified to do that work. And they're qualified  
14 through a prescribed Institute of Nuclear Power  
15 Operations INPO Engineering Support Personnel ESP  
16 Training Program that prescribes the training  
17 methodology, the kind of training they need, the  
18 experience they need before they can work  
19 independently. In addition to having that training,  
20 they need to have their supervisor sign off that they  
21 have properly completed the training, and that they  
22 have performed the work under the guidance of someone  
23 else, and the supervisor is satisfied with the level  
24 of the work that's performed.

25 We also have, as part of our training

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1 program, an annual -- as a minimum, an annual  
2 assessment by the engineer and his supervisor. If  
3 either one of them feel that there particular job  
4 responsibility require additional training or if  
5 something has developed in the industry where they  
6 feel they need this training to do their job properly,  
7 it's put into the training program. It's part of  
8 their performance evaluation to get that training, and  
9 have that training executed. The training program  
10 itself is, I believe it's a triennial basis, but INPO  
11 comes in and audits our training program. And it's  
12 very extensive, having been through it, a very  
13 thorough detailed assessment of the quality of the  
14 training program to insure that personnel are  
15 qualified to do their job.

16 The industry, in general, Entergy, in  
17 particular, takes it very seriously that unqualified  
18 personnel do not perform safety-related work. People  
19 need to meet the qualifications to do the work.

20 JUDGE WARDWELL: From the NRC staff, Mr.  
21 Rowley, or Hsu, or Scarbrough, whoever feels in the  
22 best position to answer this, have you reviewed their  
23 qualification program, and determined that, in fact,  
24 yes, it does meet your - I think at one point you use  
25 the phrase "the need for a qualified structural

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1 engineer, for instance, to assess some of this  
2 information, if my memory is correct. But are you  
3 satisfied that that training program is going to meet  
4 the level of expertise needed to evaluate the data  
5 associated with this aging management program?

6 MR. HSU: Yes.

7 JUDGE WARDWELL: Would you speak a little  
8 louder?

9 MR. HSU: Yes.

10 JUDGE WARDWELL: You have reviewed it, and  
11 you have determined that it does meet your -

12 MR. HSU: It's not a review. Okay.  
13 Because this thing is part of the aging management  
14 program audit, and I remember the first time that  
15 qualification issue come out is when we're doing the  
16 Entergy's so we know there's a program, they do have  
17 the qualification. We asked if they're doing the  
18 inspection, and then what is it their personnel  
19 qualification. They do have program. I think in the  
20 -- that what's there. Now for this specific plan, we  
21 did not probably specifically look at that. According  
22 to our experience with Entergy, we do know they do  
23 have this program. They do have the personnel  
24 qualification program.

25 JUDGE WARDWELL: And why did you not look

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1 at it for this specific program? Is that what you  
2 just said, that you did not look at it specifically  
3 for Vermont Yankee?

4 MR. HSU: Yes, because that's probably the  
5 -- because all activity be limited when we go to the  
6 audit. We only have probably around eight days, so  
7 all this program is going to be audited by the last  
8 year's resident inspector, and they are going to  
9 implement all this site activity.

10 JUDGE WARDWELL: Okay. Thank you.

11 MR. ROWLEY: Yes, that's something we  
12 don't look at directly in license renewal. That's not  
13 part of what we do, but NRC, other aspects of NRC  
14 looks at that, but not license renewal.

15 JUDGE WARDWELL: And is that because you  
16 believe it's part of ongoing operations, and is a  
17 continuation of that through the renewal period that  
18 you don't? Why wouldn't you, specifically as relating  
19 to the aging management plan, you have to evaluate the  
20 adequacy of that in regards to demonstrating that it  
21 can achieve the results of Part 54.

22 MR. ROWLEY: These inspections are  
23 something they have to do now, not wait until they get  
24 to license renewal, so that's a current operating  
25 thing. By the time we get to license renewal, it's

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1 already set, and we don't look at it.

2 JUDGE WARDWELL: Okay.

3 JUDGE KARLIN: I have one -

4 JUDGE WARDWELL: I did not mean to tell a  
5 lie. I've got one more, then. I want to add a note to  
6 get back to something. This was something you  
7 mentioned, Dr. Hsu, and it was a conversation between  
8 Mr. Scarbrough - not a conversation, it was an  
9 iterative stepping that we went through between Mr.  
10 Scarbrough, who reviewed lots of this information in  
11 regards to the steam dryer associated with the power  
12 uprate, and then Mr. Hsu, who's reviewed it, as I  
13 understand it, for the extended period of operation.  
14 And it dealt with our discussions of the design-basis  
15 accident, and the need to demonstrate that the steam  
16 dryer can maintain its integrity during that. And you  
17 said, Mr. Scarbrough, I believe, that you did review  
18 it for the power uprate and found it to be adequate in  
19 regards to Entergy's review of that effort. Is that  
20 correct?

21 MR. SCARBROUGH: The NRC staff team did,  
22 as indicated in the safety evaluation for that power  
23 plant.

24 JUDGE WARDWELL: And you're familiar with  
25 it, and you stand by that in representing the staff.

1 MR. SCARBROUGH: Yes, sir.

2 JUDGE WARDWELL: And, Mr. Hsu, you  
3 mentioned that you did not do that as a license  
4 renewal.

5 MR. HSU: Yes, we did not do. The aging  
6 management program is look at it from the inspection  
7 and the monitoring point of view. But inspection  
8 point of view, we try to detect something, so if  
9 anything happen between the inspection period, the  
10 monitoring program is going to tell you what's going  
11 to happen, so that's supplemental that your inspection  
12 activity. So we concentrate in this area.

13 JUDGE WARDWELL: And the reason that you  
14 didn't -- part of the reason that you didn't look at  
15 the integrity of the steam dryer in regards to a  
16 design-basis accident is, again, back to the fact that  
17 it's an operational issue that has been reviewed by  
18 Mr. Scarbrough, and that same analysis will take  
19 place, as long as the steam dryer maintains its  
20 integrity, and you've got a monitoring program, a  
21 management program, I should say, for aging, which you  
22 feel is satisfactory to help assure that that steam  
23 dryer maintains its integrity.

24 MR. HSU: Yes.

25 JUDGE WARDWELL: I think I understand that

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1 now. Thank you. Now I'm done.

2 JUDGE KARLIN: Okay. I think I need to  
3 ask, or clarify and understand one final point, and  
4 then we'll probably be done, and take a break.  
5 Because I think I'm over-simplified, or my  
6 understanding was over-simplified with regard to the  
7 dichotomy between whether the monitoring program is  
8 there for a prediction purpose, or for detection  
9 purpose. And it's apparently not quite as simple as  
10 that.

11 Can I direct Mr. Hoffman to the testimony  
12 that you gave on your pre-filed exhibit at page 28,  
13 Question 53, Answer 53. And probably when I'm done,  
14 and this hopefully won't take too long, then I will  
15 ask Mr. Hsu and Mr. Rowley, perhaps, their thoughts on  
16 this. And this is the prediction/detection question  
17 I was over-simplifying before, I think.

18 Question - "Dr. Hopenfeld states that  
19 moisture monitoring only indicates that a failure has  
20 occurred. It does not prevent the failure from  
21 occurring." And you're asked a question about that,  
22 and you state, and this sentence is one I need to  
23 focus on. "Monitoring of plant parameters will not  
24 predict the incipient formation of cracks, but it will  
25 identify the existence of cracks sufficiently large to

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1 adversely affect dryer performance, and flag the risk  
2 of structural failure of the dryer."

3 So, as I understand it, everyone is in  
4 agreement that monitoring of the plant parameters  
5 isn't going to predict the cracks. Mr. Hoffman?

6 MR. HOFFMAN: Yes, sir.

7 JUDGE KARLIN: But it will detect cracks.  
8 Is that what you're saying here? "Identify the  
9 existence of a crack sufficiently large to adversely  
10 affect dryer performance."

11 MR. HOFFMAN: If one was developing  
12 sufficiently large, you might be -- you would detect  
13 it through the monitoring, the online monitoring  
14 program.

15 JUDGE KARLIN: You might, you would?

16 MR. HOFFMAN: No, if it was sufficiently  
17 large -

18 JUDGE KARLIN: Sufficiently large, you  
19 would. "Sufficiently" is the operative word.

20 MR. HOFFMAN: That's correct.

21 JUDGE KARLIN: Okay. And then it says --  
22 and so what good is that, detecting the --  
23 "sufficiently large to adversely affect dryer  
24 performance." And then the next phrase, "And flag the  
25 risk of structural failure of the dryer. Flag the

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1 risk." So is it predicting, is that a predictive  
2 function then? When you say "flag the risk", you mean  
3 it's telling us what's going to happen in the future,  
4 giving us an indication.

5 MR. HOFFMAN: Not predictive in the sense  
6 of say predictive maintenance. What I was trying to  
7 say there was that -

8 JUDGE KARLIN: It's giving us an early  
9 warning as you say at the bottom of this page.

10 MR. HOFFMAN: It's indicative of something  
11 is changing in the dryer to affect its performance,  
12 and based on our monitoring to date, and we're talking  
13 right now, even though we are executing the same  
14 program -

15 JUDGE KARLIN: No, no, no. I don't want  
16 the monitoring to date, I want the monitoring of plant  
17 parameters. You're saying that it will detect cracks  
18 sufficiently large that will predict the risk of  
19 structural failure.

20 MR. HOFFMAN: Yes. What I'm saying is that  
21 this program which goes into place following 2012,  
22 will have built on the operating experience that we're  
23 seeing now between 2006 and 2012, the EPU conditions,  
24 demonstrations to-date by the inspections, and what we  
25 certainly anticipate and expect by the future

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1 inspections between now and 2012, we'll see that we  
2 don't have a high cycle fatigue phenomena going on on  
3 the dryer, so anything is developing, it's very slowly  
4 developing. It will give us time to, if we see these  
5 parameters starting to change, it's not going to be  
6 this very rapid propagation for failure, because we  
7 don't have that mechanism. And, therefore, it would  
8 give us time to respond, to shut the plant down. It's  
9 not a case of -- you wouldn't see the moisture go up  
10 today and tomorrow have the dryer fail. That's what  
11 I was trying to say, so it's not going to predict the  
12 failure, but it says something is going on. You need  
13 to take a look at it. And the length of time for it  
14 to develop beyond where it is is sufficiently long  
15 that our procedure would enable us to perform those  
16 evaluations and shut the plant down, if necessary.

17 JUDGE KARLIN: Okay. Then the first  
18 sentence, "And flag the risk of structural failure of  
19 the dryer." What do you mean by "structural failure"?  
20 Let me ask this more specifically. Would the breaking  
21 off of a chunk, say six by six inches, qualify as  
22 structural failure of the dryer?

23 MR. HOFFMAN: In my terminology for here,  
24 the dryer is intended to be nominally a cylinder all  
25 in tact, and a structural failure would be a loss of

1 that in-tactness, so to speak, of the dryer. It could  
2 be a piece coming out, it could be -

3 JUDGE KARLIN: All right. So if a six  
4 inch piece comes off the dryer, is that a structural  
5 failure of the dryer?

6 MR. HOFFMAN: In this terminology, yes.  
7 I'm sorry.

8 JUDGE KARLIN: We're not talking about a  
9 total collapse of the dryer or something.

10 MR. HOFFMAN: No. The piece is no longer  
11 the same piece it was before it started.

12 JUDGE KARLIN: Okay. I think that's  
13 probably good enough. I don't need to ask the staff  
14 on this one. Thank you.

15 I think we are going to take a break at  
16 this point and review our notes to see if there's any  
17 questions we think we have missed, or maybe need to  
18 follow-up on. This is where we have the time when  
19 parties will have the opportunity to give us  
20 suggestions as to questions that they think we've  
21 missed, or would counsel that we ask, and so we'll do  
22 the same procedure as we did before.

23 It is now -- let me ask, do the parties  
24 think that they have some questions that may be  
25 wanting to ask us to propound?

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1 MR. RAUBVOGEL: Yes.

2 JUDGE KARLIN: All right.

3 MS. BATY: Possibly.

4 JUDGE KARLIN: Possibly. All right. Why  
5 don't we take a -- Entergy?

6 MR. LEWIS: No.

7 JUDGE KARLIN: No, you probably don't.  
8 All right. Well, I'm not holding you to it, but okay,  
9 just an indication. That's good enough to tell me.  
10 Why don't we take a 15-minute break, and reconvene at  
11 10 after the hour. And at that time, you can submit -  
12 - well, are you going to submit them to us in writing?

13 MR. RAUBVOGEL: We were planning to.

14 JUDGE KARLIN: NRC staff? And during the  
15 15 minutes, or how much time do you need?

16 MR. RAUBVOGEL: We need 10 minutes or so,  
17 and then we can give them to you typewritten and  
18 ready.

19 JUDGE KARLIN: All right. Well, maybe we  
20 ought to extend the break a little bit longer so we  
21 can read them and digest them, as we did before.  
22 Vermont, do you all have anything, Ms. Hofmann?

23 MS. HOFMANN: We actually gave them to  
24 NEC.

25 JUDGE KARLIN: Oh, that's right. That's

1 what you all did yesterday. And, Mr. Roth, do you  
2 think you have anything?

3 MR. ROTH: Yes, I have a few.

4 JUDGE KARLIN: Okay. Well, why don't we  
5 make it 20 minutes, during which time if you have  
6 written questions, and you can get them to us during  
7 the 20 minutes, please get them to the law clerks, and  
8 we'll try to look at them, and reconvene. Three  
9 copies, if possible. Yes, sir?

10 MR. TRAVIESO-DIAZ: Are we going to get to  
11 Contention Four today?

12 JUDGE KARLIN: It somewhat depends -- we  
13 may very well get to some of Contention Four. It  
14 depends on what kind of questions we get, or what we  
15 think we may need to ask. I think it's a pretty good  
16 bet that we'll at least -- I think our theory would be  
17 we at least want to swear the witnesses in, and get  
18 the exhibits out on the table, and get that procedure  
19 done today, if nothing more than that, so we could hit  
20 it fresh in the morning. Okay? So we'll take a 20-  
21 minute adjournment.

22 (Whereupon, the proceedings went off the  
23 record at 2:58 p.m., and went back on the record at  
24 3:32 p.m.)

25 JUDGE KARLIN: On the record. We're now

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1 back in session. I would like to go back on the  
2 record and remind the witnesses you're still under  
3 oath.

4 We've received some questions from several  
5 of the parties. May I ask? Are there any of the  
6 parties that want to offer questions orally at this  
7 time?

8 (No verbal response.)

9 Okay. So we'll just deal with the ones  
10 that were submitted in writing. And as we proceed, I  
11 think I'll just give you anticipation of our hope for  
12 the remainder of the afternoon. It's about 3:30 p.m.  
13 right now. We will go through these questions  
14 hopefully relatively crisply and then thank the  
15 witnesses on Contention 3 and our thought is to make  
16 as much progress as we can on Contention 4 today as  
17 well and the thought being we would ask for the  
18 Contention 4 witnesses to be brought forward, to be  
19 sworn in and ask the counsel to introduce the  
20 associated exhibits for each of them and then also to  
21 have the presentation by Dr. Horowitz, his 12 slides  
22 or whatever it is that we asked for and I think that  
23 will take us up to 5:00 p.m. and we'll be done for the  
24 day and then we can start crisply in the morning  
25 tomorrow and may be able to finish tomorrow. That's

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1 the idea.

2 Dr. Horowitz is available to do that?

3 (No verbal response.)

4 Great. Okay. So any other questions or  
5 points at this time?

6 (No verbal response.)

7 All right. Then we have some follow-up  
8 questions for the panel. (Aside.) Do you want to go  
9 first? Okay. Let me ask a question.

10 JUDGE REED: If you're not ready, I'll go.

11 JUDGE KARLIN: No, I think I'm ready.  
12 This is for -- Again, I'm not sure who it's for, but  
13 I'm going to ask it of two parties, one NRC Staff, Mr.  
14 Scarbrough and Mr. Hsu, Mr. Rowley, whatever. If you  
15 believe that there were a higher chance of a crack  
16 occurring in the steam dryer than you currently  
17 believe, would you have a different monitoring or  
18 inspection program? If, for example, you were not  
19 sure about the -- Well, would you change anything?  
20 Mr. Scarbrough.

21 MR. SCARBROUGH: Yes. The information I  
22 was provided by the Licensee as part of power uprate  
23 with the review of the Staff and its consultants  
24 reached their assurance findings that the stresses  
25 were below the fatigue limits and part of the

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1 conditions of that were to evaluate the uncertainties  
2 and we were comfortable with that. However, because  
3 of the past occurrence at Quad Cities, we wanted to be  
4 doubly sure that we had a very robust monitoring and  
5 inspection program and that's what you see in the  
6 license conditions that were imposed. I mean, there  
7 was a very slow and deliberate power ascension that  
8 took place and I was a member of that team that  
9 monitored it as it went up.

10 JUDGE KARLIN: Let me cut through it. The  
11 power ascension program with regard to the EPU, it's  
12 occurred. You all are having some reliance upon the  
13 confidence that is gained from that. If you were not  
14 so confident about the iVibration (phonetic), you  
15 know, that program, would you change anything about  
16 the ongoing monitoring program?

17 MR. SCARBROUGH: And the answer to that is  
18 if we weren't confident in the evaluation we would not  
19 have granted the power uprate.

20 JUDGE KARLIN: I'm positing something  
21 which is different which is if you weren't that  
22 confident would you have done something different.

23 MR. SCARBROUGH: Yes. I would imagine if  
24 there was some additional areas that we might have  
25 decided that we had needed for a series of inspections

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1 during outage, I mean, we could have done something  
2 like that. We could have added another one, I guess.  
3 If there was some sort of small amount of additional  
4 uncertainty, you might have added another inspection  
5 in terms of series of outage. We might have.

6 But in terms of what was done, in terms of  
7 having a repetitive inspection process, where you did  
8 a full inspection based on the GE SIL documents 644.

9 JUDGE KARLIN: Okay. I think you answered  
10 the question.

11 Another question for the Staff, I'll focus  
12 on Mr. Scarbrough I guess. We talked about the GE Sil  
13 644.

14 MR. SCARBROUGH: Yes.

15 JUDGE KARLIN: Is a part of Vermont  
16 Yankee's current licensing basis only via the steam  
17 dryer monitoring plan Revision 3?

18 MR. SCARBROUGH: It's part -- It was part  
19 of the license conditions for the EPU and the license  
20 amendment that was granted in March of 2006.

21 JUDGE KARLIN: And that was the steam  
22 dryer monitoring plan, was it not?

23 MR. SCARBROUGH: Right.

24 JUDGE KARLIN: So is that the only way  
25 that SIL 644 gets into the current licensing basis as

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1 part of the steam dryer monitoring plan that was  
2 imposed on the EPU?

3 MR. SCARBROUGH: I would assume so. I'm  
4 not familiar with all the other possible --

5 JUDGE KARLIN: Maybe I'll ask Mr. Hsu. Is  
6 there any -- Are you aware of any other way that that  
7 SIL 644 gets into the current licensing basis?

8 MR. HSU: I'm not aware of it. I think  
9 that's the correct way.

10 JUDGE KARLIN: All right. Mr. Rowley.

11 MR. ROWLEY: It is -- If there's any other  
12 way, I'm not sure. But the current license does  
13 specifically state that 644 --

14 JUDGE KARLIN: Right. Mr. Lukens, perhaps  
15 you know or could answer that question please.

16 MR. LUKENS: I'm only aware of the  
17 connection between 644 and our current licensing basis  
18 through the license condition that currently exists as  
19 a --

20 JUDGE KARLIN: All right. Thank you. I  
21 have a couple more here. This is a question for Mr.  
22 Scarbrough or whoever else on the Staff feels it's --  
23 We talked about the BWR VIP-139 Program and you talked  
24 about it might be approved by NRC sometime this year,  
25 Mr. Scarbrough.

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1 MR. SCARBROUGH: Yes.

2 JUDGE KARLIN: Okay. And let's say that  
3 it is approved by the NRC and Vermont Yankee says it's  
4 unacceptable and they take exception to some part of  
5 it. Will there be an opportunity for public  
6 participation when that event occurs?

7 MR. SCARBROUGH: At's part of the license  
8 condition power uprate, it does specify that the steam  
9 dryer monitoring plan incorporates the SIL 644  
10 Revision 1. So that's part of their steam dryer  
11 monitoring plan. If they decided not to follow the  
12 VIP-139 or they were making changes, I would imagine  
13 what might happen would be a public meeting between  
14 the NRC Staff and the Licensee to discuss what their  
15 proposal.

16 Because typically what we do when we have  
17 for the steam dryer issue, we'll have public meetings  
18 with the licensees and they'll describe what they plan  
19 to do. So that's where there would be some public  
20 participation in that.

21 JUDGE KARLIN: So the scenario is NRC  
22 approves 139 and Entergy takes exception to 139 and  
23 the opportunity for public input as to whether that  
24 exemption should be granted is what, if anything?

25 MR. SCARBROUGH: I don't believe there is

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1 any direct input in terms of a comment period of  
2 things of that nature unless there was --

3 JUDGE KARLIN: So there is no opportunity  
4 for public input or comment on whether the exemptions  
5 should be granted.

6 MR. SCARBROUGH: Other than to a public  
7 meeting where there might be public risk involved.

8 JUDGE KARLIN: Is there a public meeting  
9 where the Staff and the Applicant have a talk?

10 MR. SCARBROUGH: Yes.

11 JUDGE KARLIN: And does Public get to ask  
12 questions?

13 MR. SCARBROUGH: At the end, typically  
14 they'll be allowed to raise questions.

15 JUDGE KARLIN: Will there be an  
16 opportunity for -- Will a notice for opportunity for  
17 hearing be issued on whether or not that exemption  
18 should be granted?

19 MR. SCARBROUGH: I'm not aware of any.

20 JUDGE KARLIN: And you think not?

21 MR. SCARBROUGH: I think not.

22 MS. BATY: They said there wouldn't be an  
23 exemption because it's not a regulation. It would be  
24 -- Depending on what they're doing, it could be  
25 license amendments.

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1 JUDGE KARLIN: All right. Thank you.

2 MS. BATY: But it wouldn't technically be  
3 an exemption.

4 JUDGE KARLIN: Okay. The terminology.

5 MS. BATY: The terminology just to be  
6 clear on that.

7 JUDGE KARLIN: Would this be an exemption  
8 under 50.13?

9 MS. UTTAL: No. An exemption would be  
10 from the regulations. So if they were seeking -- on  
11 regulations, then 50 would be appropriate.

12 JUDGE KARLIN: Thank you. So I think the  
13 terminology was used that they take exception to it.  
14 So thank you. That's helpful. But the bottom line is  
15 whatever the event is there will be no opportunity  
16 for, no notice of opportunity, to request a hearing on  
17 that by the public.

18 MR. SCARBROUGH: As far as I know, that's  
19 correct.

20 JUDGE KARLIN: Will the Staff  
21 determination on whether or not to grant Entergy an  
22 exception from 139 be appealable to the Commission by  
23 the public, a member of the public?

24 MR. SCARBROUGH: I don't know really the  
25 normal process. I mean, there are requests in some

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1 areas and things of that nature. I guess it goes to  
2 that process because I'm not --

3 JUDGE KARLIN: All right. Thank you.

4 JUDGE REED: Okay. I've tried to organize  
5 these a little bit, but there are questions that are  
6 kind of scattered. I'll start with this one.

7 I guess this would be addressed probably  
8 to Mr. Lukens. After the 2003 BWR 3 event, and I  
9 presume that's the Quad Cities event.

10 MR. LUKENS: Yes sir.

11 JUDGE REED: A number of corrective  
12 actions were taken to fortify the steam dryer. How  
13 did Vermont Yankee perform similar corrective actions?

14 MR. LUKENS: I have as an exhibit the RAI  
15 that was submitted as part of our license renewal  
16 process. Okay. I've nearly misspoke. It's an RAI  
17 that came from an EPU application and what it contains  
18 in part is a table that showed the modifications we  
19 proposed to do initially and then the modifications we  
20 did ultimately. And this is Exhibit --

21 JUDGE REED: Could you simply summarize  
22 the results of that examination?

23 MR. LUKENS: The results are that we  
24 either did what we said we would do earlier or we did  
25 more than that.

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1 JUDGE REED: Okay. But can you tell us  
2 what actions were taken?

3 MR. LUKENS: We replaced the vertical  
4 sections of hood, the reinforcing vessels in that  
5 vertical section. We replaced end plates. We  
6 replaced high bars.

7 JUDGE REED: And when you replaced them  
8 did you replace them with an identical component of  
9 new or were they -- in some way?

10 MR. LUKENS: No, they were not identical.  
11 All of them were made more robust. For example, in  
12 the vertical hood, we replaced one quarter inch  
13 material to 5/8ths and we replaced, if I may, little  
14 bitty reinforcing gussets with full lengthwise. That  
15 was part of the experience that came out of the 2003  
16 event. They had clipped these gussets in the Quad  
17 Cities' dryer, but they weren't full length and it  
18 turned out that a couple of gussets became in stress  
19 range. So informed by that information, we changed  
20 them out.

21 JUDGE REED: Now does this run from bottom  
22 to top or are we talking -- I'm not sure.

23 MR. LUKENS: They run from the bottom of  
24 the vertical hood to the top of vertical hood.

25 JUDGE REED: The top of the vertical hood.

1 MR. LUKENS: They're on the order of four  
2 feet high.

3 JUDGE REED: Thank you.

4 MR. LEWIS: Judge Reed, do you want to  
5 witness to identify the location of this. It is an  
6 exhibit.

7 JUDGE REED: It is an exhibit?

8 MR. LUKENS: Yes sir.

9 MR. LEWIS: Yes.

10 JUDGE REED: Yes, if it's an exhibit,  
11 please.

12 MR. LUKENS: It's Exhibit E3-04-VY.

13 JUDGE REED: Thank you.

14 MR. LUKENS: Its title is "Attachment 2 to  
15 Vermont Yankee Nuclear Power Station Proposed Tech  
16 Spec Change NO. 263, Extended Power Uprate Supplement  
17 No. 8, Response to Request for Additional  
18 Information." And given a few minutes, I can tell  
19 what page that's on.

20 JUDGE REED: I think that's okay. I think  
21 we can locate it with what you've given us. We're not  
22 going to take the time to look it up here today.

23 Any other changes that were made?

24 MR. LUKENS: The table in this exhibit  
25 captures all the modifications that were made for the

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1 Vermont Yankee steam dryer.

2 JUDGE REED: Okay. If it's in the record,  
3 we will look it up.

4 MR. LUKENS: Right.

5 JUDGE REED: Thank you for identifying  
6 that.

7 So this is a -- I think you've answered  
8 this question, but I'm going to ask it just to make  
9 sure. What modifications did you make to steam dryer  
10 prior to EPU and I think this is --

11 MR. LUKENS: Those 2004 modifications were  
12 the EPU-related modifications.

13 JUDGE REED: Okay.

14 JUDGE REED: Another question again for  
15 you, Mr. Lukens. Can Entergy inspect the dryer  
16 whenever the plant shuts down such as a parameter  
17 accedence shutdown? So if the plant shuts down for  
18 whatever reason, can you inspect the dryer?

19 MR. LUKENS: Typically, on a shutdown that  
20 occurs on some simple event, and parameter accedence  
21 is an example of one of those, we never enter primary  
22 containment. We never take a head off of a reactor  
23 vessels. So the answer to that would be no. It would  
24 not be practical.

25 JUDGE REED: So in order to inspect, you

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1 have to take the head off the vessel.

2 MR. LUKENS: We have to take the head off.  
3 We have to take the dryer out.

4 JUDGE REED: So it would not be practical  
5 to do inspections on other than refueling cycles.

6 MR. LUKENS: That's correct.

7 JUDGE REED: I think that's the gist of  
8 this question. Okay.

9 Now I have several questions that relate  
10 to IGSCC. I'm not sure I have them in any particular  
11 order. Can IGSCC cracking eventually result in sudden  
12 breaking apart of steam dryer components? Again, for  
13 you, Mr. Lukens.

14 MR. LUKENS: The real answer to that is  
15 no. For an IGSCC crack to become a site for fatigue,  
16 it has to be in a location where there is a cyclic  
17 stress above the endurance limit and the location we  
18 have identified IGSCC cracks are not in high stress  
19 areas of the dryer. We have not found any indications  
20 in the high stress areas of the dryer.

21 JUDGE REED: Thank you. In 2007  
22 inspection that you spoke of, were there cracks that  
23 could not be immediately classified as IGSCC and took  
24 further evaluation?

25 MR. LUKENS: Yes.

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1 JUDGE REED: If so, what was the nature of  
2 that further evaluation?

3 MR. LUKENS: There were -- I can think of  
4 two different sets of indication that took us a day or  
5 two to evaluate and this was not done simply by  
6 Vermont Yankee. These indications because they're  
7 captured on CD by a camera, that information, the real  
8 time inspection data, was transmitted to structural  
9 engineers at General Electric. These are the folks  
10 who know as much about a steam dryer as anybody knows  
11 and we worked with them to characterize those  
12 indications.

13 JUDGE REED: And the results came back.

14 MR. LUKENS: And the results came back  
15 IGSCC.

16 JUDGE REED: IGSCC. Thank you.

17 And I have one last question and again I  
18 think it's for you. Isn't Vermont Yankee switching  
19 from an 18-month to a 24-month interval between  
20 refueling outages and therefore inspections of the  
21 dryer?

22 MR. LUKENS: I am 90 percent confident  
23 that we are not. It's been investigated and my  
24 current understanding is that it is somewhere between  
25 unlikely and not possible that the current

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1 configuration in the reactor vessel with the number of  
2 control rods we have, the size core we have, that we  
3 could control a 24-month cool.

4 JUDGE REED: Okay.

5 JUDGE KARLIN: Is there some intermediate  
6 extension or is it 18 months into the future?

7 MR. LUKENS: I'm not aware of --

8 JUDGE KARLIN: We go to 20 months.

9 MR. LUKENS: -- intervals except 18 and  
10 24.

11 JUDGE KARLIN: Okay.

12 JUDGE REED: That's all I have.

13 (Off the record discussion.)

14 JUDGE KARLIN: I think we have completed  
15 our inquiries and questions related to Contention 3.  
16 Again, our appreciation to the witnesses who spent a  
17 lot of time preparing, submitting materials and then  
18 being patient with answering our questions here,  
19 especially mine here being the least technical of  
20 everyone in this room probably.

21 But, anyway, thank you and you all may  
22 step down now. We don't need you anymore. You may be  
23 dismissed and thank you for your testimony.

24 What I'd like to do is ask the parties to  
25 -- Yes, Mr. Raubvogel.

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1 MR. RAUBVOGEL: We would request that  
2 questions that we submitted both yesterday and today  
3 and any others be part of the record in the same  
4 manner that our direct examination plan was submitted  
5 to the Board just so that it's a part of the entire  
6 record.

7 JUDGE KARLIN: I think that would be --  
8 Any reaction from the other parties? Staff? Yes, I  
9 think that's -- Sir?

10 MR. TRAVIESO-DIAZ: I believe that was  
11 what was done in other nuclear proceedings. It was  
12 put on the record at the end.

13 JUDGE KARLIN: Yes, I think that's right  
14 and that's the appropriate thing to do. So what -- We  
15 have handwritten questions from some of you and  
16 actually we only have one copy of some of these  
17 handwritten questions and I did want to remark that  
18 whoever did these gets an A for penmanship.

19 (Laughter.)

20 MR. RAUBVOGEL: Would you like to provide  
21 additional copies to the clerk?

22 JUDGE KARLIN: Yes. I don't know how we  
23 can get an additional copy of this. Mr. Roth, for  
24 example, this is your only copy. Right?

25 MR. ROTH: That's correct.

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1 JUDGE KARLIN: So I think we'll just have  
2 to put these in the record after the record closes.  
3 I think that's the appropriate time. We'll follow the  
4 same procedure under the Reg. about putting these  
5 questions in with one exception, Mr. Raubyogel. We're  
6 not going to ask SECY to put it on the electronic  
7 hearing docket then until we're sure.

8 With that, you are all dismissed. Thank  
9 you.

10 (Panel of witnesses excused.)

11 And if we could get the witnesses for  
12 Contention 4 up, we will have them sworn and introduce  
13 their exhibits and then proceed to Dr. Horowitz's  
14 presentation. Off the record.

15 (Whereupon, at 3:55 p.m., the above-  
16 entitled matter recessed and reconvened at 3:59 p.m.)

17 JUDGE KARLIN: All right. Can we go back  
18 on the record, Mr. Reporter? Thank you.

19 The Atomic Safety Licensing Board is now  
20 ready to begin consideration of the evidentiary  
21 hearing portion of consideration of NEC Contention 4  
22 and I see we have the witnesses sitting in the witness  
23 box and so I will ask you all to rise please and raise  
24 your right hand. Please stand and raise your right  
25 hand.

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1 Whereupon,

2 CONTENTION 4 PANEL

3 were called as witnesses and, after having been first  
4 duly sworn, were examined and testified as follows:

5 JUDGE KARLIN: Thank you. Please be  
6 seated.

7 Welcome. Now I will ask counsel for  
8 Entergy to interrogate its witness so that we can  
9 introduce the exhibits please.

10 MR. LEWIS: Thank you, Judge Karlin. I'm  
11 going to direct these questions to Entergy's  
12 witnesses, Mr. Horowitz and Mr. Fitzpatrick.

13 Gentlemen, do you have before you a  
14 document bearing the caption in this proceeding  
15 entitled "Testimony of Jeffrey S. Horowitz and James  
16 C. Fitzpatrick on NEC Contention 4, Flow Accelerated  
17 Corrosion" dated May 12, 2008?

18 DR. HOROWITZ: Yes.

19 MR. FITZPATRICK: Yes.

20 MR. LEWIS: Did you prepare this testimony  
21 for this proceeding?

22 DR. HOROWITZ: Yes.

23 MR. FITZPATRICK: Yes.

24 MR. LEWIS: Do you have any corrections to  
25 this testimony?

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1 DR. HOROWITZ: Yes.

2 MR. LEWIS: What are they please?

3 DR. HOROWITZ: On page 33, answer 49,  
4 lines six and eight, I believe the sentence that says  
5 "The portion of this statement concerning elbows and  
6 by extension other geometries, other than straight  
7 pipe is incorrect."

8 MR. LEWIS: Thank you. For the record,  
9 this is a duplicate of the leading-up prior statement.  
10 So it's simply repeated or a redundant statement.  
11 Copies have been given to the other parties and copies  
12 of this corrected testimony has been given to the  
13 court reporter.

14 JUDGE KARLIN: All right.

15 MR. LEWIS: With this correction, is this  
16 testimony your true and accurate testimony in this  
17 proceeding?

18 DR. HOROWITZ: Yes.

19 MR. FITZPATRICK: Yes, it is.

20 MR. LEWIS: I would move that this  
21 testimony be moved into evidence as is read.

22 (Whereupon, the document  
23 referred to was marked as  
24 Entergy Exhibit E4-01 for  
25 identification.)

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1 JUDGE KARLIN: Any objections?

2 (No verbal response.)

3 Hearing none, it is admitted into  
4 testimony.

5 (The document referred to  
6 having been previously marked  
7 for identification as Entergy  
8 Exhibit E4-01, was received in  
9 evidence.)

10 MR. LEWIS: At the same time, Entergy  
11 moves to introduce Exhibits E4-02 through E4-43. These  
12 are Entergy's exhibits that are referenced in the  
13 testimony and relate to this contention. There was on  
14 exhibit E4-08 which was missed three pages in the  
15 copying. The copies have been given to the court  
16 reporter and the parties now have the three missing  
17 pages added. It was a fact reference booklet with  
18 missing pages. We move those exhibits into evidence  
19 at this time.

20 (Whereupon, the documents  
21 referred to were marked as  
22 Entergy Exhibits E4-02 through  
23 E4-43 for identification.)

24 JUDGE KARLIN: Any objections?

25 (No verbal response.)

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1 Hearing none, they're admitted.

2 (The documents referred to  
3 having been previously marked  
4 for identification as Entergy  
5 Exhibits E4-02 through E4-43,  
6 were received in evidence.)

7 Anything else, Mr. Lewis?

8 MR. LEWIS: That is it.

9 JUDGE KARLIN: Thank you. NRC Staff  
10 please.

11 MR. SUBIN: I direct this to Mr. Hsu and  
12 Mr. Rowley. Do you have before you the affidavit of  
13 Kaihwa R. Hsu and Jonathan G. Rowley concerning NEC  
14 Contention 4, Flow Accelerated Rate Corrosion and the  
15 rebuttal to this contention?

16 MR. HSU: I do.

17 MR. ROWLEY: Yes.

18 MR. SUBIN: Did you prepare this testimony  
19 for this proceeding?

20 MR. ROWLEY: Yes.

21 MR. HSU: Yes.

22 MR. SUBIN: Okay. Do you have any  
23 corrections or additions of this testimony?

24 MR. HSU: Yes.

25 MR. SUBIN: Can you state that for the

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1 record?

2 MR. ROWLEY: Corrections. On Question 21,  
3 change "pease" to "please."

4 On Question A, answer B, delete "license"  
5 and insert "were the" after "evaluate of."

6 On Question A8, change "managed" to  
7 "management." Same question, change "program" to  
8 "programs." Change "program generically" to "programs  
9 generically." Change "existing program" to "existing  
10 programs."

11 Question A10, insert "a" before "computer  
12 code."

13 Question A14, change "model" to "model's."  
14 Change Question A15 to insert "a" before  
15 "FAC."

16 Question A17, insert the word "the" before  
17 "CHECWORKS."

18 Question A18, insert "of" after the word  
19 "input."

20 Question Q19, insert "are needed" after  
21 "cycles."

22 Question A19, I guess, like 12, insert  
23 "of" after "five to tens years."

24 Question Q20, line 3, delete the extra  
25 period.

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1 Question A22, line four, insert a period  
2 after the word "plant."

3 Question A24, line nine, change "increase"  
4 to "increases."

5 Question A24, line 11, change "ware"  
6 spelled W-A-R-E to "wear" spelled W-E-A-R.

7 Question A25, line four, delete "instead."

8 Question A26, Answer A26, line nine,  
9 delete the word "to" after "CHECWORKS."

10 A27, line four, delete "to" after  
11 "continue." A27, line five, insert "in" after  
12 "parameter."

13 A28, line three, delete "necessary" after  
14 "need to."

15 Q30, line one, change "managing" to  
16 "manage."

17 A30, line two, insert "that" after "mine."  
18 A30, line three, change "selected" to select." A30,  
19 line four, change "structurally" to "structural."

20 Q31, line one, delete "to" after "modify."

21 A32, line eight, insert "for the following  
22 four reasons." A32, line 33, change "ruptured" to  
23 "rupture." A32, line 37, change "the" to "that."

24 A34, line five, insert "to be" before  
25 "acceptable."

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1 A35, line four, delete "of" after  
2 "selecting." A35, line nine, insert "of" after  
3 "section."

4 A37, line six, insert "the" before "EPU."  
5 A37, line six, insert "the" between "of" and "last."  
6 A37, line 11, change "used" to "use."

7 Q38, line one, change "Q38.." to "Q38."

8 A39, line three, change the comma to a  
9 semicolon. A39, line five, change the period after  
10 "EPU" to colon "and." And A39, line nine, insert "due  
11 to" after "aging."

12 MR. SUBIN: Do you adopt your testimony as  
13 your testimony in this proceeding?

14 MR. ROWLEY: We do.

15 MR. SUBIN: I move to have this testimony  
16 admitted to the transcript as it is read.

17 (Whereupon, the document  
18 referred to was marked as NRC  
19 Staff Exhibit No. for  
20 identification.)

21 JUDGE KARLIN: Thank you, Mr. Subin. Any  
22 objections?

23 (The document referred to  
24 having been previously marked  
25 for identification as NRC Staff

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1 Exhibit, was received in  
2 evidence.)

3 MR. ROTH: No objections, Your Honor. But  
4 just going back, setting backwards a little bit, there  
5 was corrected exhibits that were handed out by  
6 Entergy. I didn't get a copy of those both with  
7 respect to the steam dryer and Exhibit 8.

8 JUDGE KARLIN: All right. Mr. Diaz, could  
9 you get that to Mr. Roth please?

10 MR. TRAVIESO-DIAZ: Yes.

11 JUDGE KARLIN: Did you have something, Mr.  
12 Subin?

13 MR. SUBIN: Yes, I also wanted to admit  
14 the corresponding exhibits.

15 JUDGE KARLIN: Yes, certainly.

16 MR. SUBIN: Sixteen, 17, 18, 20, 21, A, B,  
17 C and Exhibits 1 and 19 have already been admitted.

18 JUDGE KARLIN: All right.

19 MR. SUBIN: I move to have those admitted.

20 (Whereupon, the documents  
21 referred to were marked as NRC  
22 Staff Exhibits 17-21 and A-C  
23 for identification.)

24 JUDGE KARLIN: So have all of them already  
25 been admitted?

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1 MR. SUBIN: No, just the last two that I  
2 mentioned earlier.

3 JUDGE KARLIN: But the others you are  
4 moving for admission?

5 MR. SUBIN: Right. Correct.

6 JUDGE KARLIN: Any objections?

7 (No verbal responses.)

8 Hearing none, they're admitted.

9 (The documents referred to  
10 having been previously marked  
11 for identification as NRC Staff  
12 Exhibits 17-21 and A-C were  
13 received in evidence.)

14 Is that all, Mr. Subin?

15 MR. SUBIN: Yes, that's all.

16 JUDGE KARLIN: Ms. Tyler.

17 MS. TYLER: The direct and rebuttal  
18 testimony of Joram Hopenfeld has already been  
19 admitted. I now move to admit the exhibits referenced  
20 in that testimony which are exhibit NEC JH-36 through  
21 exhibit NEC JH-53 and Exhibit NEC JH70 through NEC  
22 JH72.

23 (Whereupon, the documents  
24 referred to were marked as NEC  
25 Exhibit JH36-JH53 and JH70-JH72

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1 for identification.)

2 Now directing questions to Dr. Rudolf  
3 Hausler.

4 JUDGE KARLIN: Are there any new exhibits  
5 associated with Dr. Hopenfeld's testimony?

6 MS. TYLER: NEC would like to admit all  
7 the exhibits associated with his testimony.

8 JUDGE KARLIN: I'm sorry. Are there any  
9 new exhibits associated with his Contention 4  
10 testimony --

11 MS. TYLER: I just mentioned --

12 JUDGE KARLIN: -- that haven't already  
13 been admitted?

14 MS. TYLER: I just did mean to admit  
15 those.

16 JUDGE KARLIN: Okay. Any objections?

17 (No verbal response.)

18 No. Then they're admitted.

19 (The documents referred to  
20 having been previously marked  
21 for identification as NRC  
22 Exhibits JH36-JH53 and JH70-  
23 JH72, was received in  
24 evidence.)

25 Yes. Okay. Now proceed.

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1 MS. TYLER: Okay. Directing questions to  
2 Dr. Rudolf Hausler, Dr. Hausler, do you have in front  
3 of you the pre-filed direct testimony of Dr. Rudolf  
4 Hausler regarding NEC's Contention 4 and the pre-filed  
5 rebuttal testimony of Dr. Rudolf Hausler regarding  
6 NEC's Contention 4?

7 DR. HAUSLER: I do.

8 MS. TYLER: Did you prepare this testimony  
9 for submission in this proceeding?

10 DR. HAUSLER: I'm sorry -- A little  
11 difficulty hearing.

12 MS. TYLER: Did you prepare this testimony  
13 for submission in this proceeding?

14 DR. HAUSLER: Yes.

15 MS. TYLER: Do you have any corrections to  
16 make to the testimony at this time?

17 DR. HAUSLER: No ma'am. Not at this time.

18 MS. TYLER: Do you adopt this testimony as  
19 your sworn testimony in this proceeding?

20 DR. HAUSLER: I do.

21 MS. TYLER: I move to admit Dr. Rudolf  
22 Hausler's testimony.

23 (Whereupon, the document  
24 referred to was marked as NEC  
25 Exhibit for identification.)

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1 JUDGE KARLIN: All right. Any objections?

2 (No verbal response.)

3 Hearing none, it is admitted.

4 (The document referred to  
5 having been previously marked  
6 for identification as NEC  
7 Exhibit, was received in  
8 evidence.)

9 MS. TYLER: I also move to admit the  
10 exhibits referenced in that testimony which are  
11 exhibits NEC RH02 through NEC RH05.

12 (Whereupon, the documents  
13 referred to were marked as NEC  
14 Exhibit RH02-RH05 for  
15 identification.)

16 JUDGE KARLIN: Any objections?

17 (No verbal response.)

18 Hearing none, they're admitted.

19 (The documents referred to  
20 having been previously marked  
21 for identification as NEC  
22 Exhibits RH02-RH05, were  
23 received in evidence.)

24 MS. TYLER: Directing questions now to  
25 Ulrich Witte, Mr. Witte, do you have before you the

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1 pre-filed direct testimony of Ulrich Witte regarding  
2 NEC Contention 4 and the pre-filed rebuttal testimony  
3 of Ulrich Witte regarding NEC Contention 4?

4 MR. WITTE: Yes, I do.

5 MS. TYLER: And did you prepare this  
6 testimony for submission in this proceeding?

7 MR. WITTE: Yes, I did.

8 MS. TYLER: Do you have any corrections to  
9 make to it at this time?

10 MR. WITTE: No.

11 MS. TYLER: Do you adopt this testimony as  
12 your sworn testimony in this proceeding?

13 MR. WITTE: Yes, I did.

14 MS. TYLER: I move to admit Mr. Witte's  
15 testimony for the record.

16 (Whereupon, the document  
17 referred to was marked as NEC  
18 Exhibit for identification.)

19 JUDGE KARLIN: Any objections?

20 (No verbal response.)

21 Hearing none, it is admitted.

22 (The document referred to  
23 having been previously marked  
24 for identification as NEC  
25 Exhibit, was received in

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1 evidence.)

2 MS. TYLER: I also move to admit the  
3 exhibits referenced in Mr. Witte's testimony which are  
4 Exhibits NEC W02-NEC W22.

5 (Whereupon, the documents  
6 referred to were marked as NEC  
7 Exhibit W02-W22 for  
8 identification.)

9 JUDGE KARLIN: Any objections?

10 (No verbal response.)

11 Hearing none, they so be admitted.

12 (The documents referred to  
13 having been previously marked  
14 for identification as NEC  
15 Exhibit W02-W22, were received  
16 in evidence.)

17 Anything else, Ms. Tyler?

18 MS. TYLER: No.

19 JUDGE KARLIN: All right. Thank you.

20 I think that's helpful to get the  
21 witnesses sworn in and their exhibits brought in to  
22 the evidentiary record this afternoon. Normally, at  
23 this point, we would begin questioning the witnesses.  
24 But we did have the request prior to the beginning of  
25 the evidentiary hearing in a written notice that Dr.

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1 Horowitz and I apologize, Dr. Horowitz, that your name  
2 tag says "Mr. Horowitz." We know it's Dr. Horowitz.  
3 We asked him to put together a brief presentation on  
4 CHECWORKS.

5 I would like to call upon you to give us  
6 that presentation at this point, sir, and you may go  
7 over to the podium if you find that helpful.

8 (Off the record comment.)

9 JUDGE KARLIN: All right. Let's take a  
10 pause.

11 (Pause.)

12 JUDGE WARDWELL: We requested a  
13 presentation that would be kind of a nuts and bolts  
14 discussion of how CHECWORKS works. I reviewed the  
15 slides and I think all the slides do achieve that goal  
16 with the exception of Slide 12. I think we will get  
17 to some of the things you want to talk about in Slide  
18 12, but I'd rather do it as part of questioning rather  
19 than have you present it because I want it to be  
20 strictly as best we can an impractical presentation of  
21 what CHECWORKS is about.

22 So I would ask you to stop at Slide 11.  
23 Slide 13 is merely questions and we will have plenty  
24 of questions for you tomorrow on this which will cover  
25 what you said in Slide 12 also.

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1 At this time, I would like to ask NEC's  
2 witnesses if they've had a chance to review these  
3 overhead slides. Have you received these overhead  
4 slides before today?

5 (Off the record comment.)

6 With the exception of Slide 12, is there  
7 anything there that you feel is editorialized in  
8 regards to Dr. Horowitz's presentation of just the  
9 mechanics of how CHECWORKS works? Do you see any  
10 professional opinions on how effective it is or what  
11 it does, how it achieves it in a relative fashion of  
12 effectiveness or that type of thing? Do you have any  
13 objections to what he's saying?

14 MR. WITTE: Your Honor, for the record, I  
15 have not had a chance to review this.

16 JUDGE WARDWELL: You did receive it before  
17 though.

18 MR. WITTE: Yes, sir.

19 JUDGE WARDWELL: Thank you.

20 Dr. Hausler. Thank you, Dr. Hopenfeld.

21 DR. HAUSLER: (Off microphone) Your Honor,  
22 the slides are really in the sense of radiation what  
23 Dr. Horowitz is going to explain to us. In that  
24 sense, they really are -- objection or opinion of --

25 JUDGE WARDWELL: Fine, we will wait until

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1 later then.

2 Dr. Horowitz, proceed and if I do stop  
3 you, it is because I have the feeling that it's more  
4 editorialized also and I'll ask you to move on. But  
5 other than that, proceed until either --

6 DR. HOROWITZ: First of all, good  
7 afternoon. I appreciate the opportunity to speak  
8 about CHECWORKS before you this afternoon.

9 (Inaudible.)

10 Should I announce that?

11 JUDGE WARDWELL: Yes, that would be fine.

12 DR. HOROWITZ: So background, the story  
13 I'm about to tell really begins with the Surry  
14 accident of Unit 2 in December 1986. Surry is a two-  
15 unit PWR station located in Virginia. As a result of  
16 that accident, four men were killed. There was plant  
17 damage. There was also injuries to other workers and  
18 that prompted an investigation by all sorts of parties  
19 and, as a result of the investigation, it was  
20 determined that the cause of the rupture was flow  
21 accelerated corrosion as we now call erosion corrosion  
22 mechanism. This mechanism is a dissolution of the  
23 iron oxide coating from steel surface and if it  
24 continues on unabated it will eventually result in  
25 rupture.

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1           The fact is that there were large portions  
2 of the elbow in question eroded away. It corroded  
3 away. In fact, about half of the material, more than  
4 half of the material, of the elbow was gone.

5           So, as a result of this accident, there  
6 was a need for U.S. nuclear units to inspect single  
7 phase piping. By single phase, I mean water only and  
8 water only as opposed to two phase which contain water  
9 and steam. At the time of the accident back in '86,  
10 there were only very limited programs in the U.S. to  
11 inspect single phase piping.

12           Because of the situation, both EPRI and  
13 NUMARC, an industry organization, committed to develop  
14 a computer program to assist utilities in selecting  
15 inspection locations to look for flow accelerated  
16 corrosion damage.

17           At the same time, back in the spring of  
18 '97, NUMARC issued programmatic guidance which is in  
19 effect the father of NSAC-202L.

20           JUDGE KARLIN: What does NUMARC stand for  
21 please?

22           DR. HOROWITZ: Nuclear Utility Management  
23 and Resources Council.

24           JUDGE KARLIN: All right. Thank you.

25           DR. HOROWITZ: Over the past 20 something

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1 years, CHEC has evolved in the CHECWORKS and I'll talk  
2 about the evolution a little bit.

3 Okay. Next slide, Slide 3, in view of the  
4 current constraint, the U.S. utilities were planning  
5 for outages and had to have selection inspection  
6 locations selected. So we were under a great deal of  
7 pressure to develop this tool to help them to select  
8 inspection locations and, in fact, the program was  
9 released within seven months of the Surry accident.  
10 It was released from a little over three months since  
11 NUMARC made the decision to go ahead with the program.

12 So what we did is we gathered laboratory  
13 data from England from Central Electricity Generating  
14 Board and from France from the Electricity of France,  
15 the national utility, and we also gathered plant and  
16 laboratory data from Siemens in Germany. In fact, at  
17 the time, we obtained all known laboratory data on the  
18 subject and we were in a unique position because  
19 nobody had ever looked at all that data together.

20 JUDGE KARLIN: May I ask? When you say  
21 "we," who is "we"?

22 DR. HOROWITZ: We at the time of starting  
23 the CHECS was the EPRI program manager and myself.

24 JUDGE KARLIN: Okay.

25 DR. HOROWITZ: So what we did and

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1 essentially the two of us and later in the game we had  
2 help from a programmer used the scientific knowledge  
3 available at EPRI of corrosion experts and the  
4 laboratory data and they are mostly from Europe and we  
5 designed a new correlation to relate the plant  
6 conditions with rates of corrosion. Now Slide 4  
7 please.

8 So we were not the first to do this.  
9 There was previous work, again, mostly in Europe and,  
10 in fact, gentlemen named Keller and Kastner, both from  
11 Germany and both work for Siemens, had during the past  
12 roughly 15 years developed their own models for  
13 predicting rates of flow accelerated corrosion. We  
14 also had the benefit of some scientific work done with  
15 Phillipe Berge who has since retired from EIF who did  
16 a great deal of background work in this area and we  
17 came up with a simple looking model.

18 I say simple looking because it's a  
19 product of seven factors. Now naturally the factors  
20 themselves are not simple numbers. They're  
21 complicated functions in general. And you can see  
22 these six factors, the first six factors, we used in  
23 CHEC and when we extended the program to two phase, we  
24 added factor seven for void fraction.

25 Just very, very briefly, the factors we

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1 considered are temperature of the fluid, the mass  
2 transfer factor which is related to the mass transfer  
3 that a straight pipe would experience, a geometry  
4 factor which relates the straight pipe mass transfer  
5 to that in the fixings such as an elbow, the pH factor  
6 and oxygen factor that accounts for water chemistry  
7 and the alloy factor to account for the composition of  
8 the material. Next Slide No. 5.

9 So coming along was basically the last of  
10 the first generation programs. We had the advantage  
11 over previous workers and we knew what they did. But,  
12 more importantly, we had the largest database of  
13 experimental and eventually plant conditions.

14 We also took the more sophisticated  
15 approach particularly when we went to CHECMATE two  
16 years later of incorporating local conditions of water  
17 chemistry and the flow and we did that by having  
18 separate features to form detailed calculation of the  
19 plant chemistry and also a flow as desired by the  
20 analysts.

21 We also used geometry factors based on  
22 plant data. In the past, geometry factors were a  
23 concept developed by Keller in the early '70s and  
24 Keller was working steam turbine. So he developed a  
25 large number of geometry factors. From what we can

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1 tell and a lot of this knowledge has been lost, what  
2 he used is he used comparisons between overall  
3 pressure drop and the rate of flow accelerated  
4 corrosion. We, on the other hand, use plant data from  
5 actual plants compared to straight pipes and we also  
6 had insight from copper modeling tests which is  
7 explained in one of my exhibits how exactly that's  
8 works.

9                   What we've done over the years, this was  
10 1987, in the 21 years or so is we have continually  
11 looked at the data as it becomes available.  
12 Laboratory data has become available, limited now to  
13 France, particularly in the 1990s and periodically  
14 we'll go back and we'll look at all available plant  
15 data and go back and examine how well the correlation  
16 performs. When a new issue occurs or we get reports  
17 from users that something is not working as well as  
18 we'd like it we will do a separate study and look at  
19 that individual parameter.

20                   Slide 6, Input Parameters. When we  
21 designed the program, one of our foremost goals was to  
22 have a program that utility engineers could use. So  
23 therefore the inputs to the program had to be readily  
24 available to utility engineers. The way it's  
25 structured currently in CHECWORKS is we have five

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1 classes of input data just to divide this out for some

2 --

3           The first is a heat balance diagram and  
4 the heat balance diagram is a logical representation  
5 of how the major components in the power are  
6 connected, having feedwater heaters and injection  
7 lines, whether it's a reheat or not, and we have kind  
8 of a computerized tinker toy to allow the user to  
9 connect them up together. But this is done once when  
10 the model is put together.

11           To make the program work, you also have to  
12 include global conditions, in other words, things that  
13 affect everything in the plant such as operating  
14 hours, power level, water chemistry parameters and  
15 operating time. This is done for each operating  
16 period. So this is a relatively small job to complete  
17 for the plant.

18           By far, the most information that's put in  
19 is at the component level and I've listed some of the  
20 things here. So, for each component you're analyzing,  
21 you have to define the geometry and material, the flow  
22 rate, the thermal dynamic conditions, parameters like  
23 this. If it's a valve, some other information. If  
24 it's an elbow, some other information. But that's  
25 pretty low level.

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1           You also can input the component  
2 replacement information. The component is operated  
3 for awhile. It needs to be replaced. You could put  
4 that in the program to find the new component, to find  
5 whether it was replaced and this becomes very  
6 important because the way the program works is it does  
7 a step-wise integration of the wear and you have to  
8 know how old it is to do that properly.

9           And, lastly, inspection data. If  
10 available, you can input inspection data which is  
11 normally a thickness matrix at a given time. Okay.  
12 Slide 7 please.

13           Plant Modeling. So conceptually, we've  
14 put together a plant model. How do we use it? We  
15 have all the data in. What do we do next?

16           The analyst goes through and divides the  
17 plant into a number of lines. We call them analysis  
18 lines and the lines do not have to be physically  
19 attached, but they represent components which have the  
20 same water chemistry and generally the same  
21 temperature. What that means is there are components  
22 we expect to behave in the same way and depending on  
23 the complexity of the reactor itself and the amount of  
24 inspection data we have available here, there's  
25 typically between 20 and 50 of these lines, sometimes

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1 more. But that 20 to 50, 25 to 50 is a good rule of  
2 thumb.

3 Using all the information available to the  
4 program, now the analyst tells the program to  
5 calculate for a given analysis line. That program  
6 will for each operating point, excuse me, for  
7 operating period calculate the corrosion rate,  
8 multiply by the time and calculate the amount of  
9 incremental wear for that operating period. At the  
10 end of the process, the individual pieces will be  
11 summed up and the total predicted wear will be  
12 obtained.

13 Next slide is No. 8. So specifically we  
14 tried to design CHECWORKS to do is to handle changes  
15 of conditions and the reason it's true is if  
16 conditions aren't changing and I was in Japan last  
17 year and the Japanese reactors tend to run at  
18 consistent conditions, consistent chemistry, forever  
19 and that's the way to do things over there the tool is  
20 much less useful because the advantage of the tool,  
21 for example, in the early '90s pressurized water  
22 reactors were going through a large improvement of  
23 water chemistry. They changed the chemicals they  
24 used. They changed the pH. They changed the mix of  
25 chemicals used and having a tool like this you can

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1 evaluate in advance of making a change what the  
2 impacts would be. Changes of operating conditions and  
3 water chemistry and for each operating period in the  
4 program, the conditions are defined and the  
5 calculations are made.

6 In doing this design of the program,  
7 forecasting change is one of the main things we were  
8 concerned about and the second was in like all the  
9 components, both components with inspection data and  
10 without inspection data. It's important to keep in  
11 mind that CHECWORKS is a tool to help the engineer  
12 select inspection locations. CHECWORKS does not  
13 produce a list of inspection locations. It's not  
14 automatic. You need a human being between the program  
15 output and the inspection list generated. Slide 9.

16 That's overall how the program works. Now  
17 I'll get into a little more detail about how it's  
18 actually used. There are two modes of operation  
19 called Pass 1 and Pass 2 and Pass 1 does a prediction  
20 using the correlation without any consideration of  
21 inspection data and this just gives you a raw  
22 prediction. It's typically only used when a line has  
23 not been inspected. A line is not considered. And as  
24 I said, it's seldom used particularly in the CHECWORKS  
25 program.

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1 Pass 2, on the other hand, at the opinion  
2 of the analyst considers inspection data and Pass 2 in  
3 the -- relates the predicted amount of wear and the  
4 amount of wear measured at that time. The next slide  
5 please.

6 So a user using the program after doing  
7 the Pass 2 analysis has the ability to look in  
8 graphical basis and also tabular basis how the  
9 predictions compare and this is an important part of  
10 the process and we strongly recommend that users  
11 consider spending time looking at the information and  
12 trying to understand what the information is telling  
13 the analyst. Note that the line correction factor is  
14 computed separately for each line analyzed and the  
15 user has the ability to, I mentioned that before, see  
16 the results. And keep in mind that the line  
17 correction factor is calculated by the program and is  
18 displayed to the user. Next slide which is the lat  
19 one, Slide 11.

20 So does the program give the user? The  
21 program in the various forms, tabular and graphical,  
22 gives information for each component to analyze and  
23 proves the predicted wearing on an average basis and  
24 for the last operating period, the predicted thickness  
25 and the predicted time for each user-defined critical

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1 thickness. And for Pass 2 analysis, the user also  
2 gets the line correction factor.

3 Thank you. Any questions?

4 JUDGE WARDWELL: Thank you, Dr. Horowitz.  
5 We'll have questions for you tomorrow on this. But  
6 we'll wait until then to start pulling that back out  
7 again and get into the middle of that.

8 JUDGE KARLIN: Thank you, Dr. Horowitz.  
9 Yes. I think with that we probably have hit a  
10 breaking point that would be good to break now and  
11 reconvene tomorrow morning at 8:30 a.m. crisply if we  
12 can. It may be a long day. We may go later than 5:00  
13 p.m. tomorrow, as late as they will let us stay here  
14 and it takes. But I don't think we'll have to go  
15 late. We're just going to ask questions and see how  
16 far we get.

17 Right now, it's a little anticlimactic for  
18 all these excellent witnesses to be sworn in and not  
19 get a chance to speak. But we will ask the questions  
20 tomorrow rest assured. You'll get your chance. So we  
21 will stand adjourned for the day and reconvene  
22 tomorrow at 8:30 a.m. Thank you. Off the record.

23 (Whereupon, at 4:34 p.m., the above-  
24 entitled matter was concluded to reconvene at 8:30  
25 a.m. the next day.)

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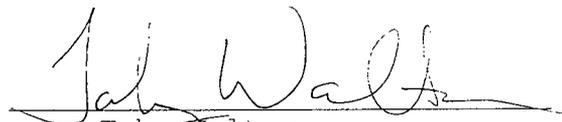
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