

**Official Transcript of Proceedings**  
**NUCLEAR REGULATORY COMMISSION**

Title: Entergy Nuclear Vermont Yankee

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

Location: Newfane, Vermont

DOCKETED  
USNRC

July 25, 2008 (10:00am)

Date: Monday, July 21, 2008

OFFICE OF SECRETARY  
RULEMAKINGS AND  
ADJUDICATIONS STAFF

Work Order No.: NRC-2296

Pages 694-878

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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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Monday, July 21, 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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P R O C E E D I N G S

1:01 P.M.

1  
2  
3 JUDGE KARLIN: Thank you. Mr. Reporter,  
4 we'll go on the record now.

5 In accordance with the Atomic Energy Act  
6 and the regulations of the Nuclear Regulatory  
7 Commission, we are convening here today an evidentiary  
8 hearing in the matter of Entergy Nuclear Vermont  
9 Yankee, LLC and Entergy Nuclear Operations, Inc. Let  
10 me get this right, the docket number is 50-271-LR, LR  
11 stands for license renewal. And the Atomic Safety and  
12 Licensing Board number is 06-84903LR.

13 It is an application where Entergy is  
14 applying for a 20-year renewal of its license to  
15 operate the Vermont Yankee Nuclear Power Plant in  
16 Vernon, Vermont.

17 For the record, today's date is July 21,  
18 2008 and this proceeding is being held in the Windham  
19 Superior Court in Newfane, Vermont.

20 Welcome to everyone here.

21 On my left is Dr. Richard Wardwell. He is  
22 a Ph.D. in groundwater and geotechnical engineering.  
23 Dr. Wardwell was formerly the chair of the State Board  
24 of Environmental Protection for the State of Maine and  
25 is with the Atomic Safety and Licensing Board as a

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1 full-time scientific and technical member.

2 On my right is Dr. William Reed. He has  
3 a degree from MIT. It's not a Ph.D. It's a Doctor of  
4 Science from MIT and he's formerly one of the Deputy  
5 Directors at Los Alamos and more recently was the head  
6 of the Department of Energy Computational Program  
7 known as the Accelerated Strategic Computing  
8 Initiative.

9 My name is Alex Karlin. I'm a lawyer by  
10 training. I spent about 30 years doing environmental  
11 law and I've been with the Atomic Safety and Licensing  
12 Board for a little over four years as a Legal Judge.

13 I'd like to introduce our other  
14 administrative staff before we get started. First, we  
15 have two lawyers who are our law clerks, Marcia  
16 Carpentier to my right and Lauren Bregman, another  
17 lawyer and law clerk who assists the Board with legal  
18 and other matters.

19 Karen Valloch is our administrative  
20 assistant. She's here waving her hand there and helps  
21 with administrative matters.

22 We have NRC security personnel here who  
23 have helped arrange this, Gary Simpler and Adam  
24 Gaudreau. And the local Sheriff's Office has been  
25 cooperative and helped us share Kenneth Clark, has

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1 made two of his officers available, Officer Larkin and  
2 Lavalla who are here today in the courtroom. Thank  
3 you for being here. And thanks to Sheriff Clark.

4 Diane Screnci is with the NRC Office of  
5 Public Affairs. She's sitting over there. And for  
6 media or other public affairs-related matters she'd be  
7 the one you might want to talk with if you had a  
8 question.

9 Our court reporter is Mr. Toby Walter and  
10 he's here to record and transcribe all of the  
11 proceeding and that transcription will later be made  
12 public in a couple of weeks or two on the NRC website  
13 so everyone can see it.

14 With that now I'd like to ask the parties  
15 if they would introduce themselves, so we'll start  
16 with the New England Coalition. NEC, please.

17 MS. TYLER: Karen Tyler representing NEC  
18 and I'm here with my co-counsel Andrew Laubvogel. And  
19 also seated at the table is our client, a  
20 representative of our client, Raymond Shadis.

21 JUDGE KARLIN: Welcome, welcome. Thank  
22 you.

23 Entergy.

24 MR. LEWIS: Yes, Judge Karlin, good  
25 morning. My name is David Lewis. I'm with the law

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1 firm of Pilsbury, Winthrop, Shaw, Pittman representing  
2 Entergy. With me from the same firm is Mr. Matias  
3 Travieso-Diaz and Mr. Blake Nelson.

4 There are numerous representatives of  
5 Entergy in the audience. I won't introduce them all,  
6 but they include Mr. Ted Sullivan, the Site Vice  
7 President, and Mr. John Dreyfus, the Director of  
8 Nuclear Safety Assurance.

9 JUDGE KARLIN: Great, thank you, welcome.  
10 And I might ask everyone to try to speak up as we much  
11 as possible because not only are we trying to  
12 communicate here, but people in the audience, they  
13 also would want to here and it's a little harder when  
14 you're facing this direction for them to hear what you  
15 all are saying.

16 The NRC staff, please, Mr. Subin.

17 MR. SUBIN: Lloyd Subin for the NRC staff  
18 attorney. Mary Baty, and Jessica Bielecki.

19 JUDGE KARLIN: Welcome, welcome. State of  
20 Vermont, please.

21 MS. HOFMANN: Thank you, Sarah Hofmann, on  
22 behalf on behalf of the State of Vermont, the  
23 Department of Public Service of Vermont. With me is  
24 my consulting attorney, Anthony Roisman of the  
25 National Legal Scholars. Thank you.

1 JUDGE KARLIN: Thank you.. Welcome. State  
2 of New Hampshire, is the State of New Hampshire  
3 represented? No.

4 State of Massachusetts? They told us  
5 there are three states who are active and involved in  
6 this case. They include the State of Vermont, they  
7 just spoke. And the State of New Hampshire also is  
8 represented and has counsel. They, I guess, are not  
9 here today.

10 And the State of Massachusetts also is an  
11 interested state. It's a formal status in this type  
12 of proceeding and they have formal proper status, but  
13 they indicated to us that they would not be attending  
14 this meeting. So we have three states and essentially  
15 three main parties.

16 Welcome to all of you and thank you for  
17 coming.

18 Before we get going, we want to thank this  
19 Court, Judge David Howard, I believe is the presiding  
20 Judge of this Court, this historic Courtroom, Windham  
21 Superior Court and we appreciate that he and Larry  
22 Robinson the Clerk of this Court have made this  
23 facility available.

24 It's tight, it's warm, we'll all have to  
25 work together and keep the fans going at full blast,

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1 but we appreciate the use of this facility, historic  
2 and beautiful facility.

3 I also welcome the public and the  
4 opportunity to listen, to hear, to hopefully maybe  
5 understand a little bit about what we're trying to do  
6 and the nature of this proceeding.

7 Before we get into it, I'll go through a  
8 few sort of preliminary matters to get everyone up to  
9 speed and I have five of them that I'd like to cover.

10 First, well, housekeeping, what is the  
11 Atomic Safety and Licensing Board? What is the nature  
12 of a license renewal proceeding? What's the history  
13 of this proceeding, a very brief sort of thing on  
14 that, and what's the nature of an evidentiary hearing?  
15 What are we going to do in this evidentiary hearing?

16 With that, housekeeping. If everyone  
17 could get their cell phones and turn them off so that  
18 we don't get interrupted. I'll do the same thing.  
19 The media is welcome and we're glad they're here  
20 because they can provide some avenue for the public to  
21 be informed about this case, so it's welcome to be  
22 here.

23 In terms of the second point, the nature  
24 and role of the Atomic Safety and Licensing Board. I  
25 think it's a bit important to sort of understand a

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1 little bit about that.

2 Federal law says that the Nuclear  
3 Regulatory Commission is supposed to regulate nuclear  
4 facilities in this country. The NRC, the Commission  
5 is headed by four Commissioners. They are appointed  
6 by the President and confirmed by the Senate and they  
7 lead the NRC.

8 The Commissioners have a large staff who  
9 works for them and they are referred to as the NRC  
10 staff and they're represented here today with lawyers  
11 and with technical people who have spent a lot of time  
12 working on this case.

13 The third arm or entity within the NRC is  
14 the Atomic Safety and Licensing Board. We're  
15 established by a statute, part of the Atomic Energy  
16 Act. We're kind of the judicial branch of the NRC.  
17 Our Judges are separate from the staff. We're  
18 separate from the Commissioners. We have no  
19 connection or allegiance to the staff.

20 We have no communications with the staff,  
21 except what goes informally on the record in writing  
22 or what is heard here today in Court. We don't talk  
23 with them or anything else, even though we're in the  
24 same office building back in Rockville, Maryland.  
25 It's a large office building, actually.

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1                   And under the judicial rules, the rules  
2 that govern this proceeding, we're prohibited from  
3 talking with them, the staff, and they're prohibited  
4 from talking with us. The same thing holds true with  
5 regard to all the other parties, too. We don't talk  
6 with them outside of the record. They don't talk with  
7 us. We are a judicial type of tribunal.

8                   Same thing holds true really with regard  
9 to the Commissioners. We don't talk with the  
10 Commissioners. They talk with us. They don't tell us  
11 what they think we should do in this case. We get the  
12 case. We listen to the evidence. We try to make the  
13 best decision we can and we issue a ruling and that  
14 ruling will be the final ruling of the NRC, unless  
15 somebody appeals it to the Commissioners and they're  
16 like our appellate level. And if it's appealed to the  
17 Commissioners, the Commissioners will take a look at  
18 the issues that are appealed and they'll issue their  
19 ruling and they can overrule us or they can affirm us,  
20 but they don't give me a performance review at the end  
21 of the year. They don't tell me how I ruled is good,  
22 give me a bonus. No bonuses, no performance reviews,  
23 no nothing. We just rule the way we see it and at the  
24 end of the tribunal if somebody doesn't like it, they  
25 can appeal.

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1           These rules are kind of in place to help  
2 us be as neutral and impartial as we can in ruling and  
3 calling them the way we see it. That's sort of what  
4 the Board is.

5           Third preliminary matter is the nature of  
6 the license renewal proceeding. It's limited in scope  
7 by the law, by the regulations to issues that relate  
8 to the renewal of the facility, to the aging of the  
9 facility, and how the aging will be managed over the  
10 20-year time frame they're asking for. This is not an  
11 uprate tribunal. We're not dealing with the uprate  
12 that occurred here. We're not dealing with other  
13 collateral matters. This is not a hearing on Yucca  
14 Mountain and whether it should open or close.

15           We are not even here to talk about the  
16 cooling structure that had a problem in August of '07  
17 and part of it collapsed or the cooling structure that  
18 sprung a leak last week or the other day. That's not  
19 our bailiwick. No one has brought that issue before  
20 us. It's important current issues are out there and  
21 we only have a limited slice in this tribunal of what  
22 we're dealing with.

23           Fourth, a brief history of this  
24 proceeding. And I'll try to keep it brief. It's been  
25 a couple of years.

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1 In January of '06, Entergy applied for its  
2 license renewal. In May of 2006, petitions were filed  
3 to challenge and ask for a hearing with regard to  
4 those issues. This Board was formed in June of '06  
5 and we came to Brattleboro in August of '06 and had a  
6 meeting in the high school where the parties argued  
7 that they should have a petition and have a right to  
8 have a hearing on certain issues they thought were  
9 important.

10 We listened to that, we read the briefs  
11 and we issued a ruling in September of '06 saying yes,  
12 some of the petitioners did have good contentions that  
13 met the requirements and we're going to have a hearing  
14 on it. So we granted the request to have the  
15 evidentiary hearing. This is the evidentiary hearing  
16 we granted in September of '06.

17 Why did it take so long since then? It's  
18 because there were a lot of other things going on, not  
19 by this tribunal, not by this Board, but by the staff  
20 which was reviewing the application that was submitted  
21 by Entergy, probing a lot of questions, doing a lot of  
22 things. The staff issued an environmental impact  
23 statement. That took them a couple -- took them a  
24 while. They issued an SER. You'll hear that referred  
25 to today, a final safety evaluation report. And those

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1 were issued -- the SER, which was sort of the last  
2 shoe to drop before we could have this hearing was  
3 issued in February 25th of '08. So with that done now  
4 we could proceed to get ready for and now hold this  
5 evidentiary hearing.

6 During that time frame, we did a couple of  
7 things, this Board. We went to the site and took a  
8 site visit and inspected the facility for those things  
9 that were related to the issues in our case. Did that  
10 in October of 2007 and we also had what's known as a  
11 limited appearance statement session, where members of  
12 the public were entitled to come forward and give us  
13 a presentation and a statement as to their concerns  
14 that might be related to this case. We did that in  
15 the Latchis Theater in October of 2007.

16 So since that time, since February, the  
17 parties have submitted piles and piles of documents,  
18 exhibits, and testimony from witnesses and other  
19 relevant -- we have thousands of pages of material  
20 that they have submitted and we have tried to, we have  
21 read and tried to understand and digest and I think we  
22 want to commend, I want to personally I would commend  
23 the parties for submitted for very helpful and useful  
24 materials, because there's a lot of difficult  
25 technical issues here.

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1           There are three issues in this case, three  
2 contentions that have been admitted. One of them  
3 deals with metal fatigue as Entergy, or NEC and the  
4 State of Vermont have claimed that Entergy has not  
5 properly calculated the fatigue that will occur with  
6 regard to certain metal components in the reactor over  
7 the 20-year period. And so we're going to evaluate  
8 metal fatigue. That's the first contention that we  
9 will deal with.

10           Steam dryers is another contention. There  
11 is an aging management plan that Entergy has put  
12 together as to how it is going to manage the aging of  
13 that steam dryer over the 20 years, and NEC and the  
14 State of Vermont have contended that that aging  
15 management plan is inadequate in several respects and  
16 we're going to probe that issue, the steam dryer  
17 contention.

18           And third is flow-accelerated corrosion.  
19 NEC and the State of Vermont have alleged that Entergy  
20 has failed to adequately plan for and come up with a  
21 program to manage the corrosion on pipes due to flow  
22 accelerator, the flow, flow accelerated corrosion. So  
23 those are the three contentions that we're going to  
24 deal with. Those are the only three issues we are  
25 going to deal with, because that's the way this

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1 judicial process has worked and that's what's made it  
2 through the process to this stage.

3 Finally, the fifth point, preliminary  
4 point. What's the nature of this proceeding? It is,  
5 as you might guess, a trial, an evidentiary hearing  
6 will be a trial. Witnesses will be sworn in and sit  
7 in the witness box over here. Documents and exhibits  
8 will be presented as evidence. Then, the only people  
9 who talk and get a chance to really talk at this point  
10 are the people who are involved in the trial; the  
11 lawyers, the judges, and the witnesses will testify.  
12 So that's what happens here.

13 Really, the main thing will be the three  
14 of us asking questions of the witnesses, trying to  
15 probe some issues that we have developed or questions  
16 we have as a result of the testimony and the materials  
17 they have already submitted.

18 Those are the five preliminary points.  
19 Now I'm going to turn to a couple of specific things  
20 for today. Most of this are laid out in the order of  
21 July 1 of 2007 for the public. First, we're going to  
22 have opening statements. Each of the parties and the  
23 interested states who are here will have an  
24 opportunity to give us an opening statement. Then  
25 we're going to have a presentation of the witnesses.

1                   We'll have all the witnesses for  
2 contention 2 go sit over in the witness box. They  
3 will be sworn in and then the exhibits for contention  
4 2 will be entered and offered and presumably accepted.  
5 We've had objections and ruled on earlier objections,  
6 and then we'll ask them questions. At the next point,  
7 the Court will ask questions. The Board will ask  
8 questions of the witnesses. This may take a half a  
9 day. It may take two days on any given contention.  
10 We don't know. Hopefully, the witnesses will answer,  
11 you know, short and sweet answers, and we'll ask  
12 reasonably competent questions and maybe we can get to  
13 the bottom of this.

14                   We're planning this, hope to be finished  
15 by the end of the week. After we ask questions and  
16 we've talked about this with the parties before, after  
17 we finished asking questions, we will take a 15-minute  
18 break and the parties will then be entitled to suggest  
19 to us at the end of that break any additional  
20 questions they think we should have asked, could have  
21 asked, have risen. Then we will listen to what they  
22 propose and we may ask some more questions or we may  
23 not as we decide is appropriate.

24                   There's a few parts of this evidence which  
25 is proprietary in nature. It is confidential. It is

1 business confidential or other confidential  
2 information and if we get into that, and I'm not sure  
3 that we're going to have to. I don't think it is  
4 going to happen today or tomorrow, we may have to have  
5 a closed session just for the parties who have signed  
6 the nondisclosure agreement, and that would be, you  
7 know, the public would not be able to sit in on that.  
8 But that would maybe be an hour the whole week, I  
9 don't know.

10 I think that captures it all. Anything,  
11 my colleagues at this point want to add? We're going  
12 to talk about three preliminary issues, but before we  
13 proceed, do the parties, representatives of the  
14 parties, well, first off, I see the State of New  
15 Hampshire may have arrived, so please introduce  
16 yourself, sir.

17 MR. ROTH: Yes, Your Honor, thank you.  
18 I'm sorry for being late. There was quite a bit of  
19 thunder storm traffic on the road.

20 Peter Roth for the State of New Hampshire.

21 JUDGE KARLIN: Welcome, Mr. Roth. Yes, we  
22 thought you'd be here and we're glad you are. So now  
23 we have three, two states, as I've said earlier, the  
24 State of Massachusetts has indicated they would not be  
25 able to attend today. But I'm glad New Hampshire is

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1 here. Welcome.

2 We're going to talk about three things  
3 that I have on the agenda before we get started. One  
4 is the SECY posting of NEC's proposed direct  
5 examination questions. Two is the absence of Dr.  
6 Kenneth Chang from the staff. And three is the legal  
7 issues about the oral argument on the briefs for the  
8 legal issues.

9 Are there any other things that the  
10 parties believe are burning issues we need to cover  
11 before we start with the evidentiary hearing.

12 NEC, Ms. Tyler?

13 MS. TYLER: I had discussed with Ms.  
14 Carpentier this morning the fact that --

15 JUDGE KARLIN: Could you speak us so the  
16 audience can hear you.

17 MS. TYLER: I wish I had a microphone.  
18 Two of NEC's witnesses, Dr. Hopenfeld and Dr. Hausler  
19 have put together PowerPoint slides to which they  
20 would like to be able to refer as they are relevant to  
21 the Board's questions. We distributed those slides to  
22 staff and to Entergy and in discussions among the  
23 attorneys they've objected to the admission -- the use  
24 of the slides.

25 It's NEC's position, basically what the

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1 slides -- the slides with the exception of one of  
2 them, they contain exclusively information that's  
3 either directly copied or excerpted from the pre-filed  
4 exhibits.

5 . And Judge Karlin, you said you were hoping  
6 for short and sweet answers. I think that that was  
7 the purpose of the slides. For instance, Dr.  
8 Hopenfeld at times wants to juxtapose information from  
9 Entergy's materials with information from ours to  
10 equations to definitions of low-accelerated corrosion,  
11 those are two examples. And I think it would expedite  
12 his responses to your questions. If he can refer you  
13 to a slide where he copied the information of  
14 interest, as opposed to asking you to flip through  
15 your voluminous materials.

16 JUDGE KARLIN: Okay. Entergy, do you have  
17 any response to that?

18 MR. LEWIS: Yes, Judge Karlin. We have  
19 objected as Ms. Tyler indicated. There is one  
20 addition, it's a substantive addition to the slides  
21 and we would object just on that basis. But we also  
22 believe that the slides are not responsive to any  
23 particular questions at this point and we would simply  
24 view those as NEC's attempt to make an additional  
25 presentation that's not been requested by the Board.

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1 We think that the exhibits are out there and if  
2 there's a need to refer to the exhibits, the witnesses  
3 are capable of identifying the exhibits and responding  
4 to the questions.

5 JUDGE KARLIN: Mr. Subin, the staff, do  
6 they have any thought on this?

7 MR. SUBIN: We agree with Entergy. We  
8 also believe that these exhibits could have been filed  
9 with the testimony originally if they knew in advance  
10 that that's what he was going to do for his  
11 presentation.

12 JUDGE KARLIN: Okay, well, as we've said  
13 several times in this proceeding when we had prior  
14 conference calls and meetings with the parties, the  
15 parties' opportunity to present their case was part of  
16 the written submissions ahead of time and there is  
17 massive exhibits and testimony submitted ahead of  
18 time. Then there was rebuttal testimony and exhibits  
19 submitted a bit later by everyone. And really, the  
20 only purpose of this proceeding is for us to ask some  
21 questions about that material.

22 Now the one thing on one of the  
23 contentions, contention 4, I believe it is, we did ask  
24 for Mr. Horowitz, I think it was, to give a short  
25 presentation about it because we thought that might be

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1 a better way to elicit some information for us, for  
2 our benefit. But all of the material in the record is  
3 already there.

4 We think we'll be able to elicit from Dr.  
5 Hopenfeld the information we need by asking questions  
6 of him and so we will deny the request to have  
7 additional slide presentations made.

8 Any other preliminary issues that want to  
9 be raised at this point?

10 (No response.)

11 Okay, then we will turn to the three that  
12 I did identify and the first is the Secretary of the  
13 NRC, sort of the Court Reporter, not reporter, but the  
14 clerk of the Court, SECY, we call it, the Secretary,  
15 inadvertently posted on NRC's public website, ADAMS,  
16 I believe it was or the EHD, the Electronic Hearing  
17 Docket, some proposed direct examination questions  
18 that had been posed by NEC. This was inappropriate  
19 and they shouldn't have done that. The regulations  
20 provide that those are to be kept confidential until  
21 after this evidentiary hearing occurs and then they're  
22 put on the record.

23 Ms. Baty notified us last week with an  
24 email, I guess it was Friday the 11th that this had  
25 happened and I appreciate that she jumped on it and we

1 were informed. I immediately called Emile Julian who  
2 is the responsible person at the Secretary's Office  
3 and asked him to immediately remove that document.  
4 Ms. Baty had said she had already asked him to remove  
5 it, too, but I just wanted to emphasize the point and  
6 he said he would do so and in fact, he did.

7 I sent an email immediately to counsel for  
8 all parties informing them that this was a problem and  
9 asked -- instructing them to direct all of their  
10 witnesses and the other parts of their litigation team  
11 not to access that document and to investigate whether  
12 such people had already accessed the document and if  
13 they had, to give us a report.

14 Subsequently, Entergy and the staff did  
15 give us such a report and told us what had happened  
16 and I believe everyone saw a copy of that. NEC saw a  
17 copy of those reports as well.

18 I'm not sure what more we can do. NEC,  
19 what are your thoughts?

20 MS. TYLER: Well, I think our primary  
21 thought is that it's just tremendously disappointing  
22 that this occurred. Entergy has basically represented  
23 that their attorneys and witnesses did not review the  
24 plan. The staff, however, has represented that  
25 basically all of their witnesses reviewed the plan in

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1 detail. It's hard for me --

2 JUDGE KARLIN: I'm not sure they said  
3 detail.

4 MS. TYLER: They said they read it.

5 JUDGE KARLIN: They said what they said.

6 MS. TYLER: They said what they said.  
7 They said they read it. I think it's disappointing to  
8 us that it was actually the project manager for the  
9 NRC staff that apparently circulated the plan among  
10 the other witnesses, although I'm sure Ms. Baty put a  
11 stop to it as soon as she was aware.

12 You know, I think this is a situation  
13 where the secret plan is disclosed and we can't take  
14 it back and I don't have a proposal, really, as to  
15 what we should do to remedy this, but it feels, I  
16 think very unfair at the moment.

17 JUDGE KARLIN: Well, I agree it's an  
18 unfortunate situation. We had a monthly meeting of  
19 all of the Judges of the Atomic Safety and Licensing  
20 Board last week and I alerted all of them to this  
21 problem and we have talked with SECY, Emile Julian,  
22 and said we've got to work on this. There are two  
23 aspects, really, to it.

24 In the future, I think lessons learned is  
25 it would probably be wiser if counsel for all the

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1 parties would not send this document to the SECY at  
2 all and just send it to the Judges, send it to the  
3 chair of the Board and we will in future issue  
4 instructions and encourage the other Judges to do that  
5 so that it's not sent to the SECY, so this problem  
6 doesn't occur.

7           They have training over there at SECY to  
8 tell people not top ut these things on, but the person  
9 who was involved apparently was a new employee and  
10 didn't get the training and didn't get the word. It  
11 was apparently only on there for a short amount of  
12 time, but the cat is out of the bag. I think we've  
13 tried to take remedial action and I think we have to  
14 proceed on that basis and do the best we can. I  
15 apologize for that.

16           Any other comments or thoughts?

17           (No response.)

18           The second item to talk about is Dr.  
19 Chang. Dr. Chang was put forward as a witness,  
20 Kenneth Chang, by the staff. He submitted testimony  
21 on contention 2. It was significant. And now we got  
22 a letter from the staff indicating he had an illness  
23 or a medical situation and was not going to be  
24 available today. We did have some questions for him.

25           Mr. Subin, can you please report on this

1 or Ms. Baty?

2 MR. SUBIN: Ms. Baty.

3 MS. BATY: Your Honor, the staff has  
4 considered the situation and under the circumstances,  
5 because of his medical condition Dr. Chang has retired  
6 from federal service and will not be available. In  
7 order to preserve the fairness of this proceeding,  
8 given that it's highly unusual to have a witness  
9 prepare testimony and then not appear, we would  
10 request permission to withdraw his testimony.

11 JUDGE KARLIN: Well, yes, I think this is  
12 a problem. That's probably the appropriate remedy.  
13 It seems to me that -- when did you find out this was  
14 -- there was a difficulty with him? We had a  
15 conference call on the 27th of June and talked about  
16 it at that time and I asked everyone to make sure the  
17 witnesses were all there. Did you know at that time  
18 or have an inkling?

19 MS. BATY: We did not have confirmation on  
20 his status until the day that we reported it to the  
21 Board.

22 JUDGE KARLIN: All right.

23 MS. BATY: That was the day we actually  
24 received notice from his doctor.

25 JUDGE KARLIN: I see. So the staff's

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1 position is to withdraw his testimony in its entirety?

2 MS. BATY: Yes, Your Honor.

3 JUDGE KARLIN: NEC any objections or  
4 concerns about that?

5 MR. LAUBVOGEL: Excuse us for a moment.

6 JUDGE KARLIN: Sure.

7 (Pause.)

8 MS. TYLER: I think it's an odd situation.  
9 Dr. Chang was the primary witness for the staff on  
10 NEC's contentions 2A and 2B. He apparently managed  
11 the review of the analyses that we're discussing. He  
12 wrote the relevant part of the SER. The other witness  
13 for the staff, John Fair, submitted much less  
14 extensive testimony and appears not to have been  
15 remotely as involved.

16 So if Dr. Chang's testimony is withdrawn,  
17 there's very little in the record regarding the  
18 staff's position on this issue.

19 NEC would note as well that part of what  
20 Dr. Chang had to say was actually supportive of NEC's  
21 position. Dr. Chang testified that he couldn't  
22 confirm the conservatism of the analysis in certain  
23 respects and that testimony was, in fact, inconsistent  
24 with what the Agency stated in its statements of  
25 position.

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1 I think that NEC -- if the testimony is  
2 withdrawn, I think that NEC's witness, Dr. Hopenfeld,  
3 should be permitted to refer to the aspects of Dr.  
4 Chang's testimony that were supportive of our  
5 position. Dr. Chang has submitted a sworn affidavit  
6 and I think that Dr. Hopenfeld can rely, quote  
7 unquote, on Dr. Chang's statements as an expert  
8 relying on the opinion of another expert.

9 My co-counsel has also raised the fact  
10 that there were a number of exhibits to Dr. Chang's  
11 testimony which presumably would be withdrawn from the  
12 record as well. So again, we're left with very little  
13 regarding the staff's review of the analyses which  
14 seems an unfortunate situation.

15 JUDGE KARLIN: Before I go back to the  
16 staff, perhaps I'll just ask Entergy if they have a  
17 position. I mean in this type of proceeding I would  
18 note that Entergy, the Applicant, has the burden of  
19 persuading us of proving its case that it is entitled  
20 to get this license renewed, that it has met the  
21 criteria for the three contentions in question.  
22 Entergy has the burden of proof.

23 And it might be that the loss of this  
24 testimony might be more problematic to the person with  
25 the -- the party with the burden of proof than not.

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1 Let's hear from Entergy and then we'll come back to  
2 the both of you.

3 MR. LEWIS: Thank you, Judge Karlin.  
4 We've looked at Mr. Fair's testimony and think it  
5 stands on its own quite well, so we would not oppose  
6 the staff's proposal to withdraw Dr. Chang's  
7 testimony.

8 We do believe this contention relates  
9 mainly to the adequacy of our refined analyses and  
10 confirmatory analyses and the methodologies of the  
11 uncertainties and the various science and reports that  
12 have been done on this phenomena and Mr. Fair is  
13 eminently qualified to provide responses in that area.

14 I would suggest that the exhibits that the  
15 staff has proffered remain in evidence unless there is  
16 a specific objection to an individual exhibit. They  
17 include the SER, a number of RAI responses. The SER,  
18 in fact, is a very useful document to the extent that  
19 NEC is interested in capturing Dr. Chang's review  
20 because it, in fact, sets out in considerable detail  
21 all the things that Dr. Chang looked at during the  
22 review and his questions and his concerns and all the  
23 areas where he had any issue that he thought needed to  
24 be identified.

25 JUDGE KARLIN: Okay. Ms. Baty, perhaps --

1 let me ask, the staff has a number of exhibits and  
2 perhaps we'll have to focus on this with NEC as well.  
3 How many of them are related or cited only in Dr.  
4 Chang's testimony?

5 MS. BATY: I'd have to take a moment, Your  
6 Honor, to determine that. Which ones are not also  
7 cited by Mr. Fair.

8 JUDGE KARLIN: Right.

9 MS. BATY: Just give me a moment --

10 JUDGE KARLIN: I'm not asking for a number  
11 right now, but I think before the end of the day or  
12 before -- we'll probably need to understand that what  
13 the consequences would be for the exhibits.

14 It seemed to me that if exhibits were only  
15 referred to by Dr. Chang, then they would be excluded  
16 or fall or whatever as well unless they are otherwise  
17 picked up in some other testimony. But this is a  
18 difficult situation. What is your response to NEC's  
19 argument?

20 MS. BATY: Well, I would first echo your  
21 statement that this proceeding, the burden of proof is  
22 on the Applicant to show the adequacy of their  
23 application. The issue in this proceeding is not the  
24 adequacy of the staff's review or how the staff came  
25 about its review or the staff's determination. It's

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1 really about what Entergy did.

2 The SER also, that's one -- that's an  
3 exhibit that all of our witnesses have referred to at  
4 some point in their testimony. But that's also an  
5 exhibit that the staff has required by the rules to  
6 submit. It's obviously that with that exhibit there  
7 shouldn't be any question, but what that's admissible,  
8 but of course the weight of that exhibit and what  
9 portions the Board gives weight, of course, is up to  
10 the Board.

11 As Entergy said, I've seen Dr. or Mr.  
12 Fair's professional qualifications. He is very well  
13 qualified to speak on the issue of the various FEN  
14 calculation equations and on the various NUREGs that  
15 are at issue. He's eminently qualified to do that,  
16 and he's qualified just the same way that Dr.  
17 Hopenfeld or Dr. Hausler is able to come in and review  
18 the documents and provide a professional opinion on  
19 those documents.

20 JUDGE KARLIN: Well, he may be qualified,  
21 but I don't know whether he actually did testify as to  
22 the calculations here. If I remember, he spoke, he  
23 said that he did not review the license renewal  
24 application. He focused on, was it, other aspects,  
25 right?

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1                   So Mr. Fair, he may be qualified, but his  
2 testimony does not go to any of that. Let me ask  
3 this. Who was the principal author of this section in  
4 the FSER?

5                   MS. BATY: That was Dr. Chang.

6                   JUDGE KARLIN: Who was the second staff  
7 person on this section of the Safety Evaluation  
8 Report?

9                   MS. BATY: Dr. Chang was the author of  
10 this section. Mr. Jonathan Rowley, who is also  
11 witness in the proceeding, was responsible for putting  
12 together the entire SER and coordinating the  
13 development of that document. But there is no, if  
14 there had been another individual who was prepared to  
15 adopt Dr. Chang's testimony, we would have put that  
16 individual forward. But given the circumstances of  
17 the late date and just what happened in this  
18 particular case, particularly when it comes to the  
19 refined and confirmatory analyses, Dr. Chang was the  
20 person.

21                   JUDGE KARLIN: Okay, well, NEC, one last  
22 --

23                   MR. LAUBVOGEL: Yes, Your Honor. We would  
24 certainly move that the portions of the SER that were  
25 authored by Dr. Chang be struck from the record.

1 Based upon the representations counsel just made now,  
2 we think that's critical. And then, what you're going  
3 to be left with is an incomplete SER, and I think  
4 you're going to have to assess what that means with  
5 respect to this proceeding. But we don't see how you  
6 can admit that at least the portions of the SER that  
7 were authored by Dr. Chang.

8 MS. BATY: Your Honor, may I? We would  
9 strongly object to that because Mr. Rowley, who can  
10 corroborate what is said in the SER to the extent of  
11 did the audits take place, that Dr. Chang reviewed  
12 documentation that was brought to him. So there is  
13 corroborating evidence to support the SER. And he can  
14 sponsor, he can sponsor it. It would be entirely  
15 inappropriate to strike it at this point.

16 JUDGE KARLIN: All right, thank you.  
17 We've tried, I think, my fellow judges and I will at  
18 the next break discuss this and talk about it a little  
19 bit and then try to rule. At this point, we'll just  
20 take it under advisement. As I understand it, there  
21 is a request motion by the staff to withdraw the  
22 testimony of Dr. Chang entirely from the submission  
23 and there's an objection from NEC about that,  
24 particularly if that happens and they would object to  
25 having, they want the rest of the -- the FSER, that

1 section struck. Is that right?

2 Okay. So we'll take that under  
3 advisement. I think we are going to proceed with this  
4 matter. It may be that we have to do something after  
5 the fact, but right now we're going to proceed with  
6 the evidentiary hearing.

7 MR. LEWIS: May I just offer two quick  
8 thoughts? One is I believe the NRC rules require the  
9 SER to be placed in evidence. I don't believe it can  
10 be excluded under the NRC rules.

11 And second, I believe the NRC rules give  
12 the NRC staff the right to designate the witnesses  
13 that it wishes to present. In fact, in the discovery  
14 rules there's a specific provision that says that it  
15 is the staff's prerogative to choose what witnesses.

16 JUDGE KARLIN: Yes. You're speaking of  
17 2.1207(b)(4) where the Executive Director gets to  
18 designate the witnesses. We, likewise, get to accept  
19 or reject the testimony and exhibits as we see fit and  
20 so if someone gets withdrawn -- we have said in this  
21 Court several times in this proceeding, three or four  
22 times, I've said if anybody submits written testimony  
23 for a witness, then that witness has to be here for us  
24 to ask questions of and Dr. Chang is not here, so  
25 there's a problem here and it's unfortunate, but it is

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1 what it is. There's a medical situation with regard  
2 to Dr. Chang and we're going to take it under  
3 advisement and try to issue something later.

4 MS. TYLER: Judge Karlin.

5 JUDGE KARLIN: Yes.

6 MS. TYLER: Before we move on, I just  
7 wanted to clarify that NEC doesn't necessarily object  
8 to a withdrawal of Dr. James. But if it is withdrawn,  
9 our witness, Dr. Hopenfeld, should be able to refer in  
10 his testimony to those portions of Dr. James'  
11 statement that supported our position.

12 JUDGE KARLIN: Okay. We said that once.

13 MS. TYLER: Yes.

14 JUDGE KARLIN: Thank you. Okay.

15 Next legal issues. On June 27<sup>th</sup>, we  
16 issued an order asking the parties to brief two legal  
17 issues that were of concern to us that came up because  
18 of factual material and the evidence that was  
19 submitted. We've received those briefs. We've  
20 received reply briefs on that, including the State of  
21 Vermont. We thought those were helpful.

22 We haven't completed studying those briefs  
23 and therefore we are not going to conduct oral  
24 argument on those this week. We thought about asking  
25 the lawyers to be able to do that towards the end of

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1 the week. We didn't ask you to do that and this is  
2 why. So if we need oral argument on those legal  
3 issues and briefs, we will schedule something later,  
4 probably in August, as quickly as we can. But we  
5 appreciate the submission. We just want to let you  
6 know we're not going to have any oral argument on  
7 those issues.

8 With that, we've completed the  
9 introductory session and we're ready for the opening  
10 statements to be made by the parties. I believe that  
11 -- NEC, the floor is yours.

12 MS. TYLER: Judge Karlin, could I begin up  
13 one final preliminary issues, I'm sorry, before we  
14 move to opening statements?

15 JUDGE KARLIN: Yes.

16 MS. TYLER: This is something that we may  
17 address when it comes up in the discussion of  
18 Contention 4. But Dr. Horowitz, Energy's witness,  
19 will be presenting, has a presentation prepared, about  
20 the CHECWORKS Code. We've just received from  
21 Entergy's counsel a copy of his slide this morning.  
22 We would like to ask our witness, Dr. Hopenfeld, to  
23 review them and we'd like to request the opportunity  
24 for Dr. Hopenfeld to make live rebuttal to what Dr.  
25 Horowitz has to say.

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1 Dr. Hopenfeld hasn't had the opportunity  
2 to review the materials. So I'm actually not sure at  
3 this time whether he has any rebuttal to offer. But  
4 if he does, we request that time be made available for  
5 that.

6 JUDGE KARLIN: Well, I think our response  
7 to that goes along with the same response on this  
8 issue raised earlier which is the witness testimony is  
9 for us to ask questions and get answers, not for  
10 people to give rebuttal statements or any other kind  
11 of tutorials. So we're going to try to ask, try to  
12 ask, crisp, direct questions and we're going to ask  
13 our witnesses to give us crisp, direct answers, from  
14 all of the witnesses, not tutorials, not long  
15 statements. So this is not the time for rebuttal.  
16 We'll deny that.

17 You may proceed with your opening  
18 statement please, approximately ten minutes.

19 MS. TYLER: Good afternoon to Judges of  
20 Atomic Safety and Licensing Board. My name again is  
21 Karen Tyler. I'm representing New England Coalition.  
22 New England Coalition is the sponsor of the three  
23 contentions before the Board today and opposes  
24 Entergy's application to operate the Vermont Yankee  
25 plant for an additional 20 years.

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1 Vermont Yankee is in a special class of  
2 nuclear power plants. It began operation 36 years in  
3 1972. It's one of the very oldest operating nuclear  
4 power plants in the country. It's also one of only a  
5 few plants nationwide that have obtained NRC approval  
6 to increase power output by 20 percent which increases  
7 the stress on many of the plant's components and  
8 systems.

9 You, Judge Karlin, have instructed the  
10 parties that we're not here to discuss the failure of  
11 the cooling towers and it's true that NEC doesn't have  
12 a contention before the Board today about those  
13 towers. Nonetheless, it's NEC's position that these  
14 incidents set the stage in a sense for the Board's  
15 consideration of any NEC's other issues and that the  
16 Board should be concerned about what they may signify  
17 about the condition and maintenance of the rest of the  
18 plant. NEC's contentions and the decision to  
19 relicense the plant in general deserves the Board's  
20 very careful consideration. We should be absolutely  
21 certain that Entergy has programs in place or has  
22 completed analyses that ensure that this plant can be  
23 safely operated until 2032.

24 All three of New England Coalition's  
25 contentions focus on age-related deterioration of the

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1 plant and they specifically concern with Entergy has  
2 proposed aging-management programs or performed  
3 analyses basically that demonstrate that components of  
4 the plant won't break apart with potentially  
5 disastrous consequences during the period of extended  
6 operations.

7           NEC's Contentions 2a and 2b concern a  
8 series of analyses that Entergy performed to assess  
9 the impact of environmentally-assisted metal fatigue  
10 on the plant. These analyses project cumulative usage  
11 factor calculations that Entergy performed under its  
12 current license assuming that the plant would operate  
13 for 40 years and project those CUF values to the end  
14 of the period of extended operations or 60 years.  
15 These CUFen analyses are meant to demonstrate that  
16 components of the plant that are vulnerable to  
17 environmentally-assisted metal fatigue won't break  
18 apart during the extended license term and these  
19 analyses would substitute for alternative approaches  
20 to ensuring the integrity of these components through  
21 inspection, maintenance and replacement.

22           NEC's witness, Dr. Hopenfeld, contests the  
23 validity of the methodology that Entergy has used to  
24 perform its CUFen calculations, Dr. Hopenfeld contends  
25 that Entergy's results are unreliable and further that

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1 acceptance of these results as the basis to forego a  
2 program of component inspection repair and replacement  
3 will jeopardize public health and safety. NEC also  
4 contends that this analysis is incomplete at this time  
5 because Entergy has fully performed it only for one  
6 component of the plant, that being the feedwater  
7 nozzles.

8 As we've just discussed, the parties have  
9 just finished briefly the legal framework for the  
10 Board's consideration of Contentions 2a and 2b and  
11 Entergy and the staff proposed an interpretation of  
12 the NRC rules in that briefing that would basically  
13 eliminate the role of the public and of the Board in  
14 the review of a TLAA, time-limited aging analysis,  
15 such as the CUFen calculations. In Entergy's and the  
16 staff's view, an applicant is not required to include  
17 an analysis projecting the TLAA until the end of the  
18 period of extended operations in the application. The  
19 license could instead make a very generally stated  
20 commitment to perform the analysis of an aging  
21 management plan after the license is approved and the  
22 NRC's staff's review of that analysis would take place  
23 after the license is approved.

24 If this is what the rules allow, then the  
25 rules are in violation of Atomic Energy Act which

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1 requires the Nuclear Regulatory Commission to allow  
2 public review of any safety issue that's material to  
3 the licensing division in a hearing before this Board.  
4 The Act also requires that the agency find a plant can  
5 be safely operated, operated without endangering  
6 public health, before the license is approved and not  
7 afterwards.

8 What the governing rules 54.21(c)(1) and  
9 54.29 actually require is that if an applicant intends  
10 to rely on a time-limited aging analysis to make its  
11 demonstration of reasonable assurance of public  
12 safety, it has to include an analysis that either  
13 justifies or projects that TLAA to the end of the  
14 period of extended operations in its application. If  
15 it chooses not to do this, then the applicant has to  
16 propose an aging management plan that doesn't rely on  
17 the TLAA and that it has to describe that plan in  
18 enough detail to allow both the NRC staff and any  
19 intervenors to rigorously evaluate it.

20 What this means in the context of today's  
21 proceeding is that Entergy needs to complete its CUFen  
22 analyses before the license renewal is approved and  
23 if, as NEC contend, these analyses don't in fact  
24 provide that environmentally-assisted metal fatigue  
25 won't cause failure of plant components, then Entergy

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1 needs to develop a program of inspection repair and  
2 replacement of components to address this problem and  
3 NEC would then have a right to review that program  
4 under its Contention 2 which is now stayed by order of  
5 the Board pending the Board's decision of Contentions  
6 2a and 2b.

7 NRC's Contention 3 concerns Entergy's plan  
8 to manage the age-related deterioration of the plant's  
9 steam dryer. The Contention 3 concern is that again  
10 metal fatigue could cause pieces of the dryer to break  
11 away and migrate through the plant where they could  
12 damage the related equipment.

13 Entergy has represented to the Board in  
14 this proceeding in prior motion practice that its  
15 aging management program will involve exclusively  
16 visual inspection of the dryer during summary fuel  
17 outages and monitoring of certain parameters for  
18 evidence that the dryer could be damaged. Entergy has  
19 also represented that its program will not depend or  
20 repeat the stress load modeling that Entergy conducted  
21 before the power uprate and the Board has also ruled  
22 that that modeling has not been validated as the basis  
23 for aging management of the steam dryer. NEC,  
24 therefore, contends that Entergy's program is  
25 insufficient because it doesn't involve any means of

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1 predicting stress loads on the dryer, establishing  
2 load margins or establishing that loads in the dryer  
3 will fall below ASME code fatigue limits.

4           NEC's Contention 4 finally is that Entergy  
5 has not proposed an adequate program to manage  
6 deterioration of plant piping caused by flow-  
7 accelerated corrosion. NEC has specifically contested  
8 Entergy's reliance on a computer code called the  
9 CHECWORKS. NEC's expert witness, Dr. Jerome  
10 Hopenfeld, contends that the CHECWORKS model is  
11 unreliable and can't be calibrated to plant conditions  
12 following the power uprate before the expiration of  
13 Entergy's current license.

14           In the pre-filed testimony, NEC's  
15 witnesses have disagreed with Entergy's witnesses  
16 concerning a number of very fundamental issues. These  
17 include the definition of FAC, of flow-accelerated  
18 corrosion, for purpose of Entergy's aging management  
19 plan, how flow-accelerated corrosion would wear,  
20 varies with velocity and with time and whether the  
21 CHECWORKS model can account for variations associated  
22 with geometric discontinuities in the plant. NEC has  
23 also observed that Entergy hasn't specified certain  
24 basic parameters of its program such as the total FAC  
25 susceptible area inspects.

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1           The Board has already reviewed NEC's pre-  
2           filed testimony and other evidence concerning all  
3           three contentions. NEC hopes that the Board will take  
4           this opportunity to discuss any of the issues further  
5           with NEC's witnesses.

6           On the record before the Board right now,  
7           Entergy is not satisfied with standard for license  
8           renewal under the Atomic Energy Act and the NRC's  
9           regulations. It has not demonstrated that the plant  
10          could be operated through the end of the renewed  
11          license term without jeopardizing the health and  
12          safety of the public. On the record before the Board  
13          right now, the license renewal application should be  
14          denied.

15                   Thank you.

16           JUDGE KARLIN: Thank you. Next, I think  
17          we have the State of Vermont opening statement please.

18           MR. ROISMAN: Mr. Chairman, with your  
19          permission, may I stand?

20                   JUDGE KARLIN: Yes please.

21           MR. ROISMAN: Thank you.

22           On behalf of Sarah Hoffman, the Public  
23          Advocate, the Department of Public Service and myself  
24          and the State of Vermont, welcome to Vermont. I  
25          submit that while the days may be warm our warmest day

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1 will be cooler than your coolest day back at home. So  
2 enjoy your week in Vermont.

3           There is some irony that there is a  
4 controversy about extending the life of the Vermont  
5 Yankee Plant. Which of us as we reach the end of our  
6 lives wouldn't like to get a 20 year extension. But  
7 as you might expect, the process is much more  
8 controversial than the wish to have it done. And the  
9 history of this plant, there's a history of  
10 controversy in the State of Vermont.

11           From the very beginning, Vermont Yankee  
12 was allowed to operate and be built in this state by  
13 a single vote in the state legislature, one vote.  
14 Subsequently, the legislation directed that it keep a  
15 close eye on this plant and controversy has followed  
16 the plant since its opening days, proponents,  
17 opponents, everything has been hotly contested.

18           And, throughout all of this, the State of  
19 Vermont's position has remained consistent. It wanted  
20 to be certain that with this plant which would be  
21 built and operated in this state that it would be  
22 safe, that's why we're here, and that it would be  
23 reliable and economically feasible which is why the  
24 Public Service Board holds hearings frequently  
25 regarding the Vermont Yankee plant.

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1 Vermont has through its Department of  
2 Public Service maintained close scrutiny on Vermont  
3 Yankee. A nuclear engineer has been constantly  
4 present at the Vermont Yankee plant for inspections.  
5 In fact, the Vermont Yankee plant inspection which is  
6 occurring today is where the Vermont nuclear engineer  
7 is while that inspection is taking place. Over the  
8 years, that oversight by the nuclear engineer for the  
9 State of Vermont has raised issues and resulted in the  
10 favorable resolution to improve safety to the plant.

11 Throughout this process in this hearing,  
12 Vermont was remained steadfast in its commitment to  
13 the proposition that these issues of serious safety  
14 concern need to be resolved by an independent,  
15 competent, concerned board and we are delighted that  
16 that board exists and has taken on that task. Even  
17 now, the State of Vermont's legislature has authorized  
18 the State in its pursuit of its concerns about  
19 reliability and economic viability to conduct an  
20 independent inspection of the Vermont Yankee plant and  
21 a panel has been set up to do that.

22 Now as you've heard from the New England  
23 Coalition, there are three, arguably four if you take  
24 2a and 2b as each separate, serious safety questions  
25 that are present here and these issues like the issues

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1 that have historically been raised about Vermont  
2 Yankee are hotly contested and the consequences of the  
3 resolution of these issues is enormous on either side.  
4 For Vermont Yankee, it could mean that the plant is  
5 not allowed to operate beyond the year 2012 or that in  
6 order to operate beyond that time, a substantially  
7 larger amount of money will have to be spent on safety  
8 concerns. On the opposite side is the people who  
9 believe that there is a problem here and are concerned  
10 about their own safety and the reliability of their  
11 own electric systems if the plant is allowed to go  
12 ahead, so a very large consequence here at stake.

13 Yet here we are in front of hearing board  
14 asking you to take these concerns, to strip away our  
15 hot passions, to find the facts, to locate the truth  
16 and to enter a decision based upon the record that's  
17 in front of you. And in some ways it's a remarkable  
18 thing because at this very moment in many places  
19 throughout the world issues of similar hot contest are  
20 being resolved with guns and bombs and in this  
21 American, this unique, country in which we live, we  
22 can take the most passionate issue and we can ask an  
23 independent body to decide who's right and who's wrong  
24 and whether we win or lose we go home knowing we've  
25 had our chance. We have an opportunity to have the

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1 issue resolved and the conflict is resolved without  
2 what we see in other places of the world.

3 So we thank you for coming here and  
4 reaffirming that the American way of resolving  
5 conflicts is still the only way for civilized society  
6 to operate. Thank you very much:

7 JUDGE KARLIN: Thank you, Mr. Roisman.  
8 Entergy I think is next. Mr. Lewis.

9 MR. LEWIS: Thank you. Entergy is pleased  
10 to appear before you today to present its case of  
11 these three contentions in this proceeding. That case  
12 will show that effective aging management programs  
13 have been put in place to address the aging effects  
14 that are the subject of these three contentions.

15 Those programs build off extensive  
16 experience. They follow NRC staff guidance that was  
17 intended to capture programs that were affected at  
18 other plants, but they don't stop there. They've been  
19 looked at extremely carefully by the NRC staff in this  
20 proceeding. They've been challenged in this  
21 proceeding and, as a result, there has been a lot of  
22 additional work that has gone into the testimony and  
23 into addressing these issues and then putting them to  
24 rest and today we will present a panel of witnesses on  
25 a fatigue contention followed up by witnesses on the

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1 other two contentions who are here to demonstrate that  
2 the analyses that they performed and the programs that  
3 are in place are effective and will provide reasonable  
4 assurance that the health and safety will be protected  
5 during the period of extended operation..

6 With respect to Contention 2, the evidence  
7 will show that Vermont Yankee has established a  
8 fatigue monitoring program that is consistent with the  
9 NRC staff guidance and that has been determined to be  
10 adequate by the staff to manage the effects of  
11 fatigue. The phenomena of environmentally-assisted  
12 fatigue is addressed as part of that program. Under  
13 this program, a sample of critical components is  
14 evaluated by applying environmental correction factors  
15 to the cumulative usage factors which are obtained in  
16 turn from the ASME Code Fatigue Analysis. If any  
17 environmentally-adjusted cumulative usage factor  
18 exceeds unity, the program provides for corrective  
19 actions which may include more refined analyses,  
20 repair or replacement, or an inspection program. This  
21 fatigue monitoring program also includes tracking the  
22 number of transients during the period of extended  
23 operation to provide assurance on a continuing basis  
24 that these analyses remain valid during the period of  
25 extended operation. So the program does not stop with

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1 analyses, but it's a continual effort to ensure that  
2 these CUFs remain below one.

3 A screening evaluation in Entergy's  
4 license renewal application initially indicated that  
5 more refined analyses or other corrective actions  
6 would be required for a number of components. In this  
7 proceeding, NEC then challenged the level of detail  
8 which those corrective actions were described. In  
9 order to avoid arguing about the level of detail of  
10 these future corrective actions, Entergy performed  
11 refined calculations for all of the critical locations  
12 to which the EIS phenomena applied. Those refined  
13 calculations showed that the environmentally-adjusted  
14 CUF would remain below one for the period of extended  
15 operation. Nevertheless, we still had this fatigue  
16 monitoring program which would continually validate  
17 that conclusion.

18 On review, the NRC staff questioned three  
19 of these refined analyses and they requested a further  
20 confirmatory analysis of the most bounding nozzle of  
21 these three, the feedwater nozzle. Our testimony, our  
22 experts, will show that the analysis that was  
23 performed will indeed demonstrate that the CUF remains  
24 below one. We will present a panel of well qualified  
25 experts including Mr. Gary Stevens who is a leading

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1 expert on fatigue analyses and Mr. James Fitzpatrick  
2 who is an engineer with over 30 years experience and  
3 was the Senior Lead Engineer in Design Engineering  
4 when these calculations were performed. They will  
5 demonstrate that these analyses are not only correct,  
6 but indeed conservative.

7 Now Dr. Hopenfeld for NEC has claimed that  
8 the feedwater nozzle is not bounding. But as our  
9 testimony will show, the feedwater nozzle is the  
10 component that's of these three nozzles subject to the  
11 most stresses, the most severe stresses, and the  
12 highest cumulative usage factor. Thus, there is  
13 simply no credible basis to the claim that this is not  
14 the bounding component.

15 Dr. Hopenfeld will also claim that there  
16 are uncertainties in the fatigue analyses and he  
17 therefore advocates applying very extreme and  
18 unsupportable Fen values. these environmental adjusted  
19 factors. But again as the testimony of our witnesses  
20 will show, each of the factors in Dr. Hopenfeld's  
21 testimony which will show up in Table 1 of his  
22 rebuttal is either already considered in the  
23 methodology or is irrelevant. Moreover, as our  
24 witnesses are prepared to explain, a calculation of  
25 the CUFen values using the guidance document advocated

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1 by Dr. Hopenfeld, NUREG CR6909, would and properly  
2 performed in fact give lower values than the ones  
3 computed by Entergy in every case.

4 With respect to Contention 3, Entergy will  
5 present the expert and knowledgeable testimony of Mr.  
6 John Hoffman and Mr. Larry Lukens. Their testimony  
7 will show that Entergy has taken a number of measures  
8 to ensure that the steam dryer will not suffer from  
9 vibration-induced cracking. First, Vermont Yankee  
10 made significant physical modifications to strength  
11 the dryer after the experience at Quad Cities to  
12 improve the capability of the dryer to withstand flow-  
13 induced vibration.

14 Second, in the uprate proceeding, a design  
15 validation was performed to demonstrate that predicted  
16 stress levels would be below the endurance limit  
17 specified in the ASME Code. That was in the EPU  
18 proceeding. In this proceeding, we have proposed  
19 additional aging management programs. As part of that  
20 program and indeed we've been conducting it prior to  
21 the program but will continue to conduct it we will  
22 perform continuous online monitoring of parameters  
23 that would be indicative of dryer cracking. In  
24 addition, we have been conducting and as part of our  
25 aging management program we'll continue to conduct

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1 detailed inspections of all accessible, susceptible  
2 dryer locations to confirm that fatigue cracking is  
3 not occurring.

4 Now NEC claims that this inspection  
5 program is inadequate if it doesn't include a means of  
6 measuring the stresses on the dryer components. We  
7 will show and our testimony and the evidence in this  
8 proceeding will show that this claim lacks merit for  
9 several reasons. First, as I briefly said, in design  
10 validation and in the uprate proceeding, the stresses  
11 were predicted to be below the endurance limit which  
12 means the stresses are below the levels where cracking  
13 would be expected to occur. This is not a time  
14 limited aging analysis. It's not time dependent.  
15 It's below the endurance limit and therefore cracking  
16 should not occur irregardless of cycles and  
17 irregardless of years and, as a result, this is a  
18 determination that's part of the plant's design and  
19 current licensing basis.

20 Second, I should point out that NEC here  
21 is calling for measures that are not implemented for  
22 any other component in any nuclear plants including  
23 ASME Class I components. There is no continuous  
24 measurement of stresses for the reactor vessel or any  
25 other component.

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1                   But third, most importantly as our experts  
2 will demonstrate, the inspections that we are  
3 performing are indeed adequate to demonstrate that  
4 fatigue cracking is not occurring. As our testimony  
5 of our experts will show if there were stresses that  
6 could cause fatigue, evidence of that cracking and  
7 crack growth would be apparent during the inspections  
8 prior to the period of extended operation.

9                   The aging mechanism here is high cycle  
10 fatigue resulting from resident vibrations in the  
11 hundred hertz or higher range. This means that the  
12 steam dryer experiences literally billions of cycles  
13 per year. If there were stresses that were above the  
14 endurance limit, one would expect that fatigue  
15 cracking would already have occurred.

16                   With respect to Contention 4, the  
17 testimony will show that Entergy is implementing a  
18 flow accelerated corrosion program that directly  
19 follows NRC guidance and that has been again  
20 determined to be adequate by the NRC staff to manage  
21 this aging effect. This program in turn follows the  
22 guidance and the guidelines that were developed by the  
23 Electric Power Research Institute in NSAC-202L.

24                   As part of this program and just as one  
25 element, a predictive code, CHECWORKS, is used to

1 assist the schedule and location of inspections. This  
2 entire program is an existing effective program that  
3 reactor licensees have been implementing very  
4 successfully for many years. That is why it is  
5 endorsed in the GALL Report. The whole purpose of the  
6 GALL Report was to document those programs that the  
7 staff was able to say based on the experience, "Yes,  
8 these are good programs. They've been working for  
9 many years. We have confidence in them."

10 Now NEC has claimed that CHECWORKS cannot  
11 be used without 15 years of data to re-benchmark the  
12 Code after the power uprate that occurred in 2006.  
13 Our experts will show that NEC's challenge here simply  
14 reflects a lack of understanding of how the Code works  
15 and how it's applied. Our experts will include Dr.  
16 Horowitz who is the author of the Code. He is one of  
17 the leading experts on this phenomena. Not only did  
18 he help develop the CHECWORKS Code but he helped draft  
19 NSAC-202 which has become the seminal standard-setting  
20 document. Dr. Horowitz has audited the FAC program at  
21 Vermont Yankee including its use of CHECWORKS to help  
22 select the inspection locations and he's determined  
23 that the program is appropriate and consistent with  
24 good engineering practice.

25 In sum, our witnesses will meet our

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1 standard of proof. They will demonstrate the  
2 effectiveness of the program. They will demonstrate  
3 that these aging effects are properly managed and  
4 therefore that there is reasonable assurance that  
5 Vermont Yankee can operate safely during the period of  
6 extended operation.

7 JUDGE KARLIN: Thank you. NRC staff, Mr.  
8 Subin.

9 MR. SUBIN: Good afternoon, Judges,  
10 parties and member of the public.

11 (Off the record comment.)

12 This hearing is not about the adequacy of  
13 the staff's review, but the adequacy of Entergy's  
14 license renewal application submitted for the Vermont  
15 Yankee plant. Furthermore, it only encompasses three  
16 issues, metal fatigue, the steam dryer and flow  
17 accelerated corrosion.

18 Metal fatigue, NEC's Contention 2 alleged  
19 originally that Entergy's license renewal application  
20 did not include an adequate plan to monitor and manage  
21 the effects of aging due to metal fatigue. NEC  
22 Contentions 2a and 2b further refine Contention 2 to  
23 contend that the analytical methods employed at  
24 Entergy's environmentally-corrected cumulative factors  
25 factor analyses for the critical reactor piping and

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1 components were flawed and therefore failed to  
2 demonstrate that the reactor components would not fail  
3 due to metal fatigue during the extended period of  
4 operation.

5 The staff reviewed Entergy's program for  
6 monitoring and managing the effects of aging due to  
7 metal fatigue. As part of Entergy's program to manage  
8 the effects of aging due to metal fatigue, Entergy  
9 calculated environmentally-adjusted cumulative usage  
10 factors for critical reactor piping and components.  
11 The staff reviewed these calculations because the  
12 staff was unable to make judgments regarding  
13 conservatism of three of the nozzles, the calculations  
14 for the three nozzles, we asked Entergy to -- which  
15 they had submitted in September and December of 2007.  
16 The staff requested that Entergy perform a  
17 confirmatory analysis of the feedwater nozzle which is  
18 Vermont Yankee's most limiting nozzle.

19 Entergy submitted its confirmatory  
20 analysis on January 30, 2008. The staff reviewed the  
21 confirmatory calculation and we found it acceptable.  
22 Based upon its review, the staff concluded that  
23 Entergy's program for managing the effects of aging  
24 due to metal fatigue which includes as corrective  
25 action analyses of environmentally-assisted fatigue,

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1 provides reasonable assurance that the effects of  
2 aging due to metal fatigue will be adequately managed  
3 during the period of extended operation. NEC's metal  
4 fatigue contention lacks merit because as the evidence  
5 will show, Entergy has demonstrated that the effects  
6 of aging will be adequately managed in accordance with  
7 10 C.F.R. 54.21(c)(1)(iii)(I).

8 Contention 3, the steam dryer. NEC  
9 Contention 3 alleges that Entergy's license renewal  
10 application does not include an adequate plan to  
11 manage and monitor the aging of the steam dryer during  
12 the period of extended operation. NEC specifically  
13 contends that Entergy's plan for monitoring and  
14 managing the aging of the steam dryer should involve  
15 some form of stress and load analysis to insure that  
16 the fatigue limits are not exceeded.

17 Let us explore. The steam dryer does not  
18 perform a safety function and it is not required to  
19 prevent or mitigate the consequences of accidents.  
20 However, cracking of the steam dryer due to flow-  
21 induced vibration could generate loose parts and such  
22 loose parts could affect safety-related functions  
23 structures, systems or components.

24 Entergy's aging management program for the  
25 steam dryer includes periodic visual inspections and

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1 continuous monitoring of plant parameters indicative  
2 of steam dryer damage. The evidence will show that  
3 Entergy's steam dryer monitoring plan provides  
4 reasonable assurance in the structural capability of  
5 the Vermont Yankee steam dryer over the long term and  
6 including the period of extended operation.

7 The program is sufficient to detect  
8 potential degradation of the steam dryer during  
9 operation and continuous stream monitoring.  
10 Furthermore, the results of the EPU's power accession  
11 program demonstrated that the loads during EPU  
12 operation did not result in stress on the steam dryer  
13 that exceeded the ASME fatigue stress limits.

14 The results of the spring 2007 inspection  
15 of the steam dryer verified that no significant  
16 cracking of the steam dryer has occurred during EPU  
17 operations. Thus, NEC Contention 3 lacks merit.

18 Contention 4, flow-accelerated corrosion.  
19 NEC's Contention 4 alleges that Entergy's license  
20 renewal application does not include an adequate plan  
21 to monitor and manage aging of plant piping due to  
22 flow-accelerate corrosion during the period of  
23 extended operation. Specifically, NEC challenges  
24 Entergy's use of CHECWORKS under the EPU and  
25 sufficiency of the data to be collected prior to the

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1 period of extended operation.

2 The staff reviewed Entergy's flow-  
3 accelerated corrosion program and concluded that  
4 Entergy demonstrated that the effects of the aging FAC  
5 on the plant piping will adequately be managed so that  
6 the intended functions will be managed consistently  
7 with the CLB for the period of extended operation.  
8 Furthermore, Entergy's program is consistent with the  
9 staff-endorsed goal of report recommendation and  
10 Entergy has addressed the impact of the EPU on all  
11 FAC's susceptible systems.

12 As the evidence will show, CHECWORKS is  
13 being used in numerous plants throughout the U.S. for  
14 nuclear facilities and many U.S. fossil plants and  
15 utilities overseas. Entergy is using CHECWORKS as a  
16 tool along with past inspection results, engineering  
17 judgment, industry operating experience and plant  
18 specific operating experience to help selection FAC  
19 susceptible locations for inspection and monitoring.  
20 It provides reasonable assurance that structural  
21 integrity will be maintained between inspections, not  
22 that FAC will not occur, that repairs including costly  
23 ones will never be needed. The evidence will show  
24 that 12 to 15 years of inspection data is not required  
25 to calibrate or re-calibrate to the CHECWORKS model,

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1 rather CHECWORKS only requires a minimum of two cycles  
2 of inspection data to obtain actual wear for a  
3 component. Consequently, the evidence will show that  
4 NEC Contention 4 lacks merit.

5 JUDGE KARLIN: Thank you, Mr. Lewis. Mr.  
6 Roth from the State of New Hampshire.

7 MR. ROTH: Thank you, Judge Karlin. Very  
8 briefly.

9 New Hampshire is obviously a neighboring  
10 state of Vermont and the Vermont Yankee plant is on  
11 our border and the river bank of the Connecticut River  
12 on this side is the New Hampshire border. We've  
13 claimed the river.

14 JUDGE KARLIN: Can you speak up also for  
15 the audience?

16 MR. ROTH: The riverbank is on this side  
17 of the river. The Connecticut River is our border and  
18 the water that cools the plant, I believe, is New  
19 Hampshire water. In addition, we're downstream from  
20 or downwind from the plant and potentially effected by  
21 any sort of emergency. At the same time, the Vermont  
22 Yankee plant is an integral part of all of New  
23 England's energy supply.

24 Yes, we have a concern that the best  
25 information and the analysis that has been employed in

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1 the various positions that this plant is sound for  
2 extended future use and we're grateful for the efforts  
3 that the parties have put into this, the staff and our  
4 sister state of Vermont for assembling the evidence  
5 for the Board's review today and for the rest of this  
6 hearing.

7 And I echo and share the concerns made by  
8 my colleagues from the State of Vermont so eloquently  
9 a few minutes ago and we look forward at this point to  
10 rigorous examination of the evidence and the witnesses  
11 by the Board and the careful consideration of that  
12 evidence and testimony.

13 We thank you for coming.

14 JUDGE KARLIN: Thank you. Thanks to all  
15 of you for your opening statements. We've gone about  
16 an hour and 20 minutes now. I think that we can  
17 either take a quick break or we can put the witnesses  
18 on and get the exhibits introduced through the counsel  
19 and then take a break. Okay?

20 Why don't we just proceed with getting the  
21 witnesses in the witness stand with regard to  
22 Contention No. 2, sworn in and then we'll have the  
23 introduction of the exhibits associated with that and  
24 then we'll take a short break before we go into the  
25 questioning. So if the witnesses with reference to

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1 Contention No. 2 could all take the stand over there,  
2 I would appreciate it.

3 (Off the record comment.)

4 Yes, if you'd all sit together in the back  
5 row. Could you sit in the back row, Dr. Hopenfeld?

6 DR. HOPENFELD: In the back row?

7 JUDGE KARLIN: Yes please. That would be  
8 helpful. Thank you.

9 MS. BATY: Can I bring copies of the  
10 exhibits for my witness to use when asking questions?

11 JUDGE KARLIN: I'm sorry. I couldn't  
12 hear.

13 MS. BATY: But the boxes -- If he could  
14 put the boxes in front of him.

15 JUDGE KARLIN: Yes, that would be fine.

16 (Off the record comments.)

17 JUDGE KARLIN: I hate to do this to you,  
18 but I have a request. Could we rearrange the seating?  
19 Dr. Hopenfeld, could he be seated over here? Because  
20 of the hearing situation, it would be better. Dr.  
21 Hopenfeld, perhaps that would be better.

22 DR. HOPENFELD: I appreciate it.

23 JUDGE KARLIN: If that's your preference.  
24 Sorry to rearrange the chairs, but we would like to be  
25 able to accommodate that.

1 (Off the record comments.)

2 All right. If you could all please stand  
3 up and raise your right hand.

4 Whereupon,

5 CONTENTION 2 PANEL

6 were called as witnesses and, after having been first  
7 duly sworn, were examined and testified as follows:

8 JUDGE KARLIN: Thank you. Please be  
9 seated.

10 Now what I'm going to do is ask the  
11 counsel for Entergy to start and ask their witnesses  
12 to identify themselves and to introduce the exhibits  
13 that are associated with those witnesses.

14 Mr. Lewis, I guess.

15 MR. LEWIS: Thank you. I will direct  
16 these questions to Mr. Fitzpatrick and Mr. Stevens.  
17 Gentlemen, would you please state your name for the  
18 record?

19 MR. STEVENS: Gary Lance Stevens.

20 MR. FITZPATRICK: James Fitzpatrick.

21 MR. LEWIS: You have before you a document  
22 that's entitled "Testimony of James C. Fitzpatrick and  
23 Gary L. Stevens on NEC Contentions 2a/2b,  
24 Environmentally-Assisted Fatigue, a document dated May  
25 12, 2008."

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1 MR. FITZPATRICK: Yes.

2 MR. STEVENS: Yes.

3 MR. LEWIS: Did you prepare this document  
4 as your testimony for submission in this hearing?

5 MR. FITZPATRICK: Yes.

6 MR. STEVENS: Yes.

7 MR. LEWIS: Do you have any corrections to  
8 this testimony?

9 MR. FITZPATRICK: Yes.

10 MR. STEVENS: Yes.

11 MR. LEWIS: Mr. Stevens, could you please  
12 identify what they are?

13 MR. STEVENS: Yes, on page 14, answer A26

14 --

15 JUDGE KARLIN: Could we identify the  
16 number of that?

17 MR. LEWIS: Sorry.

18 JUDGE KARLIN: I'm sorry.

19 MR. LEWIS: The testimony per your request  
20 is not marked as an exhibit.

21 JUDGE KARLIN: Right. Okay. Yes. Go  
22 ahead. Sorry.

23 MR. STEVENS: That would be page 14,  
24 answer A26, line 7. It currently reads "Amendment 35  
25 to the Application Exhibit E2-09" and that should be

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1 corrected to read "Amendment 34 to the Application  
2 Exhibit E2-28."

3 MR. LEWIS: All right. Your Honor, I  
4 should -- You do have copies with these corrections  
5 made and it's been given to the court reporter and the  
6 other parties. But any party lacking from them, I  
7 will provide it.

8 (Off the record discussion.)

9 MR. LEWIS: Also we'll provide you with  
10 copies of the corrected testimony.

11 JUDGE KARLIN: Yes, when we get through  
12 with this, you can give it to the law clerk please.

13 MR. LEWIS: Okay.

14 (Off the record discussion.)

15 JUDGE KARLIN: All right. Proceed, Mr.  
16 Lewis.

17 MR. LEWIS: Are there any additional  
18 corrections to this testimony?

19 MR. FITZPATRICK: Yes, at page six at A12  
20 line 2 add "be" at the end of the line after "may."

21 MR. LEWIS: Then do you also have before  
22 you a document entitled "Supplemental Testimony of  
23 James C. Fitzpatrick and Gary L. Stevens on NEC  
24 Contention 2a/2b, Environmentally-Assisted Fatigue,"  
25 a document dated May 30, 2008?

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1 MR. STEVENS: Yes.

2 MR. FITZPATRICK: Yes.

3 MR. LEWIS: Was this testimony also  
4 prepared by you for submission as your testimony in  
5 this proceeding?

6 MR. STEVENS: Yes.

7 MR. FITZPATRICK: Yes.

8 MR. LEWIS: Do you have any corrections to  
9 this testimony?

10 MR. STEVENS: No.

11 MR. FITZPATRICK: No.

12 MR. LEWIS: With the corrections that  
13 you've provided in these two documents, is this  
14 testimony constitute your testimony in this proceeding  
15 true and accurate?

16 MR. STEVENS: Yes.

17 MR. FITZPATRICK: Yes.

18 MR. LEWIS: Your Honor, I would move to  
19 move these two pieces of testimony into evidence.

20 (Whereupon, the documents  
21 referred to was marked as  
22 Entergy Exhibit E2-01-VY for  
23 identification.)

24 JUDGE KARLIN: For general knowledge, we  
25 have previously -- they have previously submitted this

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1 testimony in writing. All parties have seen that  
2 testimony in writing. They filed motions such as they  
3 might with regard to objections or not and those  
4 motions have already been ruled on. But I will ask  
5 for the formality. Are there any objections to this  
6 testimony?

7 MS. BATY: No.

8 MS. TYLER: No.

9 JUDGE KARLIN: Okay. The testimony is  
10 accepted and will be added to the record.

11 (The document referred to  
12 having been previously marked  
13 for identification as Entergy  
14 Exhibit E2-01-VY, was received  
15 in evidence.)

16 MR. LEWIS: Your Honor, you also in your  
17 July 1<sup>st</sup> order indicated at this point we would  
18 introduce the exhibits.

19 JUDGE KARLIN: Yes.

20 MR. LEWIS: Would you like us to introduce  
21 all the exhibits in all three contentions at this  
22 point or simply those that relate to this contention?

23 JUDGE KARLIN: Just those that relate to  
24 this contention please.

25 MR. LEWIS: Entergy has previously

1 provided to the parties and to the clerk our exhibits  
2 on this contention. They are numbered Exhibits E2-02-  
3 VY through E2-37-VY and we would move that these  
4 exhibits be introduced into evidence.

5 (Whereupon, the documents  
6 referred to were marked as  
7 Entergy Exhibit E2-02-VY  
8 through E2-37-VY for  
9 identification.)

10 MR. LEWIS: Any objections?

11 (No response.)

12 JUDGE KARLIN: They are admitted into  
13 evidence.

14 (The documents referred to  
15 having been previously marked  
16 for identification as Entergy  
17 Exhibit E2-02-VY through E2-37-  
18 VY were received in evidence.)

19 Thank you. Anything else, Mr. Lewis?

20 MR. LEWIS: No, Judge Karlin.

21 JUDGE KARLIN: Okay. NRC staff please.

22 MS. BATY: Mr. Fair, state your name for  
23 the record please.

24 MR. FAIR: John Fair.

25 MS. BATY: And do you have before you

1 "Affidavit of John R. Fair Concerning NEC Contentions  
2 2a and 2b Metal Fatigue."

3 MR. FAIR: Yes, I do.

4 MS. BATY: Did you prepare this testimony  
5 for the proceeding?

6 MR. FAIR: Yes.

7 MS. BATY: Is your statement of  
8 professional qualifications attached?

9 MR. FAIR: Yes, it is.

10 MS. BATY: Do you have any corrections or  
11 additions to your testimony at this time?

12 MR. FAIR: Yes, I do.

13 MS. BATY: Could you please -- Let's go  
14 through those corrections you have before you and can  
15 you tell me the corrections please?

16 MR. FAIR: On Q1, the first line, there  
17 was a typo on the please.

18 (Off the record comment.)

19 On Q1, the first line, there is a typo in  
20 the spelling of "please."

21 JUDGE KARLIN: All right.

22 MR. FAIR: On Q5, line 2, change the word  
23 "outdated" to "incorrect." On Q7, line 1, change the  
24 date from "December 2008" to "December 2007." And Q8,  
25 lines one and two, insert "submitted January 30, 2008"

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1 after the word "analysis." Also change the words  
2 "analysis of record" to "confirmatory analysis." And  
3 in A8, lines three and four, insert "January 30, 2008"  
4 after the word "analysis." Excuse me. "Submitted  
5 January 30, 2008" after the word "analysis."

6 MS. BATY: Mr. Fair, do you submit this  
7 testimony as your testimony, as your initial  
8 testimony, in this proceeding?

9 MR. FAIR: Yes, I do.

10 MS. BATY: Your Honor, I move to have the  
11 testimony admitted to the record as read.

12 (Whereupon, the document  
13 referred to was marked as NRC  
14 Staff Exhibit No. 1a for  
15 identification.)

16 JUDGE KARLIN: Any objections?

17 MS. BATY: And one additional, I have  
18 copies of the corrections and a clean copy for all  
19 parties, witnesses, Judges and court reporter that I  
20 can distribute.

21 JUDGE KARLIN: Good. If you could give  
22 that to our law clerk to be distributed. In the  
23 meantime, any objections?

24 (Chorus of nos.)

25 MR. LAUBVOGEL: Your Honor, to the extent

1 that there's any testimony being offered now that  
2 references Dr. Chang's testimony and for the truth of  
3 the matter asserted in that testimony, we would ask  
4 that those portions of the testimony be struck.

5 JUDGE KARLIN: Well, I don't know whether  
6 that's the case here. We would probably look at it  
7 for what it's worth. I don't even know whether Mr.  
8 Fair's testimony does reiterate Dr. Chang's testimony.  
9 If you want to submit a written motion that identifies  
10 specific segments that you think are problematic under  
11 those criteria I guess I would entertain that.

12 MR. LAUBVOGEL: We would like that  
13 opportunity. Thank you. And to the extent that the  
14 exhibits that are being offered include the FSER, we  
15 would just renew our motion from earlier.

16 JUDGE KARLIN: Okay. We understand you  
17 have a motion there.

18 MR. LAUBVOGEL: Thank you.

19 JUDGE KARLIN: All right. Anything --  
20 Yes? Go ahead, Ms. Baty.

21 MS. BATY: You want us to go through the  
22 exhibits.

23 JUDGE KARLIN: Yes please.

24 MS. BATY: The exhibits --

25 MR. LEWIS: Your Honor, I'm not sure you

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1 introduced -- you accepted the testimony.

2 JUDGE KARLIN: I'm sorry. Yes. Subject  
3 to the objections that we will consider and anything  
4 you have, please submit it within five days with  
5 specific word-smithing from Mr. Fair's testimony  
6 pursuant to what you just said. Otherwise, it's going  
7 to be admitted and is admitted.

8 (The document referred to  
9 having been previously marked  
10 for identification as NRC Staff  
11 Exhibit No. 1a, was received in  
12 evidence.)

13 Thank you, Mr. Lewis.

14 MS. BATY: Your Honor, I'm not clear on  
15 what the concern is about Mr. Fair's testimony given  
16 that his testimony is independent of Dr. Chang. Are  
17 they concerned about the overlapping exhibits?

18 JUDGE KARLIN: No, I believe it's concern  
19 about whether or not Mr. Fair is repeating verbatim  
20 something from Dr. Chang and thereby getting it into  
21 the record as hearsay or something that does. That  
22 would be problematic. We're going to hear that in  
23 writing later.

24 MS. BATY: Okay. I just didn't understand  
25 the nature given that John has provided his testimony

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1 under oath and is available for questioning on it. I  
2 don't see the purpose of an additional motion.

3 MR. LAUBVOGEL: I think it's simply that  
4 we want the chance to look at the testimony and if  
5 there are any specific statements that refer to Dr.  
6 Chang's testimony and are bringing in essentially the  
7 voracity of that, we would have the opportunity to ask  
8 that it be scratched. So I don't have any specifics,  
9 but we do want the opportunity to look at it.

10 JUDGE KARLIN: We will allow that to  
11 happen, but you have to be pretty specific about it.  
12 We would be --

13 MR. LAUBVOGEL: Yes.

14 JUDGE KARLIN: This is pretty -- The rules  
15 of evidence, we don't follow the formal rules of  
16 evidence here. We try to take all the information in  
17 and consider it for what it's worth. This is an  
18 expert panel. We probably won't be confused by the  
19 fact that Mr. Fair may be referencing something that  
20 might otherwise be hearsay and excludeable if this was  
21 jury trial obviously.

22 Okay. Ms. Baty, please continue.

23 MS. BATY: The staff has Exhibits 1  
24 through 13, 22 and 23 relating to Contention 2a and  
25 2b.

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1 As requested by the Board, co-counsel and  
2 I have looked at the overlap between Dr. Chang's  
3 testimony and Mr. Fair's testimony and have discovered  
4 that Staff Exhibit 6 and 7, 23 and 9 are referenced  
5 only Dr. Chang's testimony. However, Exhibits 6 and  
6 7 are also Entergy exhibits. Staff Exhibit 6 is also  
7 Entergy Exhibit 4, although only excerpts of that  
8 NUREG.

9 JUDGE KARLIN: What is it? Exhibit 6 is  
10 one of the NUREGs.

11 MS. BATY: Exhibit 6 is NUREG 6260.

12 JUDGE KARLIN: Okay.

13 MS. BATY: And Exhibit 7 is Entergy  
14 Exhibit 5 and that is NUREG 1801, the GALL Report.

15 JUDGE KARLIN: And 23 is nine?

16 MS. BATY: Twenty-three and nine are not  
17 a reference. They're not duplicates and their  
18 references is in Dr. Chang's testimony.

19 JUDGE KARLIN: And what are they?

20 MS. BATY: One is a letter, Vermont Yankee  
21 License Renewal Application Amendment 36 dated  
22 February 21, 2008 and that would be a document  
23 correspondence between the NRC Staff and Entergy,  
24 letter from Entergy to the NRC Staff.

25 The other is Exhibit 9 which is an excerpt

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1 from the transcript of the ACRS meeting of Dr. Chang's  
2 statements to the ACRS on February 7, 2008.

3 JUDGE KARLIN: Okay. All right. Thank  
4 you.

5 But with regard to the other exhibits --

6 MS. BATY: We would move to have the  
7 exhibits added to the record.

8 (Whereupon, the documents  
9 referred to were marked as NRC  
10 Staff Exhibits 1-13, 22 and 23  
11 for identification.)

12 JUDGE KARLIN: Are you excluding those  
13 four exhibits you just identified?

14 MS. BATY: We would --

15 JUDGE KARLIN: Or not?

16 MS. BATY: We don't think that -- We do  
17 not have -- We do not have a sponsoring -- There is no  
18 sponsoring witness on the panel for Exhibits 23 and 9.

19 JUDGE KARLIN: Well, I think nine would  
20 probably go out pretty directly because it's his  
21 testimony, is it not? So that's a problem.

22 MS. BATY: Yes.

23 JUDGE KARLIN: Okay. So your motion is  
24 for the admission of all the exhibits.

25 MS. BATY: Yes.

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1 JUDGE KARLIN: Other than six and seven.

2 MS. BATY: Six and seven were --

3 JUDGE KARLIN: And nine. Any objections  
4 other than the one that NEC has already raised?

5 (No response.)

6 We will then admit it subject to those  
7 objections and we'll consider that.

8 MS. BATY: Your Honor, I may have missed -  
9 - There was another exhibit, Exhibit D.

10 JUDGE KARLIN: D?

11 MS. BATY: Exhibit D. Staff had Exhibits  
12 A through D of section -- an excerpt of the ASME Code,  
13 Section 3 subsection MCI, one page. I don't think I  
14 mentioned that previously.

15 JUDGE KARLIN: Exhibit D, can you show me  
16 that? I mean, what is Exhibit D?

17 MS. BATY: It's a page -- it's an excerpt  
18 from the ASME Code.

19 JUDGE KARLIN: Okay. From the ASME Code  
20 that --

21 MS. BATY: Section 3 it's relevant to  
22 Contention 2 as to the requirements of the various  
23 appendices.

24 JUDGE KARLIN: Okay.

25 MS. BATY: Which appendices are required

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1 by the ASME Code.

2 JUDGE KARLIN: And are you moving to have  
3 that in or out?

4 MS. BATY: Yes. I'm moving to include  
5 that within the staff's exhibit list.

6 JUDGE KARLIN: Okay. Is NEC going to  
7 object to that?

8 MS. TYLER: I'm sorry. Could you repeat  
9 that?

10 JUDGE KARLIN: The admission of ASME Code  
11 excerpt.

12 MS. BATY: Staff Exhibit D on our list.  
13 I think I failed to list it when I was listing staff's  
14 exhibits just now going through the exhibits.

15 (Whereupon, the document  
16 referred to was marked as NRC  
17 Staff Exhibit D for  
18 identification.)

19 MS. TYLER: No, there is no objection.

20 JUDGE KARLIN: There's always judicial  
21 notice. ASME Code is American Society for Mechanical  
22 Engineers. It's a code that prescribes certain  
23 standards with regard to metal fatigue and Ms. Baty is  
24 referencing a part of that Code.

25 Okay. So there is no objection to that

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1 particular element.

2 (The document referred to  
3 having been previously marked  
4 for identification as NRC Staff  
5 Exhibit D, was received in  
6 evidence.)

7 MS. TYLER: No.

8 JUDGE KARLIN: Is that all from the staff?

9 MS. BATY: Yes.

10 JUDGE KARLIN: Thank you.

11 Ms. Tyler, anything?

12 MS. TYLER: Are you asking us -- We're not  
13 to move for admission of NEC's exhibits that were  
14 duplicated by the staff or Entergy.

15 JUDGE KARLIN: No. I'd like for you to  
16 move for exhibits of all the exhibits that you think  
17 are important.

18 MS. TYLER: You want us to move for  
19 admission.

20 JUDGE KARLIN: You don't have to  
21 physically produce a copy of it.

22 MS. TYLER: Right. We don't have to  
23 produce a copy.

24 JUDGE KARLIN: We don't need to duplicate  
25 them.

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1 MS. TYLER: Okay.

2 (Off the record comments.)

3 JUDGE KARLIN: I believe with regard to  
4 the staff exhibits they were all admitted subject to  
5 the objection and I believe the ones that were  
6 withdrawn, Ms. Baty, were your exhibits 6, 7 and 9.  
7 Is that correct?

8 MS. BATY: Well, Your Honor, to be clear  
9 six and seven are duplicates of Entergy exhibits and  
10 therefore we feel that those can be admitted because  
11 we have sponsoring witnesses from Entergy. They are  
12 duplicates.

13 JUDGE KARLIN: Yes, you don't need them to  
14 be admitted separately.

15 MS. BATY: No, we don't need them. That's  
16 correct. Then 23 and nine are exclusively referenced  
17 in Dr. Chang's testimony and we're pointing that out  
18 as a matter of the record and we would move to include  
19 them. However, I don't know what the status of it is.

20 JUDGE KARLIN: All right. You can include  
21 them and objections to which ones?

22 MR. LAUBVOGEL: Well, I was just confused  
23 by the last statement. I thought she just said that  
24 nine and 23 are Dr. Chang exhibits and, if that's  
25 correct, then, yes, we would object to the admission

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1 of those exhibits.

2 JUDGE KARLIN: Okay. That's what I  
3 thought. And D? No objections to that as I  
4 understand. So those documents are admitted subject  
5 to the recognized objection that we're taking under  
6 advisement by NEC.

7 (The documents referred to  
8 having been previously marked  
9 for identification as NRC Staff  
10 Exhibits 1-13, 22 and 23 were  
11 received in evidence.)

12 That's all from the staff, right, Ms.  
13 Baty?

14 MS. BATY: Yes.

15 JUDGE KARLIN: Okay. NEC, could you  
16 introduce your witness and your exhibits please.

17 MS. TYLER: Yes. Can I walk over to be  
18 closer to him when I talk to him?

19 JUDGE KARLIN: Yes.

20 MS. TYLER: Judge Karlin, Dr. Hopenfeld's  
21 testimony of record -- and we'll be admitting his  
22 testimony --

23 JUDGE KARLIN: Right. I understand that.

24 MS. TYLER: And we'll be admitting his  
25 testimony all through --

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1 JUDGE KARLIN: All right. That's fine.  
2 I might suggest that if he has corrections  
3 on all three.  
4 MS. TYLER: He has no.  
5 JUDGE KARLIN: No corrections.  
6 MS. TYLER: Would you please state your  
7 name for the record?  
8 DR. HOPENFELD: My name is Jerome  
9 Hopenfeld.  
10 MS. TYLER: And do you have before you a  
11 document entitled --  
12 (Off the record comments.)  
13 (Microphone relocation.)  
14 MS. TYLER: Dr. Hopenfeld, do you have a  
15 document in front of you titled "The Pre-filed Direct  
16 Testimony of Dr. Joram Hopenfeld Regarding NEC  
17 Contentions 2a, 2b, 3 and 4"?  
18 DR. HOPENFELD: I do.  
19 MS. TYLER: And do you also have before  
20 you a document titled "The Pre-trial Rebuttal  
21 Testimony of Dr. Joram Hopenfeld Regarding NEC  
22 Contentions 2a, 2b, 3 and 4"?  
23 DR. HOPENFELD: I do.  
24 MS. TYLER: Did you prepare this testimony  
25 for submission in this proceeding?

1 DR. HOPENFELD: I did.

2 MS. TYLER: Do you have any corrections of  
3 this testimony at this time?

4 DR. HOPENFELD: I do not.

5 MS. TYLER: Do you adopt this testimony as  
6 your sworn testimony in this proceeding?

7 DR. HOPENFELD: Yes.

8 MS. TYLER: I move for admission of both  
9 the direct and rebuttal testimony to the record.

10 (Whereupon, the document  
11 referred to was marked as NEC  
12 Exhibits 1 and 2 for  
13 identification.)

14 JUDGE KARLIN: Any objections?

15 (Chorus of nos.)

16 JUDGE KARLIN: Okay. Your exhibits are  
17 admitted.

18 (The documents referred to  
19 having been previously marked  
20 for identification as NEC  
21 Exhibits No. 1 and 2, were  
22 received in evidence.)

23 MS. TYLER: Okay. Now the exhibits?

24 JUDGE KARLIN: Yes please.

25 MS. TYLER: NEC has pre-filed and provided

1 to all of the parties Exhibits NEC-JH02 through NEC-  
2 JH35. Also Exhibits NEC-JH62 through NEC-JH66 and  
3 NEC-JH68-NEC-JH72 and now moves for admission of these  
4 exhibits into the record.

5 (Whereupon, the documents  
6 referred to were marked as NEC  
7 Exhibits NEC-JH02-JH35, JH62-  
8 JH66 and JH68-JH72 for  
9 identification.)

10 JUDGE KARLIN: Any objections?

11 (Chorus of nos.)

12 JUDGE KARLIN: All right. They will be  
13 admitted into evidence. Thank you.

14 (The documents referred to  
15 having been previously marked  
16 for identification as NEC  
17 Exhibits JH02-JH35, JH62-JH66  
18 and JH68-JH72, were received in  
19 evidence.)

20 Okay. At this point, what would happen is  
21 we would asking questions of the witnesses. We just  
22 got them into the hot seat and it's their turn to  
23 answer questions. But it's been a kind of long time  
24 so far, an hour and 45 minutes. So we will take a ten  
25 -- Let's make a 15 minute break and reconvene at what

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1 I have is 3:00 p.m., a 15 minute break, at which time  
2 we will commence asking questions. So we are  
3 adjourned at the moment. Off the record.

4 (Whereupon, at 2:45 p.m., the above-  
5 entitled matter recessed and reconvened at 3:02 p.m.)

6 JUDGE KARLIN: I would like to remind the  
7 witnesses that you are still under oath. So what we  
8 will do now is try to ask some questions related to  
9 contention number 2.

10 The first topic I would like to ask a few  
11 questions about is -- relates to this NUREG/CR-6909.  
12 And I guess I would like to talk to -- with Mr. Fair  
13 first, the witness for the NRC Staff, on these  
14 questions. Could you refer to NUREG/CR-6909? I  
15 believe it is Entergy 2, Exhibit E-2-30. That's the  
16 reference I have for it. Mr. Fair, could you take a  
17 look at that?

18 MR. FAIR: Yes, I have that.

19 JUDGE KARLIN: Okay. Now, can you -- the  
20 title of this is "Effect of LWR Coolant Environments  
21 on the Fatigue Life of Reactor Metals, Final Report."  
22 And what was the date on that, Mr. Fair?

23 MR. FAIR: The date is published February  
24 2007.

25 JUDGE KARLIN: Right. And that was, as I

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1 understand it, produced by Argonne National  
2 Laboratories?

3 MR. FAIR: That is correct.

4 JUDGE KARLIN: And that was at the request  
5 of the NRC Staff?

6 MR. FAIR: Yes.

7 JUDGE KARLIN: So they are like a  
8 contractor for the NRC, right?

9 MR. FAIR: Yes.

10 JUDGE KARLIN: Argonne National Labs. And  
11 I'm going to refer to that as 6909 from time to time.  
12 And if you would go to page -- the Forward of that  
13 document, page -- what -- Roman numeral little five I  
14 guess it is. And it refers to the -- if you would,  
15 the second paragraph. Tell me about NUREG/CR-5707.  
16 What is that?

17 MR. FAIR: Do you mean 5704?

18 JUDGE KARLIN: I'm sorry. 5704, yes.

19 MR. FAIR: It's an Effects of Lightwater  
20 Coolant Environments on Fatigue of Design Curves of  
21 Austenitic Stainless Steels. It was the predecessor  
22 of this NUREG.

23 JUDGE KARLIN: Okay. And it is dated  
24 April 1999?

25 MR. FAIR: It says issued April 1999, yes.

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1 JUDGE KARLIN: Okay. And then, also refer  
2 -- and that's an exhibit in this case, is it not,  
3 Exhibit -- one among others, E-2-07?

4 MR. FAIR: That is correct.

5 JUDGE KARLIN: Right. So, and then if you  
6 will read further on that preface, it also references  
7 to another exhibit in this case, a NUREG/CR -- what is  
8 it? 6583?

9 MR. FAIR: Yes.

10 JUDGE KARLIN: Could you -- and that's on  
11 the same subject, is it not?

12 MR. FAIR: Yes, it is. This covers carbon  
13 and low-alloy steels.

14 JUDGE KARLIN: Right, right. So it's a --  
15 one of them covers stainless steel, one of them covers  
16 carbon and low alloy steels.

17 MR. FAIR: That's correct.

18 JUDGE KARLIN: And then, this one -- 6909  
19 -- covers both.

20 MR. FAIR: That's correct.

21 JUDGE KARLIN: All right. And it's a more  
22 recent -- 2007 -- vintage report, right?

23 MR. FAIR: That's correct.

24 JUDGE KARLIN: Now, they are all issued by  
25 Argonne National Labs?

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1 MR. FAIR: Correct.

2 JUDGE KARLIN: And they are all something  
3 that the NRC had performed for them by Argonne --

4 MR. FAIR: That's correct.

5 JUDGE KARLIN: -- in this. So the CR in  
6 the NUREG/CR, what does that mean?

7 MR. FAIR: Contractor report.

8 JUDGE KARLIN: Contractor report, right.  
9 So that's a -- Argonne is the contractor, and this is  
10 their report.

11 MR. FAIR: That's correct.

12 JUDGE KARLIN: And now none of these -- do  
13 any of these NUREGs, the 6909, 5704, the 6583, do they  
14 refer -- distinguish between license renewals and new  
15 reactors and old reactors? Is there any distinction  
16 when it comes to the lightwater cooling reactor  
17 environments and their effect on metal fatigue?

18 MR. FAIR: I believe there is a statement  
19 in 6909 saying this procedure would be applicable to  
20 new reactors.

21 JUDGE KARLIN: Right. We'll get to that  
22 in a minute. But as a technical matter, does it make  
23 any difference -- metal fatigue is metal fatigue, and  
24 whether it occurs in a new reactor, an old reactor,  
25 it's the same issue?

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1 MR. FAIR: That's correct.

2 JUDGE KARLIN: Okay. You know, there's a  
3 choice being made as to which to apply to what, and I  
4 know that's part of the issue. Okay.

5 Bear with me for a minute while I find  
6 something.

7 (Pause.)

8 Now, I guess what I'd like you to look at  
9 is Staff Exhibit 13. Let me see if I can find that.

10 MS. BATY: Your Honor, is that --  
11 unfortunately, we failed to bring with us an extra  
12 copy for our witness. I don't know whether any of the  
13 other witnesses could share with Mr. Fair or whether  
14 we could borrow back Exhibit 13 for Mr. Fair to refer  
15 to.

16 JUDGE KARLIN: Do you not have a copy of  
17 Exhibit 13, Mr. Fair?

18 MR. FAIR: I'm sorry.

19 JUDGE KARLIN: No, no, it's not your  
20 fault. All right. I can just find it myself.

21 (Pause.)

22 Could you identify, Mr. Fair, Staff  
23 Exhibit 13?

24 MR. FAIR: Yes. This is Regulatory Guide  
25 1.207, which is entitled "Guidelines for Evaluating

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1 Fatigue Analyses Incorporating the Light Reduction of  
2 Metal Components Due to the Effects of Lightwater  
3 Reactor Environment for New Reactors."

4 JUDGE KARLIN: And so -- and what's the  
5 date of issuance of this, March 2007, correct?

6 MR. FAIR: That's correct.

7 JUDGE KARLIN: And this is a regulatory  
8 guide issued by the NRC Staff?

9 MR. FAIR: Yes.

10 JUDGE KARLIN: And it's guidelines for  
11 incorporating or evaluating fatigue in metals for new  
12 reactors.

13 MR. FAIR: That's correct.

14 JUDGE KARLIN: That's kind of the  
15 operative word. And what -- can you summarize for me  
16 what that -- what this NUREG does and says?

17 MR. FAIR: This regulatory guide?

18 JUDGE KARLIN: Yes.

19 MR. FAIR: This regulatory guide  
20 essentially refers back to the NUREG-6909 for the  
21 procedures for incorporating environmental fatigue  
22 calculations in new reactors.

23 JUDGE KARLIN: And it adopts the use of  
24 NUREG-6909 for calculating the --

25 MR. FAIR: That's correct.

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1 JUDGE KARLIN: -- fatigue in new reactors.  
2 What about existing reactors?

3 MR. FAIR: The implementation indicates  
4 that this was not backfit to existing reactors.

5 JUDGE KARLIN: Well, I'm not sure whether  
6 "backfit" is the right word, but the lawyers will have  
7 to figure that one out. But you're saying that it  
8 does not apply, was not applied, to existing reactors,  
9 is that right?

10 MR. FAIR: That's correct.

11 JUDGE WARDWELL: Where did you come up  
12 with that phrase, "backfit"? Are you quoting  
13 something, or can you point to something in the reg  
14 guide that may imply that?

15 MR. FAIR: Yes. The first paragraph under  
16 Item D, Implementation, the purpose of --

17 JUDGE WARDWELL: Bear with us for a  
18 minute. Okay. Go ahead.

19 MR. FAIR: The second sentence, "This  
20 regulatory guide only applies to new plants, and no  
21 backfitting is intended or approved in connection with  
22 its issuance."

23 JUDGE WARDWELL: And that, again, is more  
24 indicative of the fact that it's applying to new  
25 plants, and that there is no intention or approval

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1 necessary in regards to backfitting. You didn't say  
2 that backfitting would in fact be an accurate  
3 analysis. It just is not requiring that --

4 MR. FAIR: That's correct.

5 JUDGE WARDWELL: -- a clear indication of  
6 what that means?

7 MR. FAIR: That's correct.

8 JUDGE WARDWELL: Thank you.

9 JUDGE KARLIN: Let's focus on page 5 of  
10 the Staff Exhibit 13, which is Reg Guide 1.207.  
11 Page 5 talks about the regulatory position -- the  
12 Staff's regulatory position I guess is what we're  
13 saying. And as I understand it, point 1 of the  
14 regulatory position on page 5 of Staff Exhibit 13 says  
15 that the -- as I understand it, NUREG-6909 should be  
16 used to calculate the environmental fatigue usage for  
17 carbon and low-alloy steel components in lightwater  
18 reactors, right?

19 MR. FAIR: That's correct.

20 JUDGE KARLIN: And they call for the  
21 adoption of a new method for calculating the fatigue  
22 usage in air under ASME code analysis, right?

23 MR. FAIR: That's correct.

24 JUDGE KARLIN: 1.1. And 1.2 calls for --  
25 and the NRC adopts and endorses the use of the new Fen

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1 factor -- fatigue, environmentally-adjusted fatigue  
2 factor under 6909.

3 MR. FAIR: That's correct.

4 JUDGE KARLIN: Then, it goes on in .2 to  
5 do the same things and adopts 6909 with regard to  
6 stainless steels?

7 MR. FAIR: Yes.

8 JUDGE KARLIN: And also, is there a new  
9 code or does it prescribe -- and 2.1 calculates  
10 fatigue usage in air, uses an ASME code?

11 MR. FAIR: That's correct. It's a NUREG.

12 JUDGE KARLIN: So there are several things  
13 going on here. One is there is new curves under ASME  
14 for -- in air.

15 MR. FAIR: That's correct.

16 JUDGE KARLIN: Not adjusted  
17 environmentally, as it were.

18 MR. FAIR: That's correct.

19 JUDGE KARLIN: And then, there's also a  
20 new way of calculating the environmental adjustment in  
21 the lightwater reactor cooling -- coolant environment.

22 MR. FAIR: That's correct.

23 JUDGE KARLIN: Okay. So that's adopted.  
24 And they also talk about somewhere -- page 4, I  
25 believe, is it not -- 4 and 5? Is there a new 95-95

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1 confidence criterion being used here? Bottom of  
2 page 3.

3 MR. FAIR: That's correct. That's the  
4 basis of deriving the new air curves.

5 JUDGE KARLIN: Could you talk about this  
6 95-95 criterion for a moment? Are you familiar with  
7 that?

8 MR. FAIR: Yes, I am.

9 JUDGE KARLIN: Okay. What is that?  
10 What's going on there?

11 MR. FAIR: In the original ASME fatigue  
12 curves there was a fixed adjustment factor made based  
13 on the test data to -- to take test data and apply it  
14 to actual reactor components. These were adjustment  
15 factors for size, surface finish, and for the data  
16 scatter in the actual test data.

17 In NUREG-6909, a statistical evaluation  
18 was done assuming a statistical distribution of those  
19 factors that went into this calculation of the  
20 adjustment for the ASME air curves. And the basis for  
21 deriving the new curves was the 95-5 basis.

22 So this was based on the statistical  
23 evaluation. It included one additional parameter that  
24 was not included in the derivation of the original  
25 ASME air curves, which was the loading sequence.

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1 JUDGE KARLIN: Okay. So the 95-95 is a  
2 statistical competence level for --

3 MR. FAIR: That's correct.

4 JUDGE KARLIN: -- for whether or not it  
5 satisfies the ASME requirement or the requirements?

6 MR. FAIR: Well, the 95-5 or 95-95 is a 95  
7 percent confidence that there's less than a five  
8 percent probability of initiating a fatigue crack at  
9 the ASME code limit.

10 JUDGE KARLIN: Okay. And I would  
11 reference you to page 2 of the reg guide, Exhibit --  
12 what, Staff Exhibit 13. And the last -- could you  
13 read the last sentence in the second paragraph? It  
14 talks about -- there's a statement about whether or  
15 not this NUREG -- as I understand it, and let's  
16 correct me -- Reg Guide 1.207 says, "This new method  
17 for calculating environmentally-corrected metal  
18 fatigue will be used for new lightwater reactors."

19 MR. FAIR: That's correct.

20 JUDGE KARLIN: The question I'm going to  
21 focus on is, why not use it for the existing reactors,  
22 for renewals of existing reactors? And I believe  
23 there's a sentence in here that explains one of the  
24 rationales for this in the reg guide, the staff's  
25 rationale. Could you read that statement?

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1 "Because of significant conservatism in  
2 quantifying other plant-related variables such as  
3 cyclic behavior, including stress and loading rates  
4 involved in cumulative fatigue light calculations, the  
5 design of the current fleet of reactors is  
6 satisfactory." What does that mean?

7 MR. FAIR: I'm sorry, sir. I was on the  
8 wrong page.

9 JUDGE KARLIN: I'm sorry. I was on  
10 page 2. Did I say page 2, second paragraph, last  
11 sentence.

12 MR. FAIR: Last sentence.

13 JUDGE KARLIN: Page 2 of Reg Guide 1.207.

14 MR. FAIR: I believe that was an  
15 assessment that the implementation of the new criteria  
16 in 6909 will not result in a significant -- would not  
17 show that the previous criteria was unconservative or  
18 non-conservative.

19 JUDGE KARLIN: Okay. Let me go back to  
20 6909, the Exhibit 6909, NUREG-6909. Is it correct  
21 that 6909 -- 6909 was done in 2007, right?

22 MR. FAIR: That's correct.

23 JUDGE KARLIN: Was it based on a larger  
24 database?

25 MR. FAIR: It was in -- mostly on the

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1 stainless steel side.

2 JUDGE KARLIN: And it's newer information,  
3 it's more information, than the earlier NUREGs on the  
4 same subject, right?

5 MR. FAIR: Yes.

6 JUDGE KARLIN: Is it better? Is it more  
7 accurate?

8 MR. FAIR: Yes, I believe on the stainless  
9 steel side. I think if you compare the carbon steel  
10 and the low-alloy steel there is not a large  
11 difference.

12 JUDGE KARLIN: Carbon steel and the low  
13 alloy.

14 MR. FAIR: That's correct.

15 JUDGE KARLIN: But you would -- is it  
16 based upon more data?

17 MR. FAIR: It's based upon more data.

18 JUDGE KARLIN: 6909 is based upon more  
19 data. It's based upon more recent data.

20 MR. FAIR: Yes.

21 JUDGE KARLIN: And it's more accurate with  
22 regard to stainless steel.

23 MR. FAIR: Yes.

24 JUDGE KARLIN: And correct me if I'm  
25 wrong, this is the NUREG that NEC, when it says that

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1 we're -- when it alleges that staff is using an  
2 obsolete methodology for calculating the CUFens, they  
3 are suggesting that this is the standard that should  
4 be used, is that right?

5 MR. FAIR: That's the way I read their  
6 contention, yes.

7 JUDGE KARLIN: Right. Yes, that's the way  
8 I read it, too. Now, you made a statement to the  
9 ACRS, the Advisory Committee on Reactor Safety, back  
10 in February about -- about this. Let me see if I can  
11 find it.

12 (Pause.)

13 And I believe you stated that -- okay,  
14 here it is. It's Staff Exhibit 31. It's a short  
15 excerpt from February 7, 2008, meeting of the Advisory  
16 Committee on Reactor Safeguards. And, you know, the  
17 staff put this in, and you put this in about --

18 MS. BATY: Your Honor, what exhibit number  
19 did you say?

20 JUDGE KARLIN: I have it down as -- oh,  
21 I'm sorry -- Entergy Exhibit 31, E-2-31. Thank you,  
22 Ms. Baty. E-2-31. It's an excerpt from the ACRS  
23 transcript. And here you are talking -- you know,  
24 they were asking you, as I understand it, "Well, why  
25 don't we use -- why don't you use 6909 for the license

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1 renewals?" And you said, "We made a decision at that  
2 time that we would, as criteria -- we would maintain  
3 that criteria, because there were a lot of  
4 applications in process." Were you involved in the  
5 thought process as to whether or not to use a new,  
6 better methodology for license renewals?

7 MR. FAIR: Yes, I was.

8 JUDGE KARLIN: And is that pretty  
9 accurate? I mean, why not?

10 MR. FAIR: Well, at the time that we start  
11 -- first came up with the criteria for environmental  
12 fatigue, Argonne was still doing work, ongoing work,  
13 and they produced several slight modifications to the  
14 criteria. There were two additional NUREGs before  
15 6909 associated with their environmental evaluations.

16 We took a look at the significance of  
17 these changes and determined that they weren't so  
18 significant that we would try to implement them, and  
19 we wanted to maintain a stable environment for  
20 applications that were under -- that were being  
21 developed at the time. So it was a judgment at the  
22 time that it -- the changes that were ongoing weren't  
23 significant enough to change an existing criteria that  
24 applicants were working to.

25 JUDGE KARLIN: Okay. So sort of a cost-

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1 benefit analysis that you made, it's not worth  
2 imposing this more -- this new and improved method on  
3 existing operations? But you would impose it on new  
4 license -- new applicants?

5 MR. FAIR: That's part of it, yes.

6 JUDGE KARLIN: Yes. Okay. Well, and then  
7 you made a statement on the next page of this exhibit,  
8 Entergy Exhibit E-2-31, that -- well -- and, again,  
9 comparing the new NUREG-6909 to the way it would be  
10 calculated under the old NUREGs of the 1999 vintage,  
11 you said, "They would generally be lower." I guess  
12 it's -- actually, if you go and look at the latest  
13 criteria we're applying to new reactors it's not as  
14 conservative as the old criteria, because we changed  
15 the basis for deriving the curves.

16 If you look and go back at the Fen factors  
17 themselves using the new criteria, they will generally  
18 be lower.

19 MR. FAIR: That's correct.

20 JUDGE KARLIN: And what do you mean  
21 "lower"?

22 MR. FAIR: Well, if you were to calculate  
23 the Fen with the 6909 formulas, and compare it to the  
24 same Fen using the earlier NUREGs, that the current  
25 criteria would give you generally lower Fen. I

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1 believe that the --

2 JUDGE KARLIN: "Lower" meaning?

3 MR. FAIR: Smaller values.

4 JUDGE KARLIN: More conservative or less  
5 conservative?

6 MR. FAIR: Well, it --

7 JUDGE KARLIN: More stringent or less  
8 stringent?

9 MR. FAIR: The older one would be more  
10 conservative.

11 JUDGE KARLIN: More conservative.

12 MR. FAIR: Right.

13 JUDGE KARLIN: And that's what you said to  
14 the ACRS and --

15 MR. FAIR: That's correct.

16 JUDGE KARLIN: -- that's what your  
17 testimony is here today.

18 MR. FAIR: That's correct.

19 JUDGE WARDWELL: And by that you mean the  
20 number would be -- the resulting CUFen would be a  
21 higher number.

22 MR. FAIR: Actually, it would be a lower  
23 number. When you actually calculated the CUFen, the  
24 lower the number --

25 JUDGE WARDWELL: Right. Okay.

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1 JUDGE KARLIN: The old method is safer,  
2 gives you -- than the new method.

3 MR. FAIR: I use a qualifier. I mean,  
4 generally, you know, they're not in each and every  
5 case.

6 JUDGE KARLIN: Yes, generally. Now, have  
7 you calculated that for the CUFens in this case?

8 MR. FAIR: I did not calculate specific  
9 numbers. But if you go back to NUREG-6909, I believe  
10 the applicant cited the assessment in 6909 that for  
11 low-alloy steel components that the Fens are about 18  
12 percent lower using the new criteria.

13 JUDGE KARLIN: I'm sorry. The applicant  
14 said that? Or who said that?

15 MR. FAIR: That was the applicant.

16 MR. STEVENS: Your Honor, could I -- could  
17 I provide some clarification on this subject?

18 JUDGE KARLIN: Well, let me ask you, Mr.  
19 Stevens, have you calculated what it would be under  
20 6909 -- the CUFens under 6909?

21 MR. STEVENS: Yes.

22 JUDGE KARLIN: You have.

23 MR. STEVENS: We have done an assessment  
24 of that for BY.

25 JUDGE KARLIN: Holding all other variables

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1 constant, you have recalculated the CUFens under 6909  
2 and Reg Guide 1.207?

3 MR. STEVENS: That is correct.

4 JUDGE KARLIN: Okay. Great. And what are  
5 you coming up with? Now, is that in your testimony  
6 that you submitted in writing?

7 MR. STEVENS: No, it is not. This was  
8 recently completed over the weekend, and it was  
9 provided to the other parties on Saturday.

10 JUDGE KARLIN: Dr. Hopenfeld, was that  
11 presented to you?

12 DR. HOPENFELD: It was presented, but  
13 that's not what I -- what I have seen not -- there  
14 isn't any difference in the calculations. And I would  
15 be very glad to talk about it.

16 JUDGE KARLIN: All right. Well, we'll  
17 give you a moment.

18 Go ahead, Mr. Stevens.

19 MR. STEVENS: We -- I've done some --  
20 quite a few calculations with the 6909 --

21 JUDGE KARLIN: Please speak up --

22 MR. STEVENS: I'm sorry.

23 JUDGE KARLIN: -- so people can hear.

24 MR. STEVENS: I've done quite a few  
25 calculations with 6909 going back a few years as part

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1 of the review process included. And we did the -- we  
2 calculated CUFens for the VY, all nine locations that  
3 were evaluated for environmental fatigue.

4 And the CUFens using 6909 are lower than  
5 those reported by Entergy in the testimony for all  
6 nine locations. And that would support what -- Mr.  
7 Fair's prior testimony or the ACRS comment that he  
8 made earlier.

9 JUDGE REED: Mr. Stevens, in fact, the  
10 only change was the Fens, not the CUFs, is that  
11 correct?

12 MR. STEVENS: No, sir. We used --

13 JUDGE REED: Did you also change the CUFs  
14 in this --

15 MR. STEVENS: Yes. We used 6909 in its  
16 entirety, so we used the curves, calculated Fens in  
17 accordance with that document, and also CUFens as a  
18 product of the two.

19 JUDGE REED: Okay. So we are looking at  
20 a result that was attained by changes both in the  
21 environmental effects as well as how you did the basic  
22 CUF analysis.

23 MR. STEVENS: Yes, sir.

24 JUDGE REED: Okay.

25 JUDGE WARDWELL: How long does that

1 analysis take you to do?

2 MR. STEVENS: Approximately four hours.

3 JUDGE WARDWELL: Thank you.

4 JUDGE KARLIN: And let's just clarify.  
5 Dr. Reed's question I think was reasonably -- was well  
6 taken, and I think the clarification is you're saying  
7 NUREG-6909 involves more than just changing the Fen  
8 calculation, is that correct?

9 MR. STEVENS: That's correct.

10 JUDGE KARLIN: And it involves what other  
11 changes?

12 MR. STEVENS: It involves calculating  
13 fatigue with revised fatigue curves, compared to  
14 those --

15 JUDGE KARLIN: In air.

16 MR. STEVENS: Correct.

17 JUDGE KARLIN: Right.

18 MR. STEVENS: Compared to the ASME code  
19 fatigue curve.

20 JUDGE KARLIN: And what -- maybe we can  
21 just ask what the values you derived -- what were the  
22 values for the nine -- what, nine locations, six  
23 locations, nine pieces of equipment?

24 MR. STEVENS: Okay. The nine items -- and  
25 I'll report the values using 6909, and these are

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1 CUFens. Item 1 was the RPV shell bottom head  
2 location, CUFen .0263. Item 2 is the RPV shell at  
3 shroud support location. CUFen was .2637. Item 3 was  
4 the feedwater nozzle blend radius. CUFen was .2175.

5 Item 4 was the recirculation RHR Class 1  
6 piping return T. CUFen .4151. Item 5 was the  
7 recirculation inlet nozzle forging. CUFen .1921.  
8 Item 6, recirculation inlet nozzle safe-in, CUFen  
9 .0152.

10 Item 7, recirculation outlet nozzle  
11 forging, CUFen .0278. Item 8, core spray nozzle  
12 forging blend radius, CUFen .0524. Item 9, feedwater  
13 Class 1 piping, CUFen .1350.

14 JUDGE KARLIN: And what was the highest  
15 CUFen calculated by that -- in that analysis?

16 MR. STEVENS: That would be Item 4,  
17 recirculation, RHR Class 1 piping return T of .4151.

18 JUDGE KARLIN: Okay.

19 JUDGE WARDWELL: How did this analysis --  
20 how was this analysis performed in regards to the  
21 three sets of analyses that were presented as part of  
22 the testimony in regards to the basic initial  
23 calculation performed in the application, those that  
24 were done for the refined analysis, and those that  
25 were done for the confirmatory analysis? Analyses, I

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1 should say.

2 MR. STEVENS: We started with the -- all  
3 of the calculations that Entergy has done over the  
4 past year. And for the three nozzles that are a part  
5 of the testimony -- the recirculation outlet nozzle,  
6 the core spray nozzle, and the feedwater nozzle -- we  
7 used the refined analyses.

8 And the analysis -- the calculations we  
9 did here started with the stress results that went  
10 into the fatigue calculation. So we used -- you know,  
11 the majority of the analysis remained unchanged. We  
12 just took the stresses that fed into the fatigue  
13 analysis. We replaced the fatigue curve and  
14 recalculated Fens. The very tail end of the analysis  
15 was reperformed.

16 JUDGE WARDWELL: So let me make sure I  
17 understand this correctly. You used the stress  
18 analyses that -- the most recent stress analyses for  
19 a given component based on whether or not the -- it  
20 was -- the most recent was done as either a -- the  
21 original analyses, refined analyses, or confirmatory  
22 analyses.

23 MR. STEVENS: We did not use the  
24 confirmatory calculation for the feedwater nozzle, our  
25 reason being to be consistent with these comparisons.

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1 JUDGE WARDWELL: Strictly the refined for  
2 the three nozzles and then they're basically --

3 MR. STEVENS: That's correct.

4 JUDGE KARLIN: Does that mean that the  
5 Green's function issue was eliminated, or still -- as  
6 I understand it, we have three analyses essentially  
7 that you submitted, that Entergy submitted. First,  
8 it's the initial analyses, right? With the  
9 application. Is that correct?

10 MR. STEVENS: That's correct.

11 JUDGE KARLIN: Then, there was the  
12 reanalysis in September and December of '07, right?

13 MR. STEVENS: Correct.

14 JUDGE KARLIN: And that was for all seven  
15 locations or pieces of equipment -- all nine, I'm  
16 sorry. And then, there was a confirmatory analysis  
17 with regard to the feedwater nozzle, right?

18 MR. STEVENS: Correct.

19 JUDGE KARLIN: So that's the terminology  
20 I'm going to use -- the initial analysis, the  
21 reanalysis for all of them, and then the confirmatory  
22 analysis for the feedwater nozzle. And as I hear what  
23 you're saying, you used the approach of the  
24 reanalysis, and then you applied NUREG-6909 to that,  
25 is that right?

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1 MR. STEVENS: That's right.

2 JUDGE KARLIN: Now -- well, then, there  
3 may be a concern about that because the whole reason  
4 that the confirmatory analysis was done was because,  
5 as I understand it, the staff raised concerns about  
6 the simplification of being caused by using simplified  
7 data in the Green's function. Are you with me?

8 MR. STEVENS: Yes, sir.

9 JUDGE KARLIN: Was that -- is that problem  
10 still inherent in your reanalysis of these?

11 MR. STEVENS: Well, I'd just like to  
12 clarify that I don't consider that to be a problem  
13 with those analyses. But the presence of the Green's  
14 function is in the three evaluations of the nozzles in  
15 these results I reported to you.

16 JUDGE WARDWELL: And just for  
17 clarification, is it fair to say that the reason you  
18 did that is just to compare it to using 6909 versus  
19 5783 -- what's the other NUREG number -- approach?  
20 You did it for comparison purposes rather than any  
21 final calculation of record.

22 MR. STEVENS: Yes, sir. I believe at  
23 least two of the parties -- that would be Entergy and  
24 NRC Staff -- have made some statements that the newer  
25 regulatory guide and associate NUREG generally provide

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1 lower results on a CUFen standpoint than the ones used  
2 for license renewal. And so these were done to  
3 support those statements further.

4 JUDGE WARDWELL: Okay.

5 JUDGE REED: Mr. Stevens, I need to  
6 understand better how these calculations are actually  
7 performed. We've kind of jumped into the middle here,  
8 and I need to come back more to the beginning. You  
9 work for SIA, is that correct?

10 MR. STEVENS: That's correct.

11 JUDGE REED: And you personally did all of  
12 these calculations.

13 MR. STEVENS: Not -- no, sir. I was -- I  
14 did a few of them, and I supervised the staff that did  
15 the calculations.

16 JUDGE REED: But you are intimately  
17 familiar with the methodology that goes into  
18 calculating a CUFen number for a particular component.

19 MR. STEVENS: Yes, sir.

20 JUDGE REED: So you know from beginning to  
21 end exactly how that calculation proceeds and what  
22 assumptions are made.

23 MR. STEVENS: Yes, sir.

24 JUDGE REED: Could you give us a brief  
25 discourse on how that's done? I don't want a half-

1 hour tutorial. I want a five-minute description of --  
2 take a particular transient or a set of transients  
3 that are analyzed and tell us exactly how you  
4 calculate and arrive at a CUFen number.

5 MR. STEVENS: Okay.

6 (Pause.)

7 I'm trying -- I'm going to look my  
8 testimony up, so I can keep this as brief as possible.  
9 I apologize for the delay.

10 JUDGE REED: No, that's fine. You might  
11 start by talking about the kinds of transients that  
12 affect, say, a feedwater nozzle and how those lead to  
13 stresses, and then how you calculate the stresses,  
14 then how you determine what the maximum allowable  
15 stresses are, so that you -- and I don't know how to  
16 do these calculations, so I don't want to lead you too  
17 far.

18 MR. STEVENS: Okay.

19 JUDGE REED: But --

20 MR. STEVENS: I'll try and be brief but  
21 descriptive here. So we have to -- we have to collect  
22 all of the loadings for a particular component we're  
23 evaluating, and those would come from --

24 JUDGE REED: Can you speak just a little  
25 louder?

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1 MR. STEVENS: Okay. Sorry. We have to  
2 collect all of the loadings for a particular component  
3 in order to analyze it from a stress and fatigue  
4 standpoint. We would typically collect those loadings  
5 from the design specifications for the component by  
6 the vendor or manufacturer. So we would collect  
7 geometry and we would construct a model that would  
8 allow us to calculate stresses for all loadings. In  
9 this case, a finite element model is an industry  
10 standard, so we would model that component geometry --

11 JUDGE REED: So if I may interrupt, these  
12 are static loadings on a particular component. You  
13 calculate a stress tensor for that or a stress field?

14 MR. STEVENS: Correct.

15 JUDGE REED: Okay. So the issue of  
16 transients has not yet come into it.

17 MR. STEVENS: Not yet.

18 JUDGE REED: Okay.

19 MR. STEVENS: As a part of the loadings,  
20 though, there are thermal transients which are loads  
21 that vary with time, and we would also use the finite  
22 element model to evaluate stresses as a function of  
23 time for those loadings.

24 JUDGE REED: So you take a series of  
25 snapshots during a transient, and all of which have

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1 different loadings is --

2 MR. STEVENS: That's --

3 JUDGE REED: -- and calculate the  
4 stresses?

5 MR. STEVENS: Yes.

6 JUDGE REED: Okay. I'm with you so far.

7 MR. STEVENS: So during a thermal  
8 transient, we would have a stress history versus time  
9 for that transient. And then, knowing how pressure  
10 and other loadings vary during that transient, we  
11 would calculate those stresses and combine them. This  
12 is all a linear, elastic analysis, so we would combine  
13 them by superposition. And we would get a stress --  
14 a total stress history for the component from those  
15 analyses.

16 JUDGE REED: For a particular transient,  
17 you develop a stress history, meaning the stress as a  
18 function of time.

19 MR. STEVENS: That's correct.

20 JUDGE REED: Okay.

21 MR. STEVENS: And then, we have 20  
22 transients, we would repeat that process 20 times and  
23 come up with 20 stress histories.

24 JUDGE REED: Now, when you say "20  
25 transients," you don't mean the same thing happening

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1 again and again. You mean 20 different kinds of --  
2 the plant responding to something happening.

3 MR. STEVENS: That's correct.  
4 Different --

5 JUDGE WARDWELL: Are these plant-specific?

6 MR. STEVENS: Yes. So you are correct.  
7 There would be 20 different transients of a different  
8 type. Each of those transients would occur a  
9 different number of times. So the quantity of those  
10 20 transients would be specified and would be  
11 different.

12 JUDGE REED: And some of the transients  
13 are more severe than others?

14 MR. STEVENS: That's correct.

15 JUDGE REED: And would lead to larger  
16 stresses?

17 MR. STEVENS: That's correct.

18 JUDGE REED: But they may occur fewer  
19 times, so you may have a smaller transient that occurs  
20 much more frequently that is going to contribute  
21 relatively more to the ultimate answer, is that  
22 correct?

23 MR. STEVENS: That's correct.

24 JUDGE REED: Okay.

25 MR. STEVENS: So now, once we have the

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1 stress history, and we would feed that into a fatigue  
2 analysis, and the fatigue analysis first tells us how  
3 to take those stress histories and link them together  
4 or combine them in such a way that we can count number  
5 of stress fluctuations on a component. Stress  
6 fluctuations are what lead to fatigue.

7 JUDGE REED: So it's not stress, but  
8 fluctuations in stress.

9 MR. STEVENS: That's correct. It requires  
10 a stress fluctuation to contribute any kind of  
11 fatigue.

12 JUDGE REED: Okay.

13 MR. STEVENS: So, and the ASME code gives  
14 us guidelines and methodology for doing all of this  
15 analysis. And, in particular, counting cycles, how  
16 that's done in a conservative fashion, because in a  
17 fatigue analysis of the component we don't necessarily  
18 know the order of occurrence of the events. So the  
19 methodology assumes the worst possible occurrence by  
20 pairing the extreme stresses together.

21 So when we go through this counting  
22 process, we take the highest extreme, the highest peak  
23 stress with the lowest low stress and pair these off  
24 to get these stress fluctuations.

25 JUDGE REED: So that's a conservative

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1 assumption you are making? Is that the point?

2 MR. STEVENS: Yes, sir.

3 JUDGE REED: So you don't take the actual  
4 stress history of the transients. You somehow take  
5 the high stress and the low stress and pair them up  
6 to --

7 MR. STEVENS: Well, when we -- when we --  
8 that's correct.

9 JUDGE KARLIN: May I ask a question in  
10 this -- on any given transient, you are talking about  
11 the stress load that occurs during a transient, right?

12 MR. STEVENS: Yes.

13 JUDGE KARLIN: Do you have monitors that  
14 are telling you what the stress load is on this  
15 particular valve or nozzle or outlet? How do you know  
16 -- where are you getting the data that tells you how  
17 much stress they have?

18 MR. STEVENS: The stress comes from the  
19 finite element analysis of that component.

20 JUDGE REED: And what code is being used  
21 to do that analysis?

22 MR. STEVENS: We use the ANSYS finite  
23 element code.

24 JUDGE REED: And that is a commercially-  
25 available code?

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1 MR. STEVENS: Yes, sir.

2 JUDGE REED: And ANSYS stands for?

3 MR. STEVENS: I don't recollect.

4 JUDGE KARLIN: Could you spell the  
5 acronym?

6 MR. STEVENS: A-N-S-Y-S.

7 JUDGE KARLIN: Okay.

8 JUDGE REED: And that code is in wide use  
9 or very narrow use throughout the industry or --

10 MR. STEVENS: It's widely used in the  
11 nuclear industry for finite element analysis.

12 JUDGE REED: And what can you say about  
13 the accuracy of the code, the benchmarking of the  
14 code? How confident are you that it is giving you  
15 correct numbers?

16 MR. STEVENS: The code is extensively  
17 benchmarked. It comes with verification manuals that  
18 -- where analyses are run and compared to theoretical  
19 or hand solutions and checked for accuracy. It is all  
20 controlled and developed under a 10 CFR 50 Appendix B  
21 quality assurance program.

22 And when we bring that code into our house  
23 we also have to adopt it as part of that program and  
24 do the extensive checking and verification in  
25 accordance with those verification manuals, and then

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1 ensure that our use is consistent with those -- the QA  
2 program and those checks.

3 JUDGE REED: So when you generate a finite  
4 element mesh for ANSYS, do you do a mesh refinement  
5 study?

6 MR. STEVENS: Generally not on a case-by-  
7 case basis. This is one of the areas where it does  
8 require analyst judgment and experience to do it  
9 properly. We have done those as a part of our company  
10 extensively for other reasons, but we don't do it on  
11 a case-by-case basis.

12 JUDGE REED: Would it not be possible that  
13 as you refined the mesh you would find a little local  
14 area where the stress is much higher than it would be  
15 calculated with a much coarser finite element grid?

16 MR. STEVENS: That's possible. I don't  
17 think that that's -- I would not agree with that  
18 assessment for the models used for Vermont Yankee.

19 JUDGE REED: But you can't rule it out,  
20 since you haven't done the mesh refinement study.

21 MR. STEVENS: No. We can only rule it out  
22 based on our experience.

23 JUDGE REED: So you can't actually be  
24 certain that higher stresses might not be generated if  
25 you refined the meshes in your calculations.

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1 MR. STEVENS: Generally, that kind of an  
2 artifact would come near discontinuities.

3 JUDGE REED: Yes.

4 MR. STEVENS: And the locations that we're  
5 evaluating here don't have those kinds of  
6 discontinuities.

7 JUDGE REED: Okay.

8 MR. STEVENS: So I'm confident that you  
9 would not experience a significant change in stress  
10 with your suggestion.

11 JUDGE REED: So is it your point that you  
12 believe that you have resolved the stress field  
13 reasonably accurately with the finite element meshes  
14 you're using in your calculations?

15 MR. STEVENS: Yes, sir.

16 JUDGE REED: Okay. I hope we can proceed  
17 with how you do the calculation now. And I'm sorry  
18 that --

19 (Judges confer.)

20 JUDGE WARDWELL: Dr. Hopenfeld, do you  
21 have any major objections or arguments with the way  
22 Mr. Stevens just described the approach that they use?

23 DR. HOPENFELD: Yes.

24 JUDGE WARDWELL: Is that your  
25 understanding of how the approach was used?

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1 DR. HOPENFELD: Yes. Yes, Your Honor. I  
2 understand exactly what he's talking about.

3 JUDGE WARDWELL: And is that your  
4 understanding of how it was performed when you  
5 supplied your testimony?

6 DR. HOPENFELD: Yes. Yes, it is.

7 JUDGE WARDWELL: Okay. That's all I  
8 needed to know. We'll get to you in a moment. Just  
9 wanted to make sure we're all in agreement.

10 DR. HOPENFELD: Well, make sure you pick  
11 me up.

12 JUDGE KARLIN: No. But I'm trying to --  
13 when you said yes, do you have disagreements with what  
14 he just said, or are you on board?

15 DR. HOPENFELD: I have no disagreement  
16 with what he said.

17 JUDGE KARLIN: Okay.

18 DR. HOPENFELD: But that's only part of  
19 it.

20 JUDGE KARLIN: Yes, right. We'll get to  
21 that.

22 DR. HOPENFELD: That's not the whole  
23 story.

24 JUDGE KARLIN: Okay. Fine. I just want  
25 to be clear on that. We'll get the rest of the story.

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1 DR. HOPENFELD: Okay.

2 JUDGE WARDWELL: Go ahead. I just wanted  
3 to --

4 JUDGE REED: Well, we were partway through  
5 this issue of exactly how you take a series of  
6 transients and calculate a CUFen number.

7 MR. STEVENS: Correct. So once I have all  
8 of these different stress histories for, arbitrarily  
9 talking, 20 transients here, the ASME code tells me  
10 how to start to pair these together to get fluctuating  
11 stresses that would contribute to fatigue. So I have  
12 to combine these transients. As I said, it does it in  
13 a conservative way that it takes the most -- the  
14 extreme stresses and pairs those and uses those  
15 fluctuating stresses into a fatigue analysis.

16 And very, very simplistically, if I took  
17 the highest stress and the lowest stress that would be  
18 a stress range, and alter -- a possible alternating  
19 stress range that that component may have been exposed  
20 to --

21 JUDGE REED: For that one kind of  
22 transient.

23 MR. STEVENS: For that one pairing of two  
24 extremes, which could be from two different  
25 transients. Remember, I'm going after extremes to get

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1 the most conservative fluctuation of stress that  
2 component would have seen.

3 JUDGE REED: I'm failing completely to  
4 understand why you picked the high stress from one  
5 transient and the low stress from a completely  
6 different transient that presumably occurs at some  
7 other time in the plant's history.

8 MR. STEVENS: Well, because that -- the  
9 component would see the stresses caused by both of  
10 those transients at some point in its life. So in  
11 terms of a fluctuating stress --

12 JUDGE REED: These could be days, months  
13 apart, though.

14 MR. STEVENS: Could be years apart. But  
15 you see that a typical design analysis does not know  
16 the order of events. So if it's analyzing 20  
17 transients, and it has no particular knowledge on the  
18 order those events could occur, and if it puts them  
19 next to each other as if they occurred minutes apart,  
20 that would be the most conservative.

21 JUDGE REED: And that's what you do.

22 MR. STEVENS: That's what we do. And it's  
23 a conservative way of stating the extreme stress  
24 fluctuations that that component will go through, not  
25 knowing the order of events ahead of time.

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1 JUDGE REED: I'm struggling to understand.  
2 I want to ask you at some point -- you've got 20  
3 different kinds of transients.

4 MR. STEVENS: Correct.

5 JUDGE REED: Presumably all sorts of  
6 things that happen to the plant -- changes in power  
7 level, turbine trips, whatever. And these are all  
8 stressing this particular component, and they are all  
9 occurring with different frequencies, some occurring  
10 once a year, some occurring every several years, some  
11 occurring every decade. Am I right, in this --

12 MR. STEVENS: That's correct.

13 JUDGE REED: So what I want to understand  
14 is how you ultimately take all of those various  
15 transients, calculate some sort of utilization  
16 factors, and then cumulate them up into a CUF.

17 MR. STEVENS: Let me try again. Let's  
18 start with the stress history for one transient. So  
19 I have one transient that has temperature during the  
20 time, and I have calculated stresses for that  
21 transient. So I have a stress versus time plot I can  
22 make for that one transient.

23 JUDGE REED: Okay.

24 MR. STEVENS: Now I have 19 other  
25 transients that I do the same thing. And what I'm

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1 going to do is I'm going to take the stress history  
2 for each of those other 19 transients, I'm going to  
3 tag it on to the end of the stress history for  
4 transient number 1. Now what I've got is this very,  
5 very long stress history versus time that has all 20  
6 transients attached together to each other.

7 JUDGE WARDWELL: These aren't 20 actual  
8 transients that occurred at Vermont Yankee. These are  
9 20 different types of transients that are generically  
10 experienced at a boiling water reactor similar to  
11 might be at Vermont Yankee.

12 MR. STEVENS: These are specified by the  
13 designer for the plant.

14 JUDGE WARDWELL: Okay.

15 MR. STEVENS: So I now have a long stress  
16 history, stress versus time, that represents 20  
17 transients attached together, one after another.

18 Now, when I put that history together, I  
19 made a big assumption on the order of those  
20 transients. If I would have done transient 1,  
21 transient 2, transient 3, then that stress history  
22 represents that the order of occurrence of those 20  
23 transients was in that order -- time order I put them  
24 in.

25 JUDGE WARDWELL: And the time is not a

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1 real time, it is the linkage of all of the transients,  
2 and they are attached based on the link that the  
3 transient occurs. Then, you immediately start the  
4 next transient after that one is over with, is that  
5 correct?

6 MR. STEVENS: Yes, that's correct.

7 JUDGE REED: So you are putting the plant  
8 through all of its paces basically one right after the  
9 other with no intervening period of six months of  
10 stable operation, is that --

11 MR. STEVENS: That's correct.

12 JUDGE REED: Okay.

13 JUDGE KARLIN: Let me just -- may I ask  
14 basic questions, where we're going here. I was  
15 concerned by the answer you gave to Dr. Wardwell's  
16 question. Are these -- when you were talking about  
17 the 20 transients, are these actual transients that  
18 occurred at Vermont Yankee that you were basically  
19 saying, okay, there are 20 transients and here is how  
20 much stress -- transient 1 gave X stress, transient 2  
21 gave Y stress.

22 We're going to add them all together, and  
23 here's how much stress Vermont Yankee has experienced  
24 over the 35 years it has been operating. Is that what  
25 is going on, or are these some sort of assumed

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1 stresses that are theoretical?

2 MR. STEVENS: These are -- the transients  
3 that we're calculating these stresses for are  
4 specified by the designer, they are part of the design  
5 basis, and they have been shown to be conservative --  
6 very conservative definitions, compared to the actual  
7 transients that Vermont Yankee --

8 JUDGE KARLIN: Yes, because here's where  
9 I'm going. Let me just be real basic. Metal fatigue,  
10 I'm focusing on the NUREGs and the CUFens and that  
11 sort of thing, metal fatigue. As I understand it,  
12 metal fatigue -- you take a paper clip, it's made of  
13 metal. You bend it once, twice, you bend it 100 times  
14 and then it breaks. And you do this experiment a  
15 dozen times and it breaks at a hundred.

16 With the hundredth bend, 90-degree bend,  
17 it breaks. So now you know that that piece of metal  
18 is going to break at the hundredth twist of 90  
19 degrees. That's my simplistic way of thinking about  
20 this. This is the ASME curve that says at a hundred  
21 breaks in air -- bends at 90 degrees in air this paper  
22 clip will break.

23 Now you go and say, "All right. I've got  
24 a paper clip here. I bent it 37 times. And I bent it  
25 90 degrees some of those times, and I bent it 45

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1 degrees some of those times. I bent it 200 degrees  
2 some of -- I bent it a lot of different ways." And I  
3 total up those 37 bends, and I say, "Okay. I have  
4 used up this amount of stress." And if I -- and now  
5 I know how long it is going to take for me to get to  
6 the hundredth time when it breaks. Is that what's  
7 going on?

8 MR. STEVENS: That's simplistically what  
9 is going on.

10 JUDGE KARLIN: And so when we are talking  
11 about the calculations of the 20 transients, which are  
12 bends, the times that there was stress imposed upon  
13 this, are you talking about the -- how we get to the  
14 hundredth, the theoretical one hundred, or how do we  
15 get to the actual history of this plant?

16 MR. STEVENS: The transient severity is  
17 analogous to your how far did you bend your paper  
18 clip?

19 JUDGE KARLIN: Right.

20 MR. STEVENS: Because if you bent your  
21 paper clip 90 degrees and got 100 times until failure,  
22 you would get a different number if you only bent your  
23 paper clip 45 degrees.

24 JUDGE KARLIN: Right.

25 MR. STEVENS: It's a measure of the load

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1 on that component. These transients all have  
2 different severity. One transient may have a 45-  
3 degree bend analogy, another one a 90-degree bend  
4 analogy, another one a 10-degree bend analogy.

5 JUDGE KARLIN: Right.

6 MR. STEVENS: They all have different  
7 severities. They are specified by the designer to be  
8 very conservative, so that the designer can do a  
9 fatigue design of the plant prior to construction.  
10 And those have been shown through numerous studies  
11 throughout the industry over the history to be  
12 conservative, and those are the definitions that were  
13 used in the analyses for Vermont Yankee.

14 JUDGE KARLIN: So the American Society for  
15 Mechanical Engineers and the people who designed this  
16 particular boiling water reactor figured out for each  
17 type of metal in that reactor how many bends, how many  
18 stresses it would take before it broke. Is that  
19 right?

20 MR. STEVENS: Not quite.

21 JUDGE KARLIN: Okay.

22 MR. STEVENS: What they would do is an  
23 analysis in accordance with ASME code to demonstrate  
24 that for those loadings the component will not show  
25 unacceptable results. And in this particular case

1 that's a usage factor less than one.

2 JUDGE KARLIN: Right.

3 MR. STEVENS: That does not necessarily  
4 mean failure.

5 JUDGE KARLIN: Yes. So you have a hundred  
6 -- if you had -- so the calculation is this thing will  
7 -- you can bend it a hundred times 90 degrees and it  
8 will break. Now, you've actually only bent it 70  
9 times at 90 degrees, so your CUFen factor is .7,  
10 right?

11 MR. STEVENS: That is correct.

12 JUDGE KARLIN: And you've got 30 bends  
13 left before it is going to break or before the  
14 calculation says it will break, right?

15 MR. STEVENS: Well, again, the calculation  
16 isn't indicating breakage. It's --

17 JUDGE KARLIN: Failure of some kind.

18 MR. STEVENS: -- the acceptance criteria  
19 that's used, and there is margin on that acceptance  
20 criteria.

21 JUDGE KARLIN: Okay. I understand.

22 MR. STEVENS: We work with safety factors  
23 and other things that prevent breakage.

24 JUDGE KARLIN: Okay. Sorry for the  
25 digression. Go ahead.

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1 JUDGE REED: Please continue.

2 MR. STEVENS: Back to our -- we now have  
3 our 20 transients linked together. I have made an  
4 assumption in how those transients link together, the  
5 order they occur. And what the ASME code tells us to  
6 do as well, in order to capture the most conservative  
7 order, we're going to go through this history and  
8 we're going to take the largest extremes and say that  
9 they define a stress fluctuation that the component  
10 will go through.

11 So perhaps of this entire stress history  
12 let's say the highest stress experienced was  
13 transient 1, and the lowest stress was transient 18.  
14 I would start by pairing those, and that would define  
15 a stress range, the maximum stress range that could be  
16 conceivable for that component to see throughout that  
17 stress history.

18 When I make that choice it is like taking  
19 transient 18 and moving it next to transient 1,  
20 assuming that order, adjacent order.

21 JUDGE REED: Well, aren't you,  
22 furthermore, assuming that these two transients occur  
23 with the same frequency? Suppose one is an annual  
24 thing and one is a weekly thing. How do you justify  
25 putting them together in your analysis when you know

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1 that one occurs 50 times more often than the other?

2 MR. STEVENS: That would be something I  
3 would like to take advantage of, because -- but this  
4 way is conservative and it's making that assumption.  
5 It is very bounding.

6 JUDGE REED: Okay. I understand that.

7 JUDGE WARDWELL: This is just defining the  
8 angle at which you're bending the paper clip.

9 MR. STEVENS: It's trying to -- back to  
10 your paper clip analogy, it is trying to just say that  
11 based on the stress history, and if I could reorder  
12 things in any order I wanted to, the worst extreme  
13 your paper clip may go through is 90 degrees, so I  
14 want you to take that as the top cycle, the most  
15 severe cycle to evaluate. But it's --

16 JUDGE WARDWELL: The right paper clip  
17 would -- the fact that one transient occurs now and  
18 another one occurs a week later isn't necessarily --  
19 I'm trying to find a word that -- with a paper clip  
20 you could bend it once, and then a week later bend it,  
21 it's still going to know -- it's got a memory -- it's  
22 going to know you have bent it. So it's not  
23 completely unreasonable to move 18, because this is an  
24 arbitrary number, up next to the other one, because  
25 that range of stresses has been felt by that metal.

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1 MR. STEVENS: That's correct. But it  
2 ignores that there could have been events in between  
3 those two. But in principle what you're saying is  
4 correct.

5 JUDGE KARLIN: Why does it make any  
6 difference, I mean, whether you put them together --  
7 you have had 37 events at this -- on this paper clip,  
8 you know, of bending at different angles. I don't  
9 care whether they are all done, what order they are  
10 done, at the end of the day 37 events have occurred,  
11 this much stress has occurred, and you have used up  
12 this amount of your CUFen before you get to 1, right?

13 MR. STEVENS: If transient 15 actually  
14 occurred after transient 1, and had a much smaller  
15 stress associated with it than transient 18, then the  
16 cycle the component saw on that day is much smaller  
17 than the one I assumed by putting transient 18 next to  
18 1.

19 JUDGE KARLIN: So you're assuming a  
20 conservative assumption, the worst case as it were.

21 MR. STEVENS: It's the worst possible --

22 JUDGE KARLIN: Higher stress. So it would  
23 be more consumption of the -- what's available  
24 fatigue, what available fatigue there is before it  
25 breaks or fails.

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1 JUDGE WARDWELL: I hate to beat this, but  
2 180 degrees as opposed to 90 degrees is --

3 MR. STEVENS: That's a very good analogy,  
4 yes.

5 JUDGE REED: So if we move on now, you've  
6 taken and done this pairing, what do you do with all  
7 of the other transients?

8 MR. STEVENS: Well, I go -- okay.

9 JUDGE REED: You pick the worst two, put  
10 together, and you put those together --

11 MR. STEVENS: One occurrence of the worst  
12 two.

13 JUDGE REED: One occurrence.

14 MR. STEVENS: If you can imagine now,  
15 remember in the beginning I told you that each  
16 transient has a specific number of occurrences  
17 associated with it.

18 JUDGE REED: Yes.

19 MR. STEVENS: So, if you will, each peak  
20 and valley of this long stress history --

21 JUDGE REED: Yes.

22 MR. STEVENS: -- has a number of cycles  
23 associated with it that's equal to the number of  
24 transients. If I take the portion that's transient 1,  
25 and if my designer said 100 of those could occur

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1 during the life of the plant, then that stress history  
2 -- every point on it -- could occur 100 times, almost  
3 analogous to now I've got this third dimension kind of  
4 on this graph. I've got a stress versus time history,  
5 and each point has a different number of occurrences  
6 associated with it -- the number of transients that  
7 were specified by the designer.

8           So if I take transient 1 and transient 18,  
9 I have now taken one occurrence of each of those  
10 events. If I had 100 occurrences of transient 1, I  
11 have 99 of those points left to deal with. So you can  
12 imagine, if I go through this history and take the  
13 highest and the lowest, and cross one site -- one  
14 occurrence of each of those off, and take the next  
15 highest or the next lowest, and I repeat that process  
16 until all occurrences of all transients have been  
17 consumed, I'd get a nice stress array right from  
18 largest stress range to lowest with the number of  
19 occurrences next to it.

20           JUDGE REED: I see that.

21           JUDGE WARDWELL: So far, the three NUREGS  
22 of interest haven't even come into play yet, is that  
23 correct?

24           MR. STEVENS: Yes.

25           JUDGE WARDWELL: This is all stress

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1 analysis.

2 MR. STEVENS: That's correct.

3 JUDGE KARLIN: So in that respect it's the  
4 ASME code as opposed to the Fen part of the analysis?

5 MR. STEVENS: That's correct.

6 JUDGE KARLIN: Okay.

7 MR. STEVENS: So now I have a spectrum of  
8 stress range and cycles applied to that stress range.  
9 So now I have what's required to calculate fatigue.  
10 I'll stop here for one --

11 JUDGE WARDWELL: To calculate what?

12 MR. STEVENS: Fatigue usage.

13 JUDGE WARDWELL: Fatigue.

14 MR. STEVENS: CUF.

15 JUDGE WARDWELL: CUF.

16 MR. STEVENS: Now, this represents 90, 95  
17 percent of the work.

18 JUDGE WARDWELL: How long does it take to  
19 do this -- person-hours, labor-hours?

20 MR. STEVENS: Just as an example, the  
21 confirmatory calculations for Vermont Yankee feedwater  
22 nozzle took about three weeks dedicated, approximately  
23 three individuals full-time.

24 JUDGE KARLIN: So let me understand. The  
25 confirmatory analysis for one nozzle, the feedwater

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1 nozzle, took three people three weeks of work?

2 MR. STEVENS: That's correct.

3 JUDGE KARLIN: It took nine weeks of time,  
4 nine --

5 MR. STEVENS: Nine man-weeks.

6 JUDGE KARLIN: Nine man-weeks.

7 MR. STEVENS: You must understand that  
8 that includes all the quality assurance checks and  
9 documentation proper filing.

10 JUDGE KARLIN: Well, how did you do all of  
11 them in four hours?

12 MR. STEVENS: No.

13 (Laughter.)

14 MR. STEVENS: This is the point I was  
15 going to make. What's left took us four hours. So  
16 I'll describe what's left next.

17 JUDGE WARDWELL: Before you do that, Dr.  
18 Hopenfeld, is everything Mr. Stevens has said to date  
19 your understanding of how they did it when you did  
20 your review and filed your testimony?

21 DR. HOPENFELD: With respect to the  
22 specific numerical analysis, I am not an expert in  
23 stress numerical analysis.

24 JUDGE WARDWELL: I'm not asking you any  
25 opinion. I'm asking you whether or not, when you were

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1 reviewing this for NEC and filed your testimony, is  
2 everything that Mr. Stevens said consistent with what  
3 you thought they had done?

4 DR. HOPENFELD: Yes, yes.

5 JUDGE WARDWELL: That's all we need right  
6 now.

7 DR. HOPENFELD: Oh, yes. I will --

8 JUDGE WARDWELL: Thank you. Just want to  
9 make sure he hasn't told any --

10 DR. HOPENFELD: Even now, I don't have any  
11 issue with what he said.

12 JUDGE WARDWELL: And there isn't a  
13 misunderstanding --

14 DR. HOPENFELD: No, no, no. I have no --  
15 I am absolutely in agreement with it.

16 JUDGE WARDWELL: So you don't contest --

17 DR. HOPENFELD: No.

18 JUDGE WARDWELL: -- the basic approach  
19 that they have said they did.

20 JUDGE KARLIN: And the answer to that is  
21 -- Dr. Hopenfeld, you don't contest that approach.

22 DR. HOPENFELD: I have -- no, this has  
23 gone on for 30 years in the industry.

24 JUDGE KARLIN: Right.

25 DR. HOPENFELD: I mean, this is acceptable

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1 practice. But you did go to the Fen before, and I  
2 really want to get there, and I also would like to go  
3 a little bit further beyond that, because I think  
4 there are a few things here that are not complete.

5 JUDGE KARLIN: Yes, sir. I just want to  
6 get that on the record, because you nodded.

7 DR. HOPENFELD: As to the merits, I agree  
8 with him.

9 JUDGE KARLIN: You nodded, and the Court  
10 Reporter wouldn't capture that, unless we got  
11 something.

12 JUDGE REED: So I would like to  
13 understand, then, how you actually calculate the CUF  
14 number, given this spectrum of transients, because it  
15 is my understanding that if you take a particular  
16 loading and you assume it occurs that the ASME code  
17 basically tells you how many times a particular piece  
18 of metal can be stressed in that way before it breaks.

19 So you -- well, instead of me trying to  
20 say this, let me let you tell me exactly how you go  
21 from -- from this -- from where you left us to a  
22 single number, a CUF, or a feedwater nozzle.

23 MR. STEVENS: Okay. In this discussion  
24 I'm going to keep it simple. There is details that  
25 I'm going to leave out that I recognize are there, but

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1 I am just trying to keep the conversation simple. And  
2 so we have this stress range number of cycles. One of  
3 the things that the ASME code defines for us is an SN  
4 curve or stress versus number of cycles or a fatigue  
5 curve. That's a function of the materials, the  
6 material property based on testing for that material.

7 But it does relate stress to number of  
8 allowable cycles for that material. So you can see  
9 now I have this spectrum of stress and number of  
10 occurrences. So for each of those stresses I can go  
11 look up in that ASME code curve the allowable number  
12 of cycles for that stress level. That's a material  
13 property.

14 So for this whole spectrum now I can take  
15 each one of the stresses and I can go look up what  
16 I'll call an "N allowable," the number of allowable  
17 cycles that can be tolerated by that material.

18 JUDGE REED: For that particular stress.

19 MR. STEVENS: For that particular stress,  
20 so if my stress -- if my stress table I have reduced  
21 this big, long stress history into has a thousand  
22 points, I would go look at 1,000 different stresses on  
23 that curve and determine 1,000 different allowable  
24 number of cycles.

25 JUDGE KARLIN: And you call that an "N

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1 allowable"?

2 MR. STEVENS: N subscript allowable.

3 JUDGE KARLIN: N subscript allowable,  
4 okay.

5 MR. STEVENS: Or large N, I think is what  
6 has been used in a lot of the testimony.

7 JUDGE KARLIN: Okay.

8 MR. STEVENS: From the definition of the  
9 transients in this counting process, I have the number  
10 of occurrences of each of those stresses. We'll call  
11 that little N. It's the applied number of cycles. So  
12 for each of these thousand stress entries in the table  
13 I have an applied number of cycles, and per the code  
14 I have an allowable number of cycles. I have little  
15 N and big N.

16 JUDGE REED: So you take the ratio of each  
17 one and sum up a thousand numbers.

18 MR. STEVENS: That's correct. The usage  
19 factor is defined as little N divided by big N, and  
20 the cumulative usage factor is the sum of a thousand  
21 Us, usage factors.

22 JUDGE REED: Is there any body of  
23 experimental evidence that shows that that summation  
24 is conservative? Is that just a pure assumption?  
25 It's a linearity assumption?

1 MR. STEVENS: It's documented in the 1945  
2 paper. It's called Miner's Rule, or Palmgren-Miner  
3 Rule. So it has been around for 60 years.

4 JUDGE REED: Has it been verified?

5 MR. STEVENS: It has been verified based  
6 on laboratory testimony at the time. It has also been  
7 verified now by almost 40 years of industry experience  
8 with its use.

9 JUDGE KARLIN: And when you say "industry  
10 experience," do you mean nuclear industry or all  
11 industries?

12 MR. STEVENS: I mean just nuclear. It  
13 also has been used in other industries as well.

14 JUDGE KARLIN: Okay.

15 MR. STEVENS: Now, last point on this  
16 description. In your paper clip example, where you  
17 just bent 90 degrees back and forth until failure,  
18 your stress table would really just have one line in  
19 it, not 1,000 lines. You just loaded it once.

20 So you can see that if you bent the paper  
21 clip the number of times the code curve told you to,  
22 simplistically, it would break. Now, when we have a  
23 thousand different loadings, keeping the total usage  
24 factor, the cumulative usage factor less than one is  
25 another way of expressing that same thing, except for

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1 a thousand different loadings.

2 I want to keep the ratio of applied cycles  
3 to the allowable cycles in total less than unity. And  
4 we don't mean failure here; what we mean is it's a  
5 criteria for acceptability by Section 3, because of  
6 the factors that have been built into that as well as  
7 other conservatisms in the process. We talked about  
8 one is how I link these transients together. It's a  
9 criteria that we have to meet, though.

10 JUDGE KARLIN: So at this point we are  
11 just dealing with the CUF factor, the cumulative use  
12 factor. You haven't gotten to the environmentally-  
13 adjusted side of the equation, right?

14 MR. STEVENS: That's correct.

15 JUDGE KARLIN: Okay. And as I understand  
16 your -- I would like you to address that. But as I  
17 understand it, it would be, well, okay, I did my test  
18 with the paper clip 100 times in air 90 degrees. Now  
19 I'm going to do it in --

20 MR. STEVENS: Sulfuric acid.

21 JUDGE KARLIN: -- sulfuric acid or boiling  
22 water at 500 degrees or whatever -- you know, at some  
23 other environment, dissolved oxygen, you know,  
24 different kinds of whatever is going on, a different  
25 environment, and then we'll see -- the stress may be

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1 more or it may be less, you know, so it has to be  
2 adjusted from smooth pieces of metal in air to  
3 possibly non-smooth pieces of metal in a lightwater  
4 reactor.

5 And that adjustment is what the NUREG-  
6 6909, NUREG-5704, those NUREGs attempt to provide how  
7 is it adjusted from the ASME air, smooth metal to  
8 lightwater reactor, you know, high temperature, high  
9 pressure type of situation. Right?

10 MR. STEVENS: That's correct, but I would  
11 like to make one clarification to what you said.

12 JUDGE KARLIN: Yes, please.

13 MR. STEVENS: You said that the stress  
14 would change.

15 JUDGE KARLIN: I don't know. Would it?

16 MR. STEVENS: If you're still bending  
17 these paper clips to 90 degrees, the stress would not  
18 change. What would change, if you do it in sulfuric  
19 acid or whatever is the fatigue curve itself. So for  
20 a given stress level you would look up a different  
21 allowable number of cycles that would cause a  
22 different cumulative usage factor.

23 JUDGE KARLIN: All right.

24 MR. STEVENS: But the stress in that  
25 component is still the stress given that you are

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1 applying the same load to it. No change there.

2 JUDGE KARLIN: Okay. But it might be --  
3 if I could do -- bend it a hundred times in air before  
4 it broke, and I put it in water, it might only be 75  
5 times before it's going to break.

6 MR. STEVENS: That's a good analysis.

7 JUDGE KARLIN: Or 200 times. It could be  
8 more, it could be less. It's a different environment,  
9 so it's a different experiment. Okay.

10 MR. STEVENS: Yes.

11 JUDGE KARLIN: So maybe I could ask -- I  
12 don't know if this is jumping the gun, but do you  
13 agree that the -- the Argonne came up -- Argonne  
14 National Labs came up with a new method for doing this  
15 in 2007. Do you agree that they used more data to  
16 develop the 6909?

17 MR. STEVENS: I agree with that, yes.

18 JUDGE WARDWELL: And can I just clarify a  
19 point on that? Somewhere in the testimony, or I read  
20 it somewhere -- I was trying to find it and couldn't  
21 in the short time we had available -- but it was my  
22 understanding that the 1997 or 1998 analysis that  
23 Argonne had performed, that really generated NUREG-  
24 6260 and 5704, was where they were at that point, and  
25 that 6909 is a reflection of them really completing

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1 their analysis. Is that a fair representation of it,  
2 or did I read something that isn't a fair  
3 representation of the process?

4 MR. STEVENS: I guess I would characterize  
5 it as they came out with relationships at the time  
6 that the data supported, and with additional data  
7 those relationships refined based on that additional  
8 data.

9 JUDGE WARDWELL: But they were always  
10 planning on doing that final completion, is that  
11 correct, or not? Or did they do it because some new  
12 data demonstrated something unusual?

13 MR. STEVENS: I'm not sure what their  
14 intent was. So I --

15 JUDGE WARDWELL: Mr. Fair, do you have any  
16 idea?

17 MR. FAIR: Yes. As I said previously, on  
18 the carbon and low alloy steel there was not a very  
19 significant change to the basic formulas in 6909  
20 compared to the previous. In stainless steel there  
21 was a change, because they developed more data.

22 If you go back to the old stainless steel  
23 NUREG, the older stainless steel NUREG, they have an  
24 abrupt change in the Fen factor at a temperature of  
25 200 degrees. In the current NUREG, they have a more

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1 general transition of that Fen factor based on  
2 additional data. It goes from slightly below 200  
3 degrees to up to 325 degrees Centigrade.

4 JUDGE WARDWELL: So was it fair to say  
5 that in 1998 they knew they were going to have to  
6 continue on with the analysis of the stainless steel  
7 in order to refine it for these other aspects?

8 MR. FAIR: Well, I don't know that I would  
9 characterize it quite like that. What they were doing  
10 was developing additional data. And once they had the  
11 data, then they felt it was necessary to refine their  
12 correlations.

13 JUDGE WARDWELL: But it is not a  
14 completely new analysis. It is pretty much the same  
15 analysis except now refining it for the updated  
16 information on stainless steel.

17 MR. FAIR: That's correct.

18 JUDGE KARLIN: Why did they do -- why did  
19 NRC have Argonne go off and do it again? Why did --  
20 was something wrong with the stuff in '97 and '98? I  
21 mean, or is it just science always progresses and they  
22 keep working more and more and they -- whatever. Why  
23 did we bother? Why did NRC bother to have it redone?

24 MR. FAIR: Well, in the original  
25 correlations on the carbon and low-alloy steel, it was

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1 originally thought that that was the only area where  
2 you had an environmental impact. It was questioned  
3 about in that timeframe what was the potential for an  
4 impact on stainless steel, and that drove some testing  
5 on the stainless steel.

6 And once that testing started to develop,  
7 they started to find there was an impact on the  
8 stainless steel, and it led to trying to develop more  
9 and more data.

10 JUDGE KARLIN: So 6909 is based on  
11 additional data.

12 MR. FAIR: Right.

13 JUDGE KARLIN: More information and -- Mr.  
14 Stevens, would you agree with what Mr. Fair said?  
15 It's more accurate, 6909 is a more accurate way of  
16 calculating this?

17 MR. STEVENS: Yes.

18 JUDGE KARLIN: Okay.

19 JUDGE WARDWELL: I fear that still begs  
20 the question to me, and needs repeated again, on why  
21 -- why was this under that reg guide limited -- why  
22 was the application of 6909 limited to only new  
23 reactors and not applied to license renewals? I see  
24 that basically it is just a continuation of Argonne's  
25 work, incorporating new data where there was a paucity

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1 of it in the original analysis, and it would seem to  
2 be very applicable to license renewals.

3 MR. FAIR: Well, there was one potential  
4 concern with applying this 6909 to existing reactors,  
5 and that is we change the ASME air curves for both  
6 carbon and stainless steel. So there is a potential  
7 problem with changing the licensing bases for their  
8 original fatigue usage factors in applying this new  
9 NUREG.

10 JUDGE WARDWELL: But if that's what should  
11 be done, shouldn't it be done?

12 MR. FAIR: Well, the other way that we  
13 could have done it was instead of adjusting the air  
14 curves is to reduce the Fens for this -- for the  
15 carbon and low-alloy steel. And I think as we've said  
16 a couple of times the -- currently what they are using  
17 in license renewal is generally conservative compared  
18 to the new data. It would be acceptable for a license  
19 renewal applicant to ask the staff to use the new  
20 data.

21 JUDGE KARLIN: New method or new data?

22 MR. FAIR: Well, new method. I'm sorry.

23 JUDGE KARLIN: New method.

24 MR. FAIR: But we didn't feel it was  
25 necessary to backfit, because we didn't think there

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1 was a significant enough issue there to require --

2 JUDGE KARLIN: Well, let me ask -- this is  
3 not a backfit. A backfit, as I understand it, under  
4 the regs -- 5109 -- is when you take an existing  
5 licensee and you say, "Well, you know, we've come up  
6 with a better method for doing something, and we're  
7 going to impose this new requirement on somebody who  
8 has already got a reactor building and a license."

9 This company has got a license that is  
10 going to expire in three years, four years -- 2012.  
11 Done. So when you apply a new method to a renewal,  
12 that isn't to backfit, is it?

13 JUDGE WARDWELL: It's a new application.

14 JUDGE KARLIN: It's a new application.  
15 It's a new ball game. If they don't get this new  
16 license, they close on 2012, so it's not a backfit.

17 MR. FAIR: Well, I think the license  
18 renewal rule does say the current licensing basis  
19 carries forward, and the current licensing basis would  
20 be the ASME code fatigue usage factor calculated using  
21 the current ASME code fatigue curve.

22 JUDGE KARLIN: Right, right. Current  
23 licensing basis. I mean, we're asking -- this is a  
24 legal issue that we may need briefed or something, so  
25 it's hard -- unfair to ask --

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1 JUDGE WARDWELL: From a technical  
2 standpoint, is there anything wrong with applying 6909  
3 to a licensee renewal application submittal?

4 MR. FAIR: No. Technically, there is not  
5 a problem with that.

6 JUDGE WARDWELL: If someone -- if a plant  
7 chose to do that, just so they could say, "Hey, we're  
8 up to date on everything. Here it is." And it may in  
9 fact, as you say, come out with lower numbers because  
10 it is --

11 MR. FAIR: Yes. I understand.

12 JUDGE WARDWELL: -- lower numbers, it  
13 would be further away from one in this analysis, would  
14 you reject that in your technical review as long as it  
15 -- if in fact they had done it correctly?

16 MR. FAIR: No.

17 JUDGE KARLIN: So the applicant has a  
18 choice of applying this NUREG, but nobody else.

19 JUDGE WARDWELL: But new plants don't have  
20 a choice. They have to use it.

21 MR. FAIR: That's right. That's the  
22 current status of --

23 JUDGE KARLIN: No. But, I mean, if -- if  
24 NEC says this NUREG should be applied, the staff's  
25 answer is, "Oh, no, I'm sorry, that -- you can't

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1 insist on that." Whereas, if Entergy asked to apply  
2 it, it would be okay. That's a legal question. I  
3 would --

4 (Laughter.)

5 JUDGE REED: I have a few more questions  
6 continuing on with --

7 JUDGE KARLIN: Yes, go ahead.

8 JUDGE REED: I want to turn now to how we  
9 get these Fen numbers. And my understanding of the  
10 definition of "Fens" is that they are basically the  
11 number of cycles that a particular sample can sustain  
12 in air versus in the environment in which you're  
13 considering. Is that basically right, it's a ratio of  
14 two numbers of cycles?

15 MR. STEVENS: You're asking me?

16 JUDGE REED: Yes, I'm sorry. Mr. Stevens.

17 MR. STEVENS: Yes.

18 JUDGE REED: So, and the numbers -- I  
19 guess the smallest number is one, and they go up to  
20 approximately 70 or something like that is the worst  
21 number I've seen. Is that correct?

22 MR. STEVENS: Depending on the material  
23 and the conditions they can go higher than that.

24 JUDGE REED: So in -- it's fair to say  
25 that environmental effects can make a really major

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1 affect on the number of cycles. They can reduce  
2 substantially the number of cycles that a particular  
3 component can withstand.

4 MR. STEVENS: If you have the proper  
5 conditions, yes.

6 JUDGE REED: Okay. The definition of  
7 these environmental factors makes no mention of how  
8 you calculate the CUFs. You know, it's just a ratio  
9 of two numbers that could be basically experimentally  
10 observed, is that correct?

11 MR. STEVENS: I don't recall the specifics  
12 on the NUREG, whether it said that or not.

13 JUDGE REED: Well, the number -- the  
14 definitions that I have seen, basically it's the ratio  
15 of two numbers -- you know, one is the number of  
16 cycles in air and one is the number of cycles in the  
17 environment that you are considering.

18 MR. STEVENS: That is correct.

19 JUDGE REED: It doesn't make any reference  
20 to how you calculate stresses or transients or  
21 anything.

22 MR. STEVENS: That's correct.

23 JUDGE REED: But presumably underlying  
24 that is an assumption that you are bending a paper  
25 clip over and over again, or you are stressing this

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1 material a certain number of times, and presumably in  
2 the same way. I mean, this is a case where we are  
3 repeating a transient over and over again, the same  
4 transient.

5 So underlying this is an assumption that  
6 there is a particular transient, but it doesn't have  
7 anything to do with how one calculates that -- the  
8 stresses. Is that fair to say?

9 MR. STEVENS: That's fair to say.

10 JUDGE REED: Okay. So I -- something  
11 earlier in the testimony led me to believe that the  
12 way you were applying these Fens in this later  
13 analysis was a function of how you are calculating the  
14 CUFs. Did I understand that incorrectly? Is there no  
15 -- if Mr. Fair would like to take that question, I  
16 would love to hear his answer.

17 MR. FAIR: Yes, I think I was -- it was  
18 because we changed the basic air curves. When we did  
19 the new analysis in 6909 to determine what the  
20 appropriate adjustment factors were to take the air  
21 test data --

22 JUDGE REED: Are you saying error or air?

23 MR. FAIR: Air.

24 JUDGE REED: Air.

25 MR. FAIR: Air, a-i-r.

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1 JUDGE REED: A-i-r.

2 MR. FAIR: Air test data and use a design  
3 curve. They did a new statistical analysis and  
4 determined that they didn't need as much an adjustment  
5 on cycles as was used previously in the ASME code to  
6 derive their air curves.

7 So another way to have implemented the  
8 NUREG would have been to take the Fen factors and  
9 divide them by this factor of I'll call it  
10 conservatism in the adjustment that was used in the  
11 air curves or as we did in the NUREG was to put it  
12 into the development of a new air curve. There were  
13 two ways to do it. We could take the old ASME curves,  
14 calculated the Fen based on the formulas in 6909 and  
15 divided them by a factor that we had determined from  
16 the statistical analysis, which would have been about  
17 1.7.

18 JUDGE REED: Now, I'd like to ask since  
19 we've been through now the calculation of the CUFen  
20 numbers and we've talked a bit about conservatism in  
21 the calculations, can you review for me; can you list  
22 out and call out for me all of the places where you  
23 believe conservatisms exist in the calculations that  
24 were done specifically for this reactor, for this  
25 feedwater nozzle?

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1                   What were the conservatisms in the  
2 calculations that were made for the CUFens or the  
3 CUFen, singular, for this particular nozzle?

4                   MR. FAIR: Are you asking me?

5                   JUDGE REED: yes.

6                   MR. FAIR: I did not review the  
7 calculations directly.

8                   JUDGE REED: I'll ask Mr. Stevens first,  
9 but if you would like to offer an opinion, I'd be glad  
10 to hear it.

11                   MR. STEVENS: Major conservatisms that  
12 were incorporated into these calculations, number one,  
13 the number of transients compared to what's expected  
14 at 60 years for Vermont Yankee.

15                   JUDGE REED: Okay. Now, let's stop here  
16 because this is going to take us down a path. Do we  
17 want to digress?

18                   JUDGE KARLIN: No, let's get all the  
19 conservatisms.

20                   JUDGE REED: You want to get them all  
21 listed and then come back?

22                   JUDGE KARLIN: I would.

23                   JUDGE REED: Okay. So are they listed in  
24 some of your testimony, Mr. Stevens?

25                   MR. STEVENS: Yes. I'm referring to A-30

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1 on page 16 of our initial testimony.

2 JUDGE WARDWELL: Would you say it again?

3 I'm sorry.

4 MR. STEVENS: A-30, page 16.

5 JUDGE REED: Right. And this is?

6 JUDGE KARLIN: Question 30.

7 JUDGE WARDWELL: And that's of zero, one;  
8 is that correct? Are you including zero, one? If you  
9 can, give us --

10 JUDGE KARLIN: The Exhibit number is E-  
11 201, I believe is the testimony; is that right, Mr.  
12 Stevens?

13 MR. FAIR: Yeah, I don't have it marked as  
14 that, but my recollection is that's true.

15 JUDGE KARLIN: Your initial testimony,  
16 right. And so that's the question to Dr. Reed's.

17 JUDGE REED: Okay. I found the testimony.  
18 I'm with you on that point if you'd like to continue.

19 MR. STEVENS: Okay. So the first one I  
20 mentioned is Item A there. Item B, you know, we use  
21 the transient definitions specified by the designer of  
22 the plant which are very conservative. They assume  
23 that changes in temperature and flow are very abrupt,  
24 and they're meant to be very bounding for design  
25 purposes. We used those definitions, as proposed to

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1 the actual transient severity measured in the plant,  
2 which is much less severe.

3 JUDGE REED: Can you give me some specific  
4 examples? Because what I'm not understanding is I  
5 know that if you take a particular plant transient  
6 that happens in the plant, you must be able to count  
7 how many times that occurs, but if you take a design  
8 basis transient, it's not clear to me how you get a  
9 count associated with that particular transient.

10 MR. STEVENS: The designer would make an  
11 assumption on those transients of how many times they  
12 will occur over the life of the plant.

13 JUDGE REED: And what's a transient here?  
14 Give me an example.

15 MR. STEVENS: A transient could be when  
16 they heat up the plant. So they've been in an outage  
17 and everything is at ambient condition and they're  
18 going to heat the plant up and pressurize it prior to  
19 entering into full power operation. So that heat-up  
20 process the plant would see would go from ambient  
21 temperature up to rated reactor conditions at a  
22 controlled rate, and that's a temperature change and  
23 a pressure change versus time thereby being a  
24 transient.

25 There's other events like when the plant

1       shuts down it's the reverse. There's pressure tests  
2       prior to start-up where they pressurize things to look  
3       for leaks. That's a pressure transient. There's  
4       other trip scrams that are kinds of events during  
5       operation of the plant that would cause temperature  
6       changes with time.

7                   JUDGE REED: So when you say that you take  
8       a design basis, you take a theoretical assumption  
9       about how that heat-up would progress. You would take  
10      presumably fluid temperatures as a function of time  
11      that come from an assumption that the designer made.  
12      You would plug that into your models to calculate the  
13      stresses using ANSIS (phonetic). Have I got it right?

14                   MR. STEVENS: Yes, sir.

15                   JUDGE WARDWELL: And is it more than an  
16      assumption though? I mean, it's a design value that's  
17      used by engineers the same way a wind blow would be  
18      one that's based on something, but that has a factor  
19      to it that says, okay, we're fine; that we're going to  
20      use this for our design because we know it will be  
21      enough above what we've seen to be conservative.

22                   MR. STEVENS: Yes. It's based on physics,  
23      the limitations of physics in the plant and field  
24      experience that the designer has, as well as their  
25      experience with designing the components themselves.

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1 All of that is factored into those assumptions. So  
2 they are call them very educated assumptions,  
3 validated by field experience.

4 JUDGE WARDWELL: Do you have any  
5 quantification of how conservative they are?

6 You know, in structural design you take  
7 wind loads and you put a factor on to know what that  
8 number is. At least we know how far away we are from  
9 the meteorological data. How is that handled here?

10 MR. STEVENS: And your question is  
11 referring to the thermal transients themselves?

12 JUDGE WARDWELL: Sure, and then I'll also  
13 ask it for all of A, B, C, D. And if there is no  
14 quantification, that is an answer.

15 MR. STEVENS: I have no quantification of  
16 those effects with me.

17 JUDGE WARDWELL: Do you have them for any  
18 of those, A through D, the degree of conservatism?

19 MR. STEVENS: We have it on Item A, which  
20 is the number of transients we used for 60 years, what  
21 we assumed versus what is predicted to occur at 60  
22 years at Vermont Yankee.

23 On Item C, I don't recollect if any of the  
24 testimony has it directly, but we know the difference  
25 in temperature and pressure and flow caused by EPU, or

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1 extended power up rate.

2 JUDGE KARLIN: Now, when you say the Item  
3 C, for the record and testimony clarity, please recite  
4 what Item C is.

5 MR. STEVENS: Item C is the answer to  
6 Question 30, which is the refined calculation to use  
7 bounding values for pressure and temperature at EPU  
8 conditions for the entire 60-year period of plant  
9 operation, and that's referring to the fact that EPU  
10 changes temperatures and pressures in the reactor when  
11 it's implemented, and those assumptions were made for  
12 all transients over the entire 60-year period of our  
13 analysis.

14 JUDGE REED: So you assume transients that  
15 occurred prior to the up rate were actually more  
16 severe than they really were.

17 MR. STEVENS: That's correct.

18 JUDGE REED: You assumed that they're  
19 consistent with the 20 percent increase in power  
20 level.

21 MR. STEVENS: Yes. We assumed 20 percent  
22 increased transients all the way back to the beginning  
23 of the plant operation.

24 JUDGE WARDWELL: And did you use the  
25 design basis transience or the actual transients that

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1 have occurred to date?

2 MR. STEVENS: We used the design basis  
3 severity and counts. The counts were demonstrated to  
4 be very conservative compared to the actual counts  
5 that would be projected at 60 years.

6 JUDGE KARLIN: Explain that if you would  
7 a little more.

8 MR. STEVENS: Simplistically, this is in  
9 our testimony also. After approximately 36 years of  
10 operation there have been 96 -- how many start-ups?  
11 I need to refer to the testimony.

12 Okay. I'm referring to our supplemental  
13 declaration and I'm sorry. I don't have the exhibit  
14 number of this one. It's our --

15 JUDGE KARLIN: Is this dated June 2nd?

16 MR. STEVENS: The one dated May 30th.

17 JUDGE KARLIN: May 30th supplemental --  
18 Joint Supplemental Declaration of James C. Fitzpatrick  
19 and General Stevens on NAC Contentions 2(a), 2(b),  
20 environmental system fatigue.

21 MR. STEVENS: That's correct.

22 JUDGE KARLIN: Okay, and this supplemental  
23 testimony that is attached?

24 MR. LEWIS: Yes, it's titled Declaration  
25 Supplemental Testimony.

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1 JUDGE KARLIN: Well, the -- yeah, I'm  
2 readying the cover.

3 MR. LEWIS: Oh, yes, I'm sorry.

4 JUDGE KARLIN: Joint Supplemental  
5 Declaration and then the --

6 MR. LEWIS: Yes, you're correct.

7 JUDGE KARLIN: -- attachment, May 30th  
8 Supplemental Testimony of James C. Fitzpatrick and  
9 Gary L. Stevens on NAC Contentions 2(a) and 2(b),  
10 environmental issues of fatigue.

11 MR. LEWIS: Yes.

12 JUDGE KARLIN: We're with you. Is that an  
13 exhibit, Mr. Lewis?

14 MR. LEWIS: The original had an exhibit  
15 because we thought we were going to introduce them.  
16 So the ones that you originally received have the  
17 exhibit number.

18 JUDGE KARLIN: Ah, but this is not --

19 MR. LEWIS: If you would like, please  
20 don't use that.

21 JUDGE KARLIN: This goes in as -- okay,  
22 but we know what you're referring to now. Please  
23 proceed.

24 MR. STEVENS: Okay. I'm on Q. 17, page  
25 17.

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1 JUDGE KARLIN: Okay. All right.  
2 Transient cycle projections, Q. 17. And this was Mr.  
3 Fitzpatrick actually testifying.

4 Mr. Fitzpatrick, why don't you address  
5 that?

6 MR. FITZPATRICK: The number cycles used  
7 in the half (phonetic) analysis bound by number cycles  
8 spherically by the plant, is significant. An example  
9 we cite in the testimony, I think it's on the top of  
10 page 8. Two hundred start-up/shutdown cycles were  
11 included in the original analysis.

12 JUDGE KARLIN: So when you say 200 start-  
13 up/shutdown cycles were included in the original  
14 Vermont Yankee design, so when the plant was initially  
15 licensed back in 30-some years ago, do you assume that  
16 there would be 200 start-up/shutdown cycles? That is  
17 the assumption that was made.

18 MR. FITZPATRICK: Yes.

19 JUDGE KARLIN: And now you say, however,  
20 300 start-up/shutdown cycles were conservatively used  
21 in the EAM for 60 years, that is to say 200 plus  
22 another 20 years proportionally is 300. All right?

23 Okay. So I'm with you so far. Three  
24 hundred, is that the figure that was used?

25 MR. FITZPATRICK: Used in the half

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1 analysis, yes.

2 JUDGE KARLIN: And how many actually have  
3 occurred? I mean, so originally Vermont Yankee was  
4 assumed it was going to have 200 start-up/shutdowns in  
5 40 years, and how many has it actually had so far?

6 MR. FITZPATRICK: Ninety. I don't have the  
7 exact figure.

8 JUDGE KARLIN: Approximately 90?

9 MR. FITZPATRICK: It's 93 to 95.

10 JUDGE KARLIN: So there's been  
11 considerably less than the original assumption was.

12 MR. FITZPATRICK: If you project that  
13 number out to 60 years, it's approximately 160.

14 JUDGE KARLIN: I see, yes.

15 MR. FITZPATRICK: One hundred sixty versus  
16 the 300.

17 JUDGE KARLIN: Okay. And which one are  
18 you using then?

19 MR. FITZPATRICK: Well, the 160 would be  
20 the existing number of cycles projected for 60 years.  
21 I mean, the substance of the analysis was 300.

22 JUDGE REED: Okay. So that's the  
23 justification for saying the number of transient  
24 cycles for 60 years using the refined calculations is  
25 conservative relate to the number of transients

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1 expected to occur through the 60 years. It's  
2 conservative.

3 MR. FITZPATRICK: Yes, sir.

4 JUDGE REED: Okay. That's true only for  
5 what you're calling the refined calculations, not for  
6 the original, not for the confirmatory; is that  
7 correct?

8 MR. FITZPATRICK: The original assessment  
9 used the existing number of transients in the designer  
10 specifications. In the license rule application  
11 labeled 432, and that table shows that the projections  
12 still exceed the original number of transients.

13 JUDGE KARLIN: Now, I want to if I may  
14 stop here and ask Dr. Hopenfeld do you agree that what  
15 they've done is more conservative in terms of number  
16 of transients?

17 DR. HOPENFELD: Honestly I don't -- no, I  
18 do not. However, I do not understand what they've  
19 done. Let me tell you that originally I thought I  
20 did. I thought what they did, they assumed this is  
21 the number transients we had up to date. Let's say it  
22 was like five years ago, whatever it was, and then  
23 we're going to jack it up by a factor of 51.5, which  
24 is 60 over 40.

25 I understood that, and I was happy with

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1 it, and I just came along and I said, now wait a  
2 minute. We had the bathtub curve. We also know we  
3 had an up rate. Maybe you want to make allowance, and  
4 I suggest 20 percent.

5 Then I see that later on I see a  
6 definition, which I completely don't understand, and  
7 I'd like to read it to you if you wish. I can quote  
8 you where it comes. It's on -- I don't understand  
9 what they're talking about.

10 However, Dr. Chang also testified that he  
11 doesn't -- he has no way of telling whether this is  
12 conservative or not, and I don't understand it. Let  
13 me read it to you.

14 JUDGE WARDWELL: What are you reading  
15 from?

16 DR. HOPENFELD: I'm reading from E-201, at  
17 A-55.

18 JUDGE WARDWELL: Okay. Just hold on a  
19 second. E-201.

20 DR. HOPENFELD: At A-55.

21 JUDGE WARDWELL: A?

22 DR. HOPENFELD: I think it's --

23 JUDGE WARDWELL: Page 31?

24 JUDGE KARLIN: Hold on a second. All  
25 right. Page 31.

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1 DR. HOPENFELD: Shall I read it?

2 JUDGE KARLIN: Yes, sir, please.

3 DR. HOPENFELD: Rewired projections for 60  
4 years were made based on all available sources  
5 including the numbers of cycles for 40 years that are  
6 BUI reactor pressure vessel design specification, the  
7 number of cycles actually analyzed in the BUI design  
8 stress report and the number of cycles experienced by  
9 BUI.

10 It's some kind of a combination which I  
11 don't -- this doesn't specify what it is, but then  
12 there's what Dr. Chang says at NRC Exhibit 2, at page  
13 10, which says the staff cannot determine the level of  
14 conservative regarding the number of transients.

15 So after they cannot determine, I just  
16 couldn't stretch my imagination to see what they  
17 really mean. I understood the first time.

18 JUDGE KARLIN: As I understood, you cited  
19 Dr. Chang's statement. The NRC could not determine  
20 the level of conservatism.

21 DR. HOPENFELD: The level of conservatism  
22 regarding the number of transients, the number.

23 JUDGE KARLIN: All right.

24 DR. HOPENFELD: Not the intensity of the  
25 transients, but the number.

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1 JUDGE KARLIN: But as I understood it, he  
2 was saying that he did believe it's conservative, but  
3 he wasn't able to quantify by how much it's  
4 conservative.

5 DR. HOPENFELD: That's like not knowing.

6 JUDGE KARLIN: Okay. You think that if  
7 you don't know the number of how much --

8 DR. HOPENFELD: -- you don't know what it  
9 is, but the point is what he's really making very  
10 clear at the meeting that we were in January -- at the  
11 meeting in January, the subject came up, and you could  
12 ask him, "What do you mean?" because there was a  
13 number of transients, because it went to the heart of  
14 the issue: how are we going to monitor this whole  
15 thing?

16 What I'm saying, honestly I understood at  
17 first. I don't understand it now, exactly what  
18 they've done, and it's my understanding that the NRC  
19 really doesn't understand what is conservative or not,  
20 the number that's conservative. The words are number.

21 MR. STEVENS: May I offer some  
22 clarification?

23 JUDGE WARDWELL: I'd like to just fix a  
24 point, I think, what you have and with Dr. Hopenfeld,  
25 if I could, and I'll seek your assistance, Mr.

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1 Stevens. Where were we when we were talking about the  
2 degree of conservatism A through D? What page was  
3 that and what answer?

4 JUDGE KARLIN: Page 16, 16, I believe.

5 JUDGE WARDWELL: Yes, good. I've got it.  
6 Thank you.

7 Dr. Hopenfeld, did you just testify that  
8 you felt there's no difference between someone saying  
9 I know it's conservative but I just can't quantify the  
10 degree of conservatism and someone saying I don't know  
11 how conservative it is, meaning it may be not  
12 conservative at all? It may be negatively  
13 conservative.

14 DR. HOPENFELD: And what subjective means,  
15 which is a subjective judgment of someone. I know  
16 it's conservative.

17 To me unless I can quantify, it doesn't  
18 have to be exact if I can explain, explain why I  
19 quantified the way I quantified. This is an  
20 indication I have some understanding. But what he  
21 says here, we just have no way of telling.

22 JUDGE WARDWELL: Well, for instance, B of  
23 Answer 30 on page 16 of B-201 --

24 DR. HOPENFELD: I don't have it here just  
25 in front of me.

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1 JUDGE WARDWELL: Do you want to get it?

2 DR. HOPENFELD: Yeah. Which one is it?

3 JUDGE WARDWELL: Or I can read it to you  
4 if you wish.

5 DR. HOPENFELD: Okay.

6 JUDGE WARDWELL: B says -- the question  
7 was what conservatisms are incorporated into the  
8 refined CUFen calculations, and Answer B said the  
9 refined calculations use design basis transient  
10 severity definitions as opposed to the lesser actual  
11 transient severity.

12 DR. HOPENFELD: I understand.

13 JUDGE WARDWELL: One could easily see how  
14 that would be conservative.

15 DR. HOPENFELD: Possibly, although you  
16 could quantify it, but you could see it.

17 JUDGE WARDWELL: Right. So isn't that  
18 different than saying that, in fact, we had no  
19 knowledge of whether or not it's conservative or not?

20 DR. HOPENFELD: No, because he's talking  
21 about the numbers now. You see the numbers is  
22 different because, you see, we all know that when you  
23 buy a car, okay, you know that after 50 years things  
24 are starting to fall apart. They're not going to be  
25 as it was in the beginning.

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1                   So we're not talking about the intensity,  
2                   and he is talking about the intensity disputing -- I  
3                   don't know what the intensity. I haven't got that  
4                   definition. I'm talking about the numbers.

5                   JUDGE REED: I want to take issue with  
6                   buying your car. It's well known among engineers that  
7                   when something new is built, that often there are high  
8                   failure rates initially.

9                   DR. HOPENFELD: Absolutely.

10                  JUDGE REED: So isn't it true that cars  
11                  during the first month or two or six months --

12                  DR. HOPENFELD: Yes.

13                  JUDGE REED: -- fail more frequently?

14                  DR. HOPENFELD: Absolutely. That's the  
15                  bathtub curve. That's exactly --

16                  JUDGE REED: Okay. That's the bathtub  
17                  curve.

18                  DR. HOPENFELD: That's the bathtub.

19                  JUDGE REED: Okay. So your point is that  
20                  then you enter a period of very stable operations.

21                  DR. HOPENFELD: Yes, right.

22                  JUDGE REED: And then at some point you  
23                  wear out.

24                  DR. HOPENFELD: Absolutely.

25                  JUDGE REED: And so then you begin to have

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1 more --

2 DR. HOPENFELD: It doesn't have to be a  
3 car. It's consumer electronics. I would think it's  
4 in your life expectancy, and insurance companies use  
5 it, too.

6 JUDGE REED: We all agree that that's the  
7 traditional engineering curve for failures, but do we  
8 know where we are on that curve for this particular  
9 plant? Are we still down at the bottom of a bathtub  
10 and do we have a long way to go before it goes up?

11 Why do you believe that we're at the cusp  
12 where we're just about to see a huge number of  
13 increases?

14 DR. HOPENFELD: There are a lot of factors  
15 in here, but let me give you one. I get all of you  
16 gentlemen from the D.C. area. We just came last week.  
17 I know that there was a brief --

18 JUDGE REED: Please speak up a little.  
19 I'm having a hard time hearing you.

20 DR. HOPENFELD: You all from the D.C.  
21 area, last week there was a major, major pipe drop  
22 underground, and I don't know. It wasn't the Missouri  
23 River, but it was the whole neighborhood was flooded.  
24 And these pipes, when they get over 40 years, they get  
25 to their 60 years, things just happen. It's an

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1 example as to when you get to a certain point where  
2 things start falling apart.

3 Now, in this case, taking other  
4 consideration, flow accelerated corrosion, the number  
5 of cycles which you accumulate, and there are, since  
6 I just cannot think off the top of my head right now,  
7 it shows that you're aging, and that's why I can't.  
8 This is all statistics. It's all averages. I can't  
9 define the thing where you're really sit the thing at  
10 the inflection point.

11 But you're getting there, and you have to  
12 consider that. If you made a change in the plan, you  
13 increased the power by 20 percent, at least I would  
14 claim that you want a conflict. Is it exact science?  
15 No, it's not. This is judgment, but you can't ignore  
16 it.

17 JUDGE WARDWELL: Have you done anything,  
18 Mr. Stevens, to account for the increase in orders?

19 MR. STEVENS: Yes.

20 JUDGE WARDWELL: Would you care to  
21 elaborate on what you have done?

22 MR. STEVENS: That would be Item C on page  
23 16 of our testimony, where again we took in the  
24 magnitude of the transients as defined under EPU  
25 conditions and applied them for the entire 60-year

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1 life of the plant.

2 JUDGE WARDWELL: Are there any other  
3 parameters that influence this refined calculation  
4 besides pressure and temperature that should have been  
5 incorporated to account for the EPU conditions?

6 MR. STEVENS: Well, flow rate is a  
7 significant contributor, and we incorporated that.

8 JUDGE WARDWELL: For the 60 years?

9 MR. STEVENS: Yes.

10 JUDGE WARDWELL: So it's really pressure,  
11 temperature, and flow rate.

12 MR. STEVENS: Those are the three primary  
13 inputs that drive our stress analysis.

14 May I clarify the discussion on number of  
15 cycles and bathtub effects?

16 JUDGE KARLIN: Yes, sir.

17 JUDGE REED: I'd be willing to hear you.

18 MR. STEVENS: You know, first we have to  
19 keep in mind the relevance of pipes underground versus  
20 what we're talking about here, which is a nuclear  
21 reactor where conditions are much, much, much more  
22 controlled. There's no field evidence anyway to  
23 support a bathtub effect, and in fact, the evidence  
24 that is out there would support just the opposite.

25 The simply example would be the number of

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1 start-up/shutdown events experienced by Vermont  
2 Yankee. Currently the frequency of those events is  
3 half of what it used to be. In the beginning of plant  
4 operation, they operated on 12-month operating cycles.  
5 So ignoring all other upset events that could have  
6 occurred, the control events occurred once a year.

7 Today they're on 24-month cycles, 18  
8 moving to 24. They occur one and a half times less  
9 frequent than they used to.

10 The other thing we know about extensive  
11 field experience for the entire fleet of U.S. nuclear  
12 reactors is there were learning curve effects in the  
13 beginning of plant operations. Plants tripped a lot  
14 in early years, and through improved maintenance  
15 procedures, processes, ASME code improvements,  
16 inspections, all sorts of activities, those trip  
17 frequencies have reduced down to a fraction of what  
18 they were early.

19 So what we see today across the industry,  
20 including several reactor operating years, EPU  
21 operation, transient occurrences, they occur less  
22 frequently than they did in early years of plant  
23 operation throughout the fleet of U.S. reactors.

24 So it is conservative to take a linear  
25 projection forward with time because those events are

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1 less frequent now than they used to be.

2 But having said all of that, we did the  
3 linear projections to justify that the number of  
4 cycles we used from the design was very conservative.  
5 The example we give in our testimony, what Mr.  
6 Fitzpatrick just said, was on start-up events where in  
7 40 years they've experienced less than 100.

8 So we expect, given all that I've just  
9 said, they would experience on the order of 150 or 160  
10 at the end of 60 years of operation. That tells us  
11 that the 300 cycle assumed in the design is very  
12 conservative for use, and that's what we use.

13 Having said all of that, if there's  
14 uncertainty, that's where we have an aging management  
15 program, and my opinion of Dr. Chang's philosophy is  
16 that's what he's referring to. We have projected out  
17 what the future will be, and because of any  
18 uncertainty that folks might have with that  
19 projection, there's an aging management program that  
20 will continue to monitor and verify those assumptions,  
21 and if need be, take corrective action if any of those  
22 limits are going to be exceeded.

23 JUDGE REED: So does that mean that you  
24 have someone who is counting the number of transients  
25 and keeping track of that and comparing it to the

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1 number assumed in your analyses?

2 MR. STEVENS: Entergy does, not myself.

3 JUDGE REED: I'm sorry. I should have  
4 addressed that to Mr. Fitzpatrick.

5 MR. FITZPATRICK: We have a plant procedure  
6 for coding transients.

7 JUDGE REED: So you keep a record of these  
8 transients. You sum them up and somebody is watching?

9 MR. FITZPATRICK: We have an established  
10 time per plant procedure.

11 JUDGE REED: And so what would happen if  
12 you suddenly encountered the other end of the bathtub  
13 and you started having a lot of transients and you  
14 started exceeding or you saw you were going to exceed  
15 the numbers in these analyses, the CUFen analyses?

16 MR. FITZPATRICK: We would revisit the  
17 analysis to see if there's any conservatism in the  
18 analysis. If it looks like we exceed it before the  
19 beginning of whatever the license period is at the  
20 time, we either go into an inspection program,  
21 depending on the phenomenon component. It depends on  
22 what the effects of the transient preexist.

23 For example, feedwater. If there was more  
24 transients than we predicted, we'd have to start  
25 inspecting.

1 JUDGE KARLIN: And that's what you  
2 referred to as a fatigue monitoring plan?

3 MR. FITZPATRICK: Well, the fatigue  
4 monitoring plan right now is common cycles based on  
5 existing analysis. The normal cycle fatigue, we don't  
6 get in a section.

7 JUDGE WARDWELL: And for those transients,  
8 is it merely counting the transients or do you also  
9 incorporate consideration of actual measurements of  
10 pressure temperatures and flow rates?

11 MR. FITZPATRICK: We keep the data, the  
12 actual data, but for the purpose of cycle counting  
13 right now, we assume each transient is as a design  
14 basis severity.

15 MR. STEVENS: May I clarify that just one  
16 bit? The plant procedures require that temperature  
17 limits be tracked. It's part of technical  
18 specifications to maintain reactor within heat-up/cool  
19 down limits and all of that. So as a part of all  
20 those procedures what you're asking is, in fact,  
21 monitored continuously, and if any of those limits are  
22 exceeded, that also must be evaluated.

23 So there are other programs in place that  
24 track those temperature and pressure limits  
25 continuously within the plant.

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1 JUDGE WARDWELL: How about flow rates?

2 MR. FITZPATRICK: Flow rates would be  
3 proportional power.

4 JUDGE REED: Would you speak up?

5 MR. FITZPATRICK: I'm sorry. The  
6 feedwater flow rate is proportional with power, and  
7 the flow rate in the design analysis --

8 JUDGE KARLIN: Could you hold down the  
9 conversation, sir?

10 I'm sorry. Thank you.

11 MR. FITZPATRICK: Flow rate is typically  
12 proportional to the power. The flow rate in the  
13 analysis bounds the typical operating 100 percent  
14 power curve.

15 JUDGE WARDWELL: So you have an indirect  
16 measure of flow rate --

17 MR. FITZPATRICK: Yes.

18 JUDGE WARDWELL: -- based on power.

19 MR. FITZPATRICK: And flow rate is recorded  
20 with time.

21 JUDGE REED: So the procedures that you  
22 mentioned keep an individual transient. You look at  
23 individual transients to make sure that they stay  
24 within bounds.

25 MR. FITZPATRICK: Yes.

1 JUDGE REED: But what we were talking  
2 about goes to the number of transients rather than an  
3 individual transient.

4 MR. FITZPATRICK: And those numbers are  
5 also factors.

6 JUDGE REED: The numbers are also tracked.

7 MR. FITZPATRICK: yes.

8 JUDGE REED: And you know, it's one thing  
9 to track numbers. It's quite another to compare them  
10 and realize that you're hitting the limit. And I'm  
11 just wanting a very clear statement that there is  
12 somebody's job at the plant who tracks those and  
13 compares them to the numbers that you have assumed in  
14 these analyses.

15 MR. FITZPATRICK: In the procedure, it's  
16 Engineering's job to assess the number cycles and  
17 transients.

18 JUDGE KARLIN: Well, following up on that,  
19 I mean, is there an exhibit that we can look at that  
20 says that? Is there a document in this that says  
21 here's how we're going to do that? Are you just  
22 telling us that that will be done?

23 MR. FITZPATRICK: It hasn't been entered  
24 into evidence.

25 JUDGE KARLIN: Okay. All right. Okay.

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1 I think we're going to call it a day. It's about five  
2 o'clock. It has been a warm day. I appreciate  
3 everyone's attention and help in answering our  
4 questions and being patient in that regard.

5 We have a lot more to go on Contention 2,  
6 and we may get to Contention 3 tomorrow.

7 Dr. Hopenfeld, did you have something?

8 DR. HOPENFELD: Would I be allowed to make  
9 a comment from the three comments that were made here  
10 or would you like me to talk about it tomorrow?

11 JUDGE KARLIN: No, go ahead.

12 DR. HOPENFELD: Okay. I jotted it down  
13 because I think in context I could -- first of all,  
14 with regard to the comment about the fact that EPU  
15 didn't make any difference. You have to realize it is  
16 affected by the degree of the power increase, and I  
17 believe there weren't that many that went up to 20  
18 percent. I don't know how many were.

19 In the case of BY, I think we're only a  
20 year and a half down the pike on this, and I don't  
21 know if there was a cooling tower, another vault that  
22 day. I don't think the statistics is enough to make  
23 any case out of it.

24 The more important thing that is missing,  
25 and I think very important that we all focus on that,

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1 and they say they have a monitoring program. They  
2 don't have a widget on every pipe that measures the  
3 crack propagation. There isn't such a thing in the  
4 world.

5 What they have, what they're telling you,  
6 did they monitor based on their calculation. They  
7 have different calculations if the FUA's are all by a  
8 factor of 50, which I'll show you that was what the  
9 case is. You'll find out that the monitor program is  
10 no better than their assumption.

11 Now, with regard to the last that they  
12 were talking about, with all due respect, if you make  
13 assumption in your basic modeling, and I'm going now  
14 to the CUF. I'm away from the FDN. There are two  
15 estimates. I'm kind of oscillating here, but with CUF  
16 they made certain assumptions, and the presumption  
17 here, that that's what it is.

18 But it isn't. These are assumptions. So  
19 I would like to tell you those and then you can decide  
20 whether that makes sense or not. So to me I believe  
21 that relates to the flow rate because the flow rate  
22 does make a difference. I mean the other rate, but it  
23 does come into play here, too, and I'll tell you how.

24 JUDGE KARLIN: All right. Thank you. You  
25 will have an opportunity tomorrow.

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1 JUDGE WARDWELL: You will regret, rue the  
2 day you said that.

3 JUDGE KARLIN: Right now we're going to  
4 adjourn for the day. We will reconvene tomorrow at  
5 8:30 crisply, and try to proceed as far as we can, and  
6 so for the moment we will stand adjourned.

7 Thank you.

8 (Whereupon, at 5:07 p.m., the hearing in  
9 the above-entitled matter was adjourned, to reconvene  
10 at 8:30 a.m., Tuesday, July 22, 2008.)  
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CERTIFICATE

This is to certify that the attached proceedings  
before the United States Nuclear Regulatory Commission  
in the matter of:            Entergy Nuclear Vermont  
   Yankee, LLC & Entergy Nuclear  
   Operations, Inc.

Name of Proceeding: Hearing

Docket Number:            50-271-LR,

   ASLBP No. 06-849-03-LR

Location:                    Newfane, Vermont

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



Toby Walter  
Official Reporter  
Neal R. Gross & Co., Inc.

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