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**NUCLEAR REGULATORY COMMISSION**

Title: Entergy Nuclear Operations, Inc.  
Indian Point Nuclear Generating Station

Docket Number: 50-247-LR and 50-286-LR

ASLBP Number: 07-858-03-LR-BD01

Location: Tarrytown, New York

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UNITED STATES OF AMERICA

U.S. NUCLEAR REGULATORY COMMISSION

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BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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In the Matter of: : Docket No.  
 ENTERGY NUCLEAR OPERATIONS, INC. : 50-247-LR  
 (Indian Point Nuclear Generating : 50-286-LR  
 Station, Units 2 and 3) : ASLBP No.  
 \_\_\_\_\_ : 07-858-03-LR-BD01

Thursday, November 19, 2015

Doubletree Tarrytown  
 Westchester Ballroom  
 455 South Broadway  
 Tarrytown, New York

BEFORE:  
 LAWRENCE G. MCDADE, Chairman  
 MICHAEL F. KENNEDY, Administrative Judge  
 RICHARD E. WARDWELL, Administrative Judge

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

(8:33 a.m.)

1  
2  
3 CHAIRMAN McDADE: Please be seated. The  
4 hearing will come to order. Before we get started  
5 with testimony, are there any administrative matters  
6 to be taken up by the staff?

7 MR. HARRIS: No, Your Honor. This is  
8 Brian Harris for the staff.

9 CHAIRMAN McDADE: Entergy?

10 MR. KUYLER: No, Your Honor.

11 CHAIRMAN McDADE: New York?

12 MR. SIPOS: Not at this time, Your Honor.

13 CHAIRMAN McDADE: Riverkeeper?

14 MS. BRANCATO: No, Your Honor. Thank you.

15 CHAIRMAN McDADE: Okay. Let's continue  
16 with the taking of testimony with regard to Contention  
17 26.

18 Judge Kennedy.

19 JUDGE KENNEDY: Yeah, this is Judge  
20 Kennedy. I have just a couple follow-up questions on  
21 Contention 26 first to Dr. Hopenfeld.

22 DR. HOPENFELD: Yes, sir.

23 JUDGE KENNEDY: Microphones at the ready?

24 DR. HOPENFELD: Can you hear me okay?

25 JUDGE KENNEDY: Thank you.

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1 DR. HOPENFELD: Can you hear me, sir?

2 JUDGE KENNEDY: I can hear you. Thank  
3 you.

4 DR. HOPENFELD: Okay.

5 JUDGE KENNEDY: In your pre-filed  
6 testimony, you assert that Entergy relied improperly  
7 on CUF values of record.

8 What do you mean by "CUF values of  
9 record"?

10 DR. HOPENFELD: Okay. What I meant to  
11 basically the term came from the LAR. That's the term  
12 they used in those tables, but what I mean -- what it  
13 means -- what I think what it means is the CUF that  
14 was calculated during the design stage. That's the  
15 CUF that the CLB is based on.

16 JUDGE KENNEDY: And why is that improperly  
17 relied on?

18 DR. HOPENFELD: Because as we heard the  
19 testimony yesterday, and I was trying to inject my ---  
20 interject on here, is that -- the original plants were  
21 designed, the --- when you calculated --- you assume  
22 a certain number of changes. And in most of the  
23 cases, not in all cases, some place the assumption  
24 about the transients were not conservative, but I  
25 believe in most case it was conservative.

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1           But in addition to the number of changes  
2 that you assume, you also calculate the stresses, but  
3 you use the ASME code. And we have had a lot of  
4 confusions --- confusing statements from Entergy about  
5 the subject, but in -- the code has margins, has  
6 allowances. It does not have an allowance for stress  
7 concentration. It is you that you provide the stress  
8 concentration.

9           Now, if you were designing the plant 40 or  
10 50 years ago, and you go into one of the Pen books or  
11 Peterson or something, got thousands and thousands of  
12 different stress concentrations for different  
13 geometries, because it's a very common engineering  
14 parameter that you have to use in any design.

15           Just to get you a feel for what I'm  
16 talking about, in my younger days, I remember, they  
17 used to have razor blades that had three holes in  
18 them. Now, these razor blades used to break all the  
19 time. The reason was because there's a lot of stress  
20 concentration in those holes. So, what they did, they  
21 did away with the holes and they had a slot in there  
22 and they put a stop to the breaking. That's where the  
23 stress concentration is a notch.

24           Every weld has one, because there is a  
25 difference in the metal composition between the base

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1 weld and what you --- and the welding material. So,  
2 stress concentration, an extremely important  
3 parameter. Now, when they designed, originally, the  
4 stress concentration was used, did not take in effect  
5 --- in account effects like corrosion, which affects  
6 the surface roughness, but more importantly it causes  
7 discontinuities between --- in the geometry.

8 You see the wall thinning. You sometimes  
9 have a very abrupt change in wall thickness. So, that  
10 wasn't taken in account and that's unsteady, but  
11 another thing that's more important, and that's what  
12 I test or discuss was the stress concentration depends  
13 on ductility. And ductility, as we all agree, I hope,  
14 is affected by embrittlement, by neutron flux. So,  
15 that affected embrittlement, all the stress  
16 concentration wasn't there. It wasn't taken in  
17 account.

18 So, you look at that, see, -- and there's  
19 an uncertainty there, but I am not applying for life  
20 extension and I'm going back. It is their  
21 responsibility to come up with the upper limits, with  
22 a conservative assumption. Every weld is an  
23 uncertainty, that must be a conservative assumption.  
24 That's their job. That's what I'm talking about.

25 There is no accounting in that CUF for

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1 stress concentration that is being affected by  
2 irradiation. Sure, irradiation does --- has improved  
3 the uses, but I'm talking about the stress  
4 concentration. The stress concentration is the site  
5 for stress -- for crack initiation. The cracks  
6 initiate at corners. They don't -- really, crack  
7 initiation at the stress concentration points. That's  
8 what you have to in account of. What Entergy just  
9 said, well, they don't even mention it, but they keep  
10 saying that they are conservative. We are  
11 conservative whatever we do. They are not conserving  
12 anywhere.

13 CHAIRMAN McDADE: Okay. Dr. Hopenfeld, I  
14 just want to make sure I understand what you're  
15 saying.

16 Although we cannot review the design basis  
17 of the plant, what you're suggesting is that the  
18 geometry of the plant is significantly different today  
19 40 years into its operation than it was at the time of  
20 the original design.

21 So, even if the CUF locations were  
22 appropriate at the time of design, they're not  
23 necessarily appropriate today given the inherent  
24 changes that would occur over time in the plant.

25 DR. HOPENFELD: You verbalized my thoughts

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1 very well. I couldn't say it better. That's exactly  
2 -- but also in this specific occasion I'm talking  
3 about embrittlement.

4 Because if you are to -- usually the  
5 stress concentration factors are experimental values,  
6 but there are some -- there were some attention in the  
7 literature that people try to come up with some kind  
8 of correlation to see if you can calculate on an  
9 empirical basis what it is, because at certain point  
10 stress concentration goes to infinity. It depends on  
11 the ratings and depends how --- at the corner it goes  
12 to infinity.

13 So, the point is that the effect of  
14 embrittlement, the effect of ductility on that stress  
15 concentration or that CLB CUF, whatever, is not  
16 reflected in those calculations. You don't have to do  
17 anything, but do not say conservatively, because this  
18 is untrue that I am conservative. They are not  
19 conservative. This is one example.

20 I gave you yesterday about the Fen. The  
21 Fen is based on a --- I don't want to get into that  
22 now. Hopefully we'll get later.

23 CHAIRMAN McDADE: So, it's your view that  
24 with regard to, for example, Commitments 43 and 49,  
25 that although they recalculated the CUF, that they

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1 didn't redetermine the appropriate limiting locations.  
2 And that, therefore, the analysis is ineffectual in  
3 determining whether or not the intended use will be  
4 maintained for the next 20-year period.

5 DR. HOPENFELD: Yes, they're recalculated  
6 properly. They went through the raindrop procedure,  
7 you know, the pagoda thing. That's how to count the  
8 maximum/minimum stresses and you take the difference  
9 and you multiply by a stress concentration, but that  
10 stress concentration they have multiplied -- they made  
11 changes to it.

12 There's one place and I remember in my  
13 testimony, there was one weld where I couldn't tell  
14 the difference, but there was a huge reduction in  
15 their screening process or their reevaluation process  
16 where they refuse the original CUF by I think an order  
17 of magnitude and say, well, it came from some  
18 California plant. I don't remember the detail of  
19 that, but I did discuss it in my testimony.

20 They changed the CUF by an order of  
21 magnitude. Adjusted it lower because of the stress  
22 concentration. When I looked at the stress  
23 concentration, I couldn't tell because the drawing was  
24 so kind of murky.

25 CHAIRMAN McDADE: The drawing was what?

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1 DR. HOPENFELD: You see, the stress  
2 concentration depends on the geometry -- or in the  
3 weld, in especially would depend on the radius at the  
4 corner and they change that. They made changes  
5 because they said it was too conservative. Originally  
6 they said it was too conservative. I was trying to  
7 find out how much --- I couldn't tell from the  
8 drawings that they have provided.

9 But nevertheless, my concern wasn't that  
10 much even with the geometry in this particular case,  
11 it is where is the effect of embrittlement on the  
12 ductility on the concentration factor.

13 JUDGE KENNEDY: Okay. Dr. Hopenfeld, I  
14 think I'm still a bit --- I guess I want to make sure  
15 I understand the point you made. I heard two specific  
16 points. One is that the applicant had used improper  
17 non-conservative transients in calculating the CUF  
18 values, and that the stress concentration factors  
19 should have been applied to the CUF value  
20 calculations, and that those values were improperly  
21 applied. Is that what you just testified to?

22 DR. HOPENFELD: The second one is correct.  
23 The first one I like to amplify a little bit, because  
24 I don't --- all I was saying, and maybe I --- I was  
25 saying that --- I was kind of too general, I think.

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1 I think when those plants were originally  
2 designed, you assume number of transients. And in  
3 that -- along that thought I said originally most of  
4 their chances were good, except there are some cases  
5 that were underestimated, there were more transients,  
6 but I don't know which plants they were, but I know  
7 that was the case. But in most cases they were  
8 conservative with respect to the number of transients.

9 So, in that respect when I talk about the  
10 transient in the particular case -- in the case of  
11 IPEC, transients -- number of transients or the --  
12 it's not really the number, it's the intensity of the  
13 transient. So, there has to be --- for 20 years they  
14 didn't have any data for it on the pressurizer surge  
15 line. So, I don't know how they got it. We've been  
16 trying to find out.

17 In that sense, to answer your question, in  
18 that sense the number of transients is not --- maybe  
19 they did the right thing, but I don't know what it is.

20 I do know that for 20 years there's no  
21 data on the thermal loads on those certain components.  
22 And I haven't seen anywhere in there describing what  
23 they have done.

24 And that's an uncertainty because when you  
25 calculate a CUF, when you calculate the final CUF, the

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1 past transients are reflected in there, but how do you  
2 do something when you don't know what the number of  
3 transients or what the transients were? You don't  
4 have data for it.

5 JUDGE KENNEDY: Is that the particular  
6 transient you're referring to when you -- or  
7 particular component you are referring to when you  
8 said improper non-conservative transients? Is that  
9 the one we should focus on?

10 DR. HOPENFELD: That was -- I believe  
11 there was connection of the stratification, because  
12 originally -- I'm going back to this issue of  
13 stratification.

14 Originally when Westinghouse designed,  
15 they wrongly so even though there was data, they  
16 wrongly assumed that there will be no stratification.

17 And in the mid-'80s, suddenly the  
18 component started falling apart. Some components, not  
19 all, because of stratification or there were the surge  
20 line. I don't know this particular case. Mostly  
21 welds.

22 And at that point they started getting  
23 data, but for 20 years, they didn't have any. So, you  
24 ask yourself, what did they do here? And I think they  
25 discussed it, but I don't know what they did, but I am

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1 not like the NRC staff. I'd like to verify it and I  
2 have no opportunity to verify it.

3 JUDGE KENNEDY: But that --

4 DR. HOPENFELD: So, I have to go trust  
5 what they say, and I don't -- do not.

6 JUDGE KENNEDY: Dr. Hopenfeld, I didn't  
7 mean to interrupt you, but yesterday we took the  
8 testimony on this stratification issue and how it was  
9 accounted for in the CUF calculation.

10 Do you remember that testimony from Mr.  
11 Gray yesterday?

12 DR. HOPENFELD: No.

13 JUDGE KENNEDY: Okay.

14 DR. HOPENFELD: He was talking about  
15 different part. He was talking about the moving  
16 front. There is a problem, but that -- I didn't want  
17 to -- that is not the one I really focusing. There  
18 are two aspects.

19 You see, he was talking about -- he was  
20 talking about the moving front when you -- during the  
21 heat-up where the pressurizer forces the fluid towards  
22 the primary pipe.

23 That's what he was talking about, which is  
24 -- is the moving front back and forth that cause  
25 fatigue, but I was talking about the instability of

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1 the two layers.

2 When you have stratification, you have an  
3 unstable situation, because two different fluids of  
4 two different densities come in contact. There are  
5 all kind of instabilities that you can define there.

6 One of the most common ones, I think, is  
7 called the Helmholtz instability, which is affected --  
8 - which describes --- that really takes into account  
9 the different density and the sheer between the  
10 plants.

11 Now, Entergy said that we are not going to  
12 have thermal striping because there is -- because  
13 there's a standing wave theory that says that we are  
14 not going to have it.

15 Now, originally they say they are talking  
16 about standing wave theory. Then they are talking  
17 about the Reynolds number theory.

18 I, again, I've been working on this -- we  
19 were one of the first ones to identify this problem.  
20 So, I worked on this problem 40 years ago, but -- and  
21 I had some -- I admitted certain problems in this  
22 area.

23 For the last few years I haven't been  
24 working, but I have been following the literature.  
25 And believe me, I have never heard of a pressure wave

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1 theory or Reynolds number theory.

2 Reynolds, you can't just say Reynolds  
3 number, you have to be a Reynolds number, it has to be  
4 based on something. Has to base -- at least based to  
5 be on some kind of a geometry.

6 They just say a Reynolds number theory,  
7 pressure wave -- this is voodoo engineering at best.  
8 And that's what they say that's conservative. That's  
9 what --

10 MS. SUTTON: Your Honor, this is Kathryn  
11 Sutton for the applicant. We object to these ad  
12 hominem attacks on the expert's references to voodoo  
13 and whatnot.

14 We just ask that Your Honors direct the  
15 witness to please curb those sort of ad hominem  
16 attacks on our experts. It's -- the hearing is very  
17 professional. We just ask that we maintain that sense  
18 of decorum.

19 CHAIRMAN McDADE: Okay. I don't think  
20 that when Mr. Bush commented on Ronald Reagan's  
21 economics as voodoo economics, he viewed it as an ad  
22 hominem attack on President Reagan. At that point,  
23 Governor Reagan.

24 I didn't view what Dr. Hopenfeld said as  
25 an ad hominem attack. I took it merely as an

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1 indication that he thought that this was not based in  
2 sound engineering judgment and it's taken in that  
3 regard.

4 Dr. Hopenfeld.

5 DR. HOPENFELD: True. I sincerely  
6 apologize. I lost my cool. I shouldn't, and I  
7 apologize to you, ma'am. I shouldn't have said that.

8 MR. SUTTON: Thank you. Thank you,  
9 Doctor.

10 DR. HOPENFELD: I didn't meant to, but I  
11 -- there are certain points you -- I don't know how to  
12 describe, because we are trying to get the problem, we  
13 are trying to understand something and we get  
14 distracted by saying -- well, when I bring the issue  
15 and Dr. Lahey bring an issue they say, well, it's  
16 already accounted somewhere.

17 You can deal with something, but I brought  
18 the issue of the Fen saying, well, this is accounted  
19 somewhere else. And the same thing with the oxygen.  
20 So, we don't have --

21 JUDGE KENNEDY: Dr. Hopenfeld --

22 DR. HOPENFELD: -- time to get to the  
23 details. I'm sorry.

24 JUDGE KENNEDY: Can we get back to the, I  
25 guess, what was the --

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1 DR. HOPENFELD: I'm sorry.

2 JUDGE KENNEDY: -- stratification problem  
3 and which particular component are you concerned  
4 about?

5 DR. HOPENFELD: Okay. The stratification  
6 problem is whether you have types of fluctuation that  
7 penetrates all the way to the surface.

8 What happens there, you have very large  
9 fluctuations of the order between one to ten hertz  
10 that could be very severe. And what they do is affect  
11 the cracked surface.

12 Now, we don't understand the exact  
13 phenomena. I believe that what it affects is really  
14 affects the initiation time with respect to fatigue.  
15 It doesn't really have an effect on the crack  
16 propagation. We are not into Section 11 or anything.  
17 We are into the initial initiation process.

18 JUDGE KENNEDY: I guess the question was,  
19 Dr. Hopenfeld, which particular plant component would  
20 this --

21 DR. HOPENFELD: The surge line.

22 JUDGE KENNEDY: The pressurizer surge  
23 line? Is that what you said?

24 DR. HOPENFELD: Yes.

25 JUDGE KENNEDY: Okay. And so, is that the

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1 improper non-conservative transient of concern is the

2 --

3 DR. HOPENFELD: Yes.

4 JUDGE KENNEDY: And is that also the  
5 component that you felt there was 20 years of missing  
6 data that should have been ---

7 DR. HOPENFELD: Yes.

8 JUDGE KENNEDY: -- accounted for?

9 DR. HOPENFELD: Yeah, that's what they  
10 said -- stated, yes.

11 JUDGE KENNEDY: Thank you. And then the  
12 stress corrosion or stress concentration factors, you  
13 feel those should be applied differently than you  
14 believe they've been applied in calculating the CUF  
15 value?

16 DR. HOPENFELD: Right. The stress  
17 concentration factor is --- comes at a different  
18 place. The one I really would be more concerned is  
19 indication of the tube-to-tubesheet welds. There are  
20 20,000. Not each concentration the same. That's why  
21 I asked yesterday how do you do it? And the answer  
22 was there's a procedure in the ASME.

23 And I'm not that familiar with the  
24 procedure, but I'm sure there is, but that's just not  
25 an answer, really. I would have to see what they've

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1 done, but I have no access to their computer codes and  
2 I don't really know what they have done.

3 JUDGE KENNEDY: Dr. Hopenfeld, let me try  
4 it a different way. You brought up the stress  
5 concentration factors.

6 Are they applicable to metal fatigue?

7 DR. HOPENFELD: Are they applicable to  
8 fatigue? I don't understand the question.

9 JUDGE KENNEDY: Are these not metals?

10 DR. HOPENFELD: Could you please repeat  
11 the --

12 JUDGE KENNEDY: I guess I'm, you know,  
13 this contention is about component metal fatigue.

14 DR. HOPENFELD: Right.

15 JUDGE KENNEDY: And we've been discussing  
16 for almost a day now a Cumulative Usage Factor. And  
17 I tried to start my question discussing any concerns  
18 you had about those calculations, the CUF of record, as  
19 you termed them.

20 DR. HOPENFELD: Well, yes.

21 JUDGE KENNEDY: And so, you brought up the  
22 transients, which I think we now understand.

23 DR. HOPENFELD: Yes. Yes.

24 JUDGE KENNEDY: And I'm not sure I quite  
25 grasp the stress concentration factor and how it

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1 applies to the CUF of record calculation.

2 DR. HOPENFELD: Can I explain to you?  
3 What you do, you have a whole bunch of transients.  
4 You look at the whole data of loads versus time. Then  
5 you go to some technique, I said raindrop technique,  
6 there are others, and you pick up the maximums and  
7 they group them together.

8 When you take the maximum, the peak,  
9 that's all the -- mostly that's what they're talking  
10 about. I don't really have a problem, but I'm sure  
11 that they know how to do it and I'm sure they're doing  
12 an excellent job.

13 My problem is, is after you take the plus  
14 -- the peak and subtracted the minimum, then you  
15 multiply that by a concentration factor. That -- the  
16 result that you get is related to the fatigue life of  
17 the component, yes. It affects the fatigue.

18 JUDGE KENNEDY: So, you're suggesting that  
19 there's a stress concentration factor term that needs  
20 to be applied or has been applied to the cumulative  
21 usage factor calculation.

22 Is that what you just said?

23 DR. HOPENFELD: Yes.

24 JUDGE KENNEDY: Okay. Thank you. Let's  
25 turn to Entergy. I think there's two questions at

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1 least on the table. One is the lack of data, the 20-  
2 year data for the pressurizer surge line and how that  
3 was handled in the CUF of record calculation.

4 Mr. Gray.

5 MR. GRAY: This is Mark Gray for Entergy.  
6 The transient development for the surge line and  
7 pressurizer nozzles is documented in our two WCAPs.

8 The WCAP for Unit 2 is WCAP 17199, which  
9 is Entergy 681. And the Unit 3 WCAP is 17200, which  
10 I don't readily have, but I can find that -- 682,  
11 okay. So, Entergy 682.

12 Section 3 of each of those WCAPs describes  
13 in detail the transient development for those nozzles.  
14 Within that description there are, for Unit 3 in  
15 particular, there is a discussion of how we handled  
16 the data for the past operation. To summarize, the  
17 way that is developed is in general you'll have a  
18 subset of the data for the plant operations.

19 For Unit 2 we had a good amount of data --  
20 well, let me stop for a second. The reason there is  
21 such a thing as past and future is because there was  
22 a recommendation in the '90s due to the pressurizer  
23 in-surge/out-surge issue that Westinghouse studied  
24 within the Owners Group for the plants to change their  
25 mode of operation to mitigate these transients.

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1           So, the time that the plant incorporated  
2 those changes is where we expected to see a difference  
3 in the transients that resulted from the operations.  
4 We had data for both that past and present for Unit 2.

5           For Unit 3, that data was -- we had the  
6 data for the present, but for the past, you know, we  
7 were lacking data. So, what was done and is described  
8 in the calculation notes, as well as in the WCAP, is  
9 a study of the plant operations.

10           Coupled with looking at data, we also  
11 employed operator interviews asking the operators in  
12 the history of the plant how they've changed their  
13 heat-up and cool-down operations.

14           I should say that the significant  
15 transients happened during heat-up and cool-down of  
16 the plant when the Delta-T between the pressurizer and  
17 the hot leg is high and the stratification is  
18 maximized.

19           So, a combination of operator interviews,  
20 studying the heat-up and cool-down procedures, seeing  
21 what effects there would be was one part of that  
22 investigation.

23           The other part of the investigation was  
24 using actually the results of the Owners Group program  
25 where all of the Westinghouse plants at the time were

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1 studied for their susceptibility to in-surge and out-  
2 surge transients. And all the plants were  
3 characterized according to a dimensional parameter,  
4 which is -- and this is described in WCAP 13588, which  
5 I know is in our exhibits, but, again, I don't have  
6 the exhibit number.

7 That parameter was used to compare Indian  
8 Point Unit 3's surge line and pressurizer layout to  
9 those other plants and to look for similarity in  
10 plants for which we did have data. And of course to  
11 nobody's surprise, the most similar plant to Indian  
12 Point, Unit 3, with respect to that, was Indian Point  
13 Unit 2.

14 So, the data from Indian Point Unit 2 for  
15 the past operation, as well as other plants, was all  
16 considered and an evaluation was done to determine a  
17 conservative estimation of the past transients for the  
18 surge line and pressurizer.

19 JUDGE KENNEDY: Okay. Thank you, Mr.  
20 Gray. You used the term "heat-up" and "cool-down."  
21 When do these -- when does that occur?

22 Is that something daily? Weekly?  
23 Monthly? Annually?

24 MR. GRAY: No, it's -- at the least, it's  
25 every refueling outage. Sometimes they'll cool down

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1 and heat up for a different -- and Mr. Azevedo might  
2 have a better estimate of --

3 MR. AZEVEDO: Yeah. This is Nelson  
4 Azevedo for Entergy. It's once every two years.  
5 Maybe once every few cycles we'll also cool down for  
6 some other reason like, you know, equipment failure,  
7 something like that, but normally just once every two  
8 years.

9 JUDGE KENNEDY: And so, over 20 years of  
10 operation heat-up and cool-down would occur on --  
11 what's a number -- estimated number of heat-ups and  
12 cool-downs over the 20 years of missing data?

13 MR. AZEVEDO: Well, we can look up the  
14 data. I don't have it here in front of me, but, you  
15 know, I'm not implying that all over those 20-year  
16 periods -- over that 20-year period when we cool down  
17 10 times, you know.

18 Back then we were in a different cycle  
19 length. So, the number was higher, but probably by a  
20 factor of two or so.

21 JUDGE KENNEDY: All right. Thank you.  
22 Dr. Hopenfeld, any particular concern over how the  
23 analysis was handled? And did you review those WCAPs?

24 DR. HOPENFELD: I read those three years  
25 ago when we started with this. I read them -- that's

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1 when I got the information that they did not have the  
2 transients and they developed some kind of models.

3 There wasn't sufficient detail in that --  
4 those documents to see how conservative -- or if  
5 conservatives they were, but that I couldn't tell and  
6 that was my problem.

7 And I think if I read it today, I probably  
8 couldn't tell either. So, I am very much -- maybe NRC  
9 has, because they say that all these models are  
10 conservative, but I couldn't tell. I don't know how  
11 you can tell when you don't have data, that something  
12 is conservative.

13 JUDGE KENNEDY: All right. Thank you, Dr.  
14 Hopenfeld. Stress concentration factors and their  
15 impacts on metal fatigue or CUF calculations?

16 MR. AZEVEDO: Yeah, Your Honor. This is  
17 Nelson Azevedo for Entergy. First, let me comment  
18 that I think it's implied that the stress  
19 concentrations change over time. They don't change  
20 over time. They're a function of the geometry of the  
21 plant. So, unless you modify the component, the  
22 stress concentrations stay the same.

23 Also, the ASME code when you do fatigue  
24 analysis, you use what the code calls "peak stresses."  
25 And peak stresses -- excuse me -- are already the

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1 intensified stresses.

2 "Stress intensification factor" is really  
3 not the right term, because ASME Section 3 requires we  
4 use -- excuse me -- stress intensity is not really  
5 stresses, but the end result is the same, but the  
6 stresses that we use are already peak stresses which  
7 have already been identified. They're not  
8 intensified. They're not intensified after we paired  
9 the peaks and the valleys. They're intensified prior  
10 to that and we use those peak stresses to pair them,  
11 you know, to peaks and to valleys.

12 So, the stress concentration effects have  
13 been incorporated and they're clearly specified in the  
14 ASME code how to calculate them.

15 JUDGE KENNEDY: And did I hear you say the  
16 stress concentration factors aren't influenced by  
17 corrosion or embrittlement or radiation?

18 MR. AZEVEDO: Well, again, they're  
19 certainly not influenced by embrittlement or  
20 corrosion, because there's no corrosion going on in  
21 the primary side.

22 MR. STROSNIDER: Your Honor, this is Jack  
23 Strosnider from Entergy. I'd like to add to Mr.  
24 Azevedo's comments that the notion about changes in  
25 geometry over time it should be recognized that under

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1 Section 11 of the ASME code, these systems are  
2 inspected periodically. In particular, the welds are  
3 looked at with -- using ultrasonic methods.

4 So, if there were any change which, you  
5 know, as was pointed out is not expected, they would  
6 be -- that would be identified through these  
7 inspections. It would have to be put in the  
8 corrective action program and evaluated.

9 One other thing which I think was in Dr.  
10 Hopenfeld's testimony and may have mentioned earlier  
11 was the notion of flow-assisted corrosion. And I just  
12 want to point out that that mechanism is not  
13 applicable to the primary system components that we're  
14 talking about. So, that would not be something that  
15 would change the geometry.

16 JUDGE KENNEDY: Thank you. Dr. Hopenfeld,  
17 any final thoughts on stress concentration factors and  
18 how --

19 DR. HOPENFELD: Yes.

20 JUDGE KENNEDY: -- Entergy is applying  
21 them?

22 DR. HOPENFELD: I have several, but I  
23 don't want to take too much time. But one that I  
24 would like to choose is that the stress concentration  
25 I was talking about is affected by ductility.

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1           And if the ductility doesn't change, if  
2           the irradiation doesn't affect ductility, then there's  
3           no effect on it. But from what I heard yesterday, it  
4           does affect ductility. And from what I read about it,  
5           it does affect ductility.

6           The original stress concentration for  
7           which these peaks are multiplied by do not have  
8           embrittlement effect in it.

9           JUDGE KENNEDY: Are you suggesting that  
10          the ASME code prescribed method is incorrect for this  
11          calculation?

12          DR. HOPENFELD: No, the ASME code is  
13          correct. What I am suggesting the number that you  
14          have, decay or whatever the number, ASME code will  
15          tell you go to the Pearson chart or something or  
16          handbook and pick up what the concentration factor is  
17          for this particular geometry. But it doesn't tell you  
18          that if that geometry is subjected to embrittlement  
19          over time, how to handle that, or at least I'm not  
20          familiar with.

21          So, I think it's true the geometry on the  
22          primary side doesn't change, except in one case I do  
23          have a problem with the whole LAR, but I don't want to  
24          take too much into it.

25          If you notice that in the original LAR --

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1 I don't have time to address it. So, maybe if I have  
2 time, I'll come back to it. I'm sorry. It would take  
3 me too long to explain.

4 It relates -- I'll focus my attention now  
5 on the effect of radiation on the stress  
6 concentration. I don't know how that was accounted  
7 for.

8 JUDGE KENNEDY: Well, maybe just to clear  
9 the air, Mr. Azevedo, if we focused just on  
10 embrittlement and the stress concentration factors --

11 MR. AZEVEDO: This is Nelson Azevedo for  
12 Entergy. Again, Your Honor, stress concentrations are  
13 geometrical, impacted by the geometry of the  
14 component, not the embrittlement of the component.  
15 That impacts the material properties, not the stress  
16 concentrations.

17 CHAIRMAN McDADE: Okay. Mr. Azevedo, I  
18 just didn't hear what you said. It's affected by the  
19 geometry, not by -- I just didn't --

20 MR. AZEVEDO: It's not affected by the  
21 embrittlement.

22 JUDGE KENNEDY: So, this ductility  
23 question that Dr. Hopenfeld is raising, you don't --  
24 do you feel it's significant in relation to stress  
25 concentration factors?

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1 MR. AZEVEDO: No, I don't feel it impacts  
2 the stress concentration factor at all. As we  
3 discussed over the last couple days, what it does  
4 impact is the ability of the material to resist crack  
5 propagation, but that's not what we're talking about.

6 We're talking about CUFs and crack  
7 initiation and irradiation has no impact on stress  
8 concentration. So, it's a geometry issue.

9 JUDGE KENNEDY: All right. Thank you.  
10 Dr. Hopenfeld, I have one final question. At least it  
11 will start as one final question.

12 On Page 6 of your report, Exhibit RIV or  
13 Riverkeeper 144, you state that the Fen is an  
14 experimental factor and the underlying premise is that  
15 the user would not extrapolate the Fen to conditions  
16 other than those in its derivation.

17 Are you suggesting that you believe that  
18 Entergy did so? And where in your testimony do you  
19 support that statement?

20 DR. HOPENFELD: Let me explain. I'd like  
21 to see the statement, but from what you read -- I  
22 don't have it in front of me.

23 JUDGE KENNEDY: Would you like us to --  
24 would it help if we put it up on the screen? Mr.  
25 Welkie, could we try 144? Riverkeeper.

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1 (Pause.)

2 JUDGE KENNEDY: Page 6, I hope.

3 DR. HOPENFELD: Where would you like me to  
4 look?

5 JUDGE KENNEDY: Well, I'm looking myself.

6 MR. SIPOS: I believe we're on Page 8. I  
7 believe we're on Page 8 of the pdf, Your Honor.

8 JUDGE KENNEDY: Right. Thank you. Yes.  
9 Document Page 6, which I think is pdf Page 8. Thank  
10 you. Okay. Scroll down just a little bit.

11 Right. The last sentence under Section  
12 1.1, since the Fen is an experimental factor, the  
13 underlying principle of using the above equation is  
14 that the user would not extrapolate the Fen to  
15 conditions other than those that existed in its  
16 derivation.

17 And I guess I -- that seems like a  
18 hanging statement. I filled it in by suggesting are  
19 you challenging the application of this by Entergy?  
20 Has it been applied outside -- that you believe it's  
21 been applied outside the range of applicability?

22 DR. HOPENFELD: Yes.

23 JUDGE KENNEDY: And how do you support --  
24 what do you point to to support that statement?

25 DR. HOPENFELD: One of several.

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1 Obviously one we discussed was the oxygen. The oxygen  
2 was -- I don't want to rehash that now, because there  
3 are others. The other one is stress corrosion  
4 cracking.

5 You see, when these tests -- and if I read  
6 the rebuttal to my report, it doesn't seem like they  
7 understand. It doesn't appear as to how these tests  
8 were run, because they, in their testimony, said that  
9 you can take the Fen as it was in this equation and  
10 directly apply it.

11 Dr. Chopra, who had developed this  
12 equation, discussed this issue for full two days  
13 before the ACRS in 2006. And he made it very, very  
14 clear that it's up to the user to any -- make  
15 adjustment for its environment, and I made that point  
16 in my report.

17 In reply, Entergy said that it's my  
18 imagination, that Dr. Chopra never was there. I gave  
19 you the reference. It's in the record, but -- and I  
20 can give you the pages where he said that.

21 Now, to reply to your question, which I  
22 didn't, the specific one was oxygen, but the one that  
23 really concerned me especially for the tube-to-  
24 tubesheet welds is the stress corrosion aspect of it.

25 You see, stress corrosion is different

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1 than metal fatigue and only in one respect for the  
2 same material. Stress corrosion you have uniform,  
3 steady-state --

4 JUDGE KENNEDY: Dr. Hopenfeld, let's back  
5 up just a second. I -- again, I -- maybe it's the way  
6 I'm asking the question.

7 What this statement seems to imply is this  
8 test, these tests that generated the Fen factors had  
9 a range of conditions under which the tests were run.  
10 And I read that last sentence and I may be reading it  
11 incorrectly, which is why I ask the question, as a  
12 challenge to someone applying those factors outside  
13 the applicable range of conditions under which they  
14 were developed, I don't see that as having any bearing  
15 on stress concentration factors.

16 Maybe oxygen content, I'm not sure, but  
17 this implies to me that there is an extrapolation of  
18 the Fen to conditions that are inconsistent with its  
19 derivation.

20 Could you please respond to that  
21 particular question as what -- well, first of all,  
22 what did you mean by this?

23 DR. HOPENFELD: Well, I started trying --  
24 started explaining going into the stress  
25 concentration -- stress corrosion cracking. There is

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1 no stress corrosion cracking in these tests. There  
2 was no steady-state component during these tests. It  
3 was only cycle components.

4 So, there is only fatigue, but there is a  
5 synergy, as Dr. Lahey said, between fatigue and stress  
6 corrosion cracking. Where is that synergy? In two  
7 places.

8 One, in the initiation. And I would like  
9 to -- because, again, when we talk about crack  
10 initiation, crack propagation, we're talking about two  
11 different things. So, if you wish to see what I'm  
12 talking about, I'm talking about the crack initiation  
13 and propagation by the short cracks.

14 They are talking about Section 11 cracks.  
15 I'm talking about the short cracks the way are  
16 described by Dr. -- or by Argonne in this report. And  
17 we can go to the definition of what the crack means,  
18 but there were no -- there was no stress corrosion  
19 component during these tests.

20 So, you cannot apply these Fen directly to  
21 a situation where the stress corrosion occurring  
22 simultaneously, because their synergetic effect, their  
23 mechanism of the synergy is as follows.

24 When you have steady-state tensile force  
25 superimposed on the oscillating force, oscillating

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1 stress, what you do, you're affecting the distraction  
2 of the outside layer at the tip of the crack.

3 So, the crack propagation usually would be  
4 much faster, and that's what data shows that you have  
5 a faster propagation of the crack, how it -- how the  
6 CUFen would be affected, because the fatigue like,  
7 that's what we're talking about.

8 JUDGE KENNEDY: Doctor.

9 DR. HOPENFELD: Yes.

10 JUDGE KENNEDY: I hate to keep  
11 interrupting you, Dr. Hopenfeld, but I think that --  
12 if I look at this equation, it appears to be adjusting  
13 laboratory data in air for laboratory data in water  
14 conditions. Maybe water conditions that are  
15 applicable for a pressurized water reactor.

16 What part of that do I not understand?

17 DR. HOPENFELD: What I think you don't  
18 understand is it's not only the water condition, it's  
19 the condition how the specimen was stressed. There  
20 was no uniform stress at the time when the cycle  
21 stresses were applied.

22 JUDGE KENNEDY: And how is that captured  
23 in the conditions other than those that existed in its  
24 derivation?

25 DR. HOPENFELD: It's not -- it's not --

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1 it's up to the user to make adjustments for that.  
2 There's no stress corrosion --

3 JUDGE KENNEDY: Where in this document  
4 does it say you need to do that?

5 DR. HOPENFELD: In the testimony -- in the  
6 testimony of Dr. Chopra before ACRS, he discussed the  
7 things that they did and the things they didn't do it.  
8 And the members of the ACRS a whole bunch of questions  
9 like you do right now. And the answer was, well, we  
10 haven't done this, it's up to the user to adjust it.  
11 It's up to the user to take care of it. We hadn't  
12 looked at fluence. It's up to the user, and they keep  
13 on going.

14 And we haven't covered everything.  
15 There's a full two-day discussion of this, which is --  
16 which to some degree if you read the report, some of  
17 it is in here, but I --

18 JUDGE KENNEDY: Let's --

19 DR. HOPENFELD: What I'm telling you is  
20 that loads, there was no stress concentration --  
21 stress corrosion cracking.

22 Let's put it differently. Suppose you  
23 took a sample. They use brand new samples, perfectly  
24 clean -- due to stress -- a sample that already had --  
25 that was already had some stress corrosion cracking.

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1 The result is not going to be the same.

2 JUDGE KENNEDY: Let me --- I heard a lot  
3 in your discussion there, and I heard you pointing us  
4 to another document that you would suggest draws into  
5 question the Fen calculation.

6 Is that what you just said? I'm having  
7 trouble following you, to be honest with you.

8 DR. HOPENFELD: It draws into the question  
9 of the Fen. It's a new concept, really. It hasn't  
10 been around for many years. So, it's a perfect --  
11 it's an excellent concept. I have no problem with  
12 that.

13 JUDGE KENNEDY: So, you ---

14 DR. HOPENFELD: I'm just saying I have a  
15 problem when you use --- put blindfolds and use it  
16 everywhere. You have to see under what condition it  
17 was obtained and ask yourself, is it applicable to  
18 what I'm doing? And I don't see that this is being  
19 done.

20 I brought stress corrosion cracking as  
21 one. Oxygen is two. I'm sure there are others that  
22 are constant.

23 JUDGE KENNEDY: Is there a particular  
24 exhibit in your pre-filed testimony that you'd like to  
25 point us to, to address your concern? It doesn't

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1 appear to be this document, I guess, is my point.

2 DR. HOPENFELD: Well --

3 JUDGE KENNEDY: So, I'll give you an  
4 opportunity to point us towards your most applicable  
5 reference.

6 DR. HOPENFELD: Well, in my exhibit, I did  
7 discuss the effect of stress corrosion cracking. And  
8 I -- in a reference report by -- I guess by Argonne,  
9 and it will take me time to look for it, I did discuss  
10 the synergy between stress corrosion cracking, metal  
11 fatigue. And I reference the work of Argonne where  
12 they got a very, very detailed analysis showing  
13 there's definitely synergy between stress corrosion  
14 cracking and metal fatigue.

15 And they came up with equations and they  
16 said, we can handle it. There's information in the --  
17 we can handle it. It's difficult to handle for welds,  
18 but for the very base metal it's okay, but the problem  
19 is with the welds. We don't have enough data.

20 And welds usually are subjected to large  
21 residual stresses. So, that's what the stress is.

22 JUDGE KENNEDY: Dr. Hopenfeld, are you  
23 testifying that those subsequent references would lead  
24 us to adjust the Fen parameters to account for other  
25 mechanisms, aging mechanisms?

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1 I'm trying to put -- this started with an  
2 Fen discussion, and we're off into synergistic  
3 effects.

4 DR. HOPENFELD: Here is what I suggested.  
5 I think it's an excellent question. Here is what I  
6 suggest.

7 If you're asking me how to do it, I don't  
8 know how to do it, because I don't have the data  
9 although there is information -- there is some data in  
10 the literature as to the synergy recreating how fast  
11 the crack propagate with or without stress corrosion  
12 cracking, and how fast it will initiate or not  
13 initiate.

14 I don't know if I provided the reference.  
15 There's just too much material here, but there is an  
16 effect. Now, how to take in account that effect?

17 I don't know, but I am sure a fraction  
18 mechanic expert will come up with an answer and say,  
19 well, look, if you want to be conservative, do this,  
20 take this extreme. But if you don't want to be  
21 conservative, that's what they doing.

22 I'm talking about conservatism. Their  
23 effect is finite. I don't know how to calculate it,  
24 but if you -- you cannot say in the same breath that  
25 you are conservative without taking into account.

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1 That's all I'm saying.

2 JUDGE KENNEDY: I understand, Dr.  
3 Hopenfeld. And as you're aware, we took quite a bit  
4 of testimony over the last few days both on Contention  
5 25 and 26 about synergistic effects.

6 I guess I'll just go back, circle one more  
7 time to this Fen calculation. Do you have a  
8 particular concern about how Entergy has applied the  
9 adjustments for an environmental-assisted fatigue  
10 calculation? And in particular, the application of  
11 the Fen parameter.

12 DR. HOPENFELD: Yes, because they did not  
13 account for the irradiation effect.

14 JUDGE KENNEDY: So, we're back -- are we  
15 back to synergistic effects?

16 DR. HOPENFELD: It's not -- we're using  
17 the word "synergistically" interchangeably. The way  
18 I look "synergistically," and maybe not exactly the  
19 same as Dr. Lahey, I look synergistically as one thing  
20 happening, another thing happen. They work  
21 simultaneously.

22 And when they work simultaneously, the  
23 result is different than separately. That's what  
24 "synergistically" mean.

25 In the case of embrittlement and fatigue,

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1 as far as I'm -- embrittlement, like the other thing,  
2 just affects the material property. It's a different  
3 property. It's not that it works together. It's just  
4 the property is different. So, I -- in that case, the  
5 synergy word doesn't mean much to me.

6 JUDGE WARDWELL: But let me take a crack  
7 at what I -- I want to make sure you are or are not  
8 saying.

9 Do you believe that the Fen should include  
10 -- the selection of the Fen should include some aspect  
11 associated with stress corrosion cracking and oxygen  
12 content? Is that your position?

13 DR. HOPENFELD: All right. Let me answer  
14 to -- yes. In the case of oxygen content, it's  
15 already included in there. They told you use a number  
16 if you don't have the actual measurements of oxygen  
17 near the surface. It's not at the surface, but near  
18 the surface or near the component.

19 If you don't know what it is, then use a  
20 conservative value. And Argonne gave you 0.4 -- maybe  
21 it's more. If you have justification, use something  
22 else, but don't use 0.05.

23 Even Westinghouse in their analysis  
24 acknowledge that oxygen gets in there during the heat-  
25 up period.

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1                   Now, how does it get out? I'm not going  
2                   -- there are millions of -- oxygen is being reduced  
3                   during --- in the core all the time.

4                   JUDGE WARDWELL: So, you're saying that  
5                   oxygen is already included in the Fen, but it's not  
6                   included sufficiently, is your position.

7                   DR. HOPENFELD: No, I -- the Fen includes  
8                   the oxygen. There's an oxygen term. What do they  
9                   call it? Reduced oxygen with a star on it. So, you  
10                  have to put -- ask yourself what oxygen --

11                  JUDGE WARDWELL: Okay. So, the Fen does  
12                  include the oxygen.

13                  DR. HOPENFELD: Oh, sure.

14                  JUDGE WARDWELL: And but you are -- are  
15                  you objecting to the value that the applicant has used  
16                  --

17                  DR. HOPENFELD: Yes.

18                  JUDGE WARDWELL: -- for oxygen in the Fen?

19                  DR. HOPENFELD: Absolutely.

20                  JUDGE WARDWELL: Okay. Thank you. Now,  
21                  what about stress corrosion cracking?

22                  DR. HOPENFELD: I'm sorry?

23                  JUDGE WARDWELL: And what about stress  
24                  corrosion cracking?

25                  DR. HOPENFELD: Stress corrosion is not

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1 there, and I think --

2 JUDGE WARDWELL: And you believe it should  
3 be a component --

4 DR. HOPENFELD: Yes, but I don't --

5 JUDGE WARDWELL: -- in the calculation of  
6 the Fen.

7 DR. HOPENFELD: -- know how to do it. I  
8 wouldn't know how to do it. But if I was -- if  
9 somebody said, hey, you are getting on this plane,  
10 think of it this way. Stress corrosion is not only  
11 unique to -- it occurs on planes, too.

12 If I get on a plane and the guy said we  
13 got -- these wings are stress corroded, but they're  
14 also going to fatigue during the turbulence, then so  
15 I add, did you take into account the stress corrosion  
16 and said, no, I am not going to get on that plane.

17 So, the answer to your question, sir, yes,  
18 I would include it. I don't know how, but, again, if  
19 you take an expert person, and I can name you some  
20 expert, Dr. James for one, he will come up with a  
21 number how you can adjust or put a safety factor into  
22 this.

23 JUDGE WARDWELL: And is that in your  
24 testimony in regards to a suggested method to include  
25 stress corrosion cracking into the selection of the

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1 Fen value?

2 DR. HOPENFELD: I didn't feel it was my  
3 position to -- in writing this report to make  
4 suggestion as to what to do. I didn't put myself in  
5 that. I just said it's not adequate.

6 JUDGE WARDWELL: Do you have a cite to  
7 anyone else -- is this your professional opinion, or  
8 are there others in the industry to which you have  
9 cited backing up your professional opinion in regards  
10 to whether or not stress corrosion cracking should be  
11 included as part of the selection of Fen?

12 DR. HOPENFELD: There are plenty of --  
13 there is -- in the paper I cited -- indicated an  
14 effect of synergy before. Now, they didn't say  
15 specifically --

16 JUDGE WARDWELL: Excuse me, Dr. Hopenfeld.  
17 I'm not talking about synergism. I'm now asking just  
18 what you were trying to focus in on. The selection of  
19 the Fen value, you believe, should include stress  
20 corrosion cracking.

21 I'm asking you, do you have a cite to  
22 anyone else who also -- who shares that opinion of you  
23 and your testimony? And if so, where do you cite  
24 that?

25 DR. HOPENFELD: I do not have anybody

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1 addressing the Fen should be corrected by stress  
2 corrosion crack. It's up to the user to do that. The  
3 stress -- the code doesn't tell you, you know, how to  
4 do this. It's up to the user to make the adjustments.

5 But I don't think that --- I haven't seen  
6 anywhere in dispute that -- I mean, the whole concept  
7 of Fen is not that old. It's fairly new. So, I  
8 haven't seen any discussion in literature that say,  
9 hey, these people should have adjusted the Fen.

10 I am telling you that that Fen was not the  
11 effect of stress corrosion cracking. The effect of  
12 pre-conditioning the specimen with crack was not  
13 involved here.

14 JUDGE WARDWELL: Thank you. Let me turn  
15 to Entergy, either Mr. Gray or Azevedo or whoever  
16 else. Let's start more generically.

17 Is there any mechanism by which you would  
18 -- is there any mechanism in the current guidance that  
19 allows you to change or add or supplement different  
20 parameters in the calculation of the Fen?

21 MR. AZEVEDO: You mean to account for  
22 stress corrosion cracking?

23 JUDGE WARDWELL: Or any -- I was doing it  
24 more generically to start with, but, yes, my next  
25 question was going to be for stress corrosion

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1 cracking. So, fine. Use that as an example.

2 MR. AZEVEDO: Well, let me just start out  
3 by saying that the stress corrosion cracking is  
4 handled by a separate program. We have a separate  
5 program to handle stress corrosion cracking specific  
6 of LI-600. Those are the materials susceptible to  
7 stress corrosion cracking. That's a separate program.

8 JUDGE WARDWELL: Separate AMP?

9 MR. AZEVEDO: It's a separate -- yeah,  
10 that's correct. We have inspections specifically for  
11 that. So, that's addressed in a separate program.

12 To the extent --- well, stress corrosion  
13 cracking is driven by a susceptible material, a  
14 conducive environment, in the presence of stress.

15 To the extent that the environment impacts  
16 the CUF, that's exactly what the Fen is for to account  
17 for the impact of the environment on the crack  
18 initiation. In this case, the CUF. So, we would  
19 claim that that's already -- that's specifically what  
20 the Fen is doing.

21 JUDGE WARDWELL: Okay. Thank you.

22 MR. AZEVEDO: But, again, stress corrosion  
23 cracking is a separate program, a separate issue and  
24 handled separately from the CUFen.

25 JUDGE WARDWELL: Yesterday we talked about

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1 the oxygen content and that you're using an order of  
2 magnitude greater than what you are actually  
3 experienced at the plant; is that correct?

4 MR. AZEVEDO: That's correct.

5 JUDGE WARDWELL: And do you have anything  
6 else to add to it just so those comments are here in  
7 the transcript and saves us from flipping back to find  
8 out where you said it before yesterday?

9 MR. AZEVEDO: I'm not sure there's  
10 anything else I can say other than that we feel that  
11 the numbers that we're using are extremely bounding  
12 and that's already accounted for.

13 JUDGE WARDWELL: And when we were talking  
14 about that number, that number does relate to the one  
15 used for the ultimate calculation of the Fen; is that  
16 correct?

17 MR. AZEVEDO: That's correct.

18 JUDGE WARDWELL: Thank you.

19 MR. DOLANSKY: This is Bob Dolansky with  
20 Entergy. I just would like to add I believe the  
21 numbers that Mr. Azevedo gave yesterday were actually  
22 in our testimony or in a cite.

23 Is that right, Nelson, the numbers you  
24 read from yesterday?

25 MR. AZEVEDO: Yes, it's one of the Entergy

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1 exhibits.

2 JUDGE WARDWELL: Thank you.

3 JUDGE KENNEDY: With that, I have no  
4 further questions on Contention 26.

5 JUDGE WARDWELL: I think I'd like to clear  
6 up a couple, if I dare.

7 CHAIRMAN McDADE: Please.

8 JUDGE WARDWELL: This is for Mr. Azevedo  
9 or whoever else in Entergy. Dr. Hopenfeld did mention  
10 something about the importance of this fatigue for  
11 welds.

12 Do you put any more emphasis on welds as  
13 opposed to any other component in regards to the  
14 fatigue analysis?

15 MR. AZEVEDO: All the locations, all the,  
16 you know, nozzle corners, for example, welds, anywhere  
17 where there's a change in geometry or change in the  
18 materials, the ASME code specifically addresses that  
19 and tells you how to calculate the stress indices and  
20 the peak stresses which are used for fatigue analysis.

21 So, I'd say welds are not handled any  
22 different than any other component that requires to  
23 be, you know, accounted for, for change in geometry.

24 JUDGE WARDWELL: And those environmental  
25 conditions that you apply to other components are also

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1 applied to the welds like the oxygen content, et  
2 cetera.

3 MR. AZEVEDO: Yes, all the CUFs are  
4 amplified by the Fen. That's correct.

5 JUDGE WARDWELL: Dr. Hopenfeld also  
6 mentioned something about the fact that transient data  
7 wasn't available from the early operations of the  
8 plants.

9 Could you comment on that whether it is or  
10 isn't, and then how have you adapted for that in  
11 regards to the tracking of CUFs during operations and  
12 that will be extended into the period of extended  
13 operation?

14 MR. COX: This is Alan Cox. Let me start,  
15 and Mr. Azevedo can continue, but I believe you're  
16 referring to the lack of the details about pressurizer  
17 heat-ups and cool-downs.

18 I just want to say that the number of  
19 pressurizer plant heat-ups and cool-downs is known.  
20 That is not lost.

21 What was not available was the specific  
22 temperature information related to each of those heat-  
23 ups and cool-downs as far as how many cycles occurred.

24 JUDGE WARDWELL: Say again what was  
25 missing. I missed a couple words right in there that

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1 are crucial.

2 MR. COX: The detailed temperatures  
3 related to the -- the local temperatures that -- at  
4 the pipe when the heat-ups and cool-downs occurred.

5 JUDGE WARDWELL: Aren't those critical,  
6 though, or are they not? And how did you handle that  
7 lack of data?

8 MR. AZEVEDO: Well, yeah, this is exactly  
9 what Mr. Gray was discussing a few minutes ago. Maybe  
10 he can reiterate what he said before.

11 MR. GRAY: Hi. Yes. Mark Gray for  
12 Entergy. We --

13 JUDGE WARDWELL: Are you suggesting I  
14 wasn't paying attention, Mr. Azevedo?

15 MR. AZEVEDO: No, Your Honor. I did not  
16 mean that.

17 (Laughter.)

18 JUDGE WARDWELL: I probably wasn't.

19 MR. GRAY: Yeah, let me explain a little  
20 bit about the difference in the heat-up and cool-down  
21 events versus the actual sub-events and maybe that  
22 will clear that up a little bit.

23 During a given heat-up you can have sub-  
24 events, sub-cycles, transients that occur in the  
25 pressurizer lower head due to in-surges and out-

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1 surges. So, the data for the number of heat-ups and  
2 cool-downs for the plant was available. What we  
3 didn't have was detailed temperature information for  
4 those in-surges and out-surges.

5 And so, the study that we did both with  
6 respect to the sensitivity of the Indian Point Unit 3  
7 layout to in-surges and out-surges, the similar  
8 operating procedures to other plants including Indian  
9 Point 2, that study was all used to determine an  
10 applicable set of transients for that path. And  
11 that's what was documented in the WCAP and the  
12 supporting calculations.

13 JUDGE WARDWELL: Thank you. I do recall  
14 that testimony. I appreciate that.

15 Dr. Hopenfeld, two different times you  
16 mentioned, I believe, the tube-to-tubesheet welds.  
17 And I wasn't -- because you mentioned it twice, I was  
18 wondering why that sticks in your mind as something of  
19 importance.

20 And if so, to what degree is it important  
21 in regards to the CUF and CUFen calculations?

22 DR. HOPENFELD: It's extremely important.  
23 And I could spend half an hour, but I could spend a  
24 week to talk about it, but I don't want to take the  
25 week and I don't want to -- you wouldn't be interested

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1 in a week of work.

2 The reason it's important -

3 JUDGE WARDWELL: I think that's a safe  
4 assumption.

5 DR. HOPENFELD: Okay. The reason it's  
6 important is because -- and the reason it's important  
7 to say -- to know what the CUF is, and if we can go  
8 off to some material, maybe designated proprietary,  
9 because I would like to mention a number for that --

10 JUDGE WARDWELL: I'd like you to avoid  
11 that at all possible. I don't think I need it in-  
12 depth enough to see that number.

13 DR. HOPENFELD: Okay. If you don't need  
14 it, okay.

15 JUDGE WARDWELL: Make up a suggested  
16 number. Don't --

17 DR. HOPENFELD: Okay. Suggested --

18 JUDGE WARDWELL: Or a range of numbers.

19 DR. HOPENFELD: More than one. It's  
20 three.

21 JUDGE WARDWELL: More than one?

22 DR. HOPENFELD: Yes.

23 JUDGE WARDWELL: Fine.

24 DR. HOPENFELD: Three.

25 JUDGE WARDWELL: And what's this number

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1 for? Number of what?

2 DR. HOPENFELD: It's the CUF. The CUFen

3 --

4 JUDGE WARDWELL: The CUF more than one --

5 DR. HOPENFELD: -- for the weld.

6 JUDGE WARDWELL: -- for what?

7 DR. HOPENFELD: For the welds, I mean, the  
8 CUFen for the welds between the tube-to-tubesheet  
9 welds. The tube-to-tubesheet welds. The CUFen for  
10 the tube-to-tubesheet welds.

11 JUDGE WARDWELL: If it becomes greater  
12 than one, then what?

13 DR. HOPENFELD: If it's greater than one,  
14 then what happens? First of all, I have to backup.  
15 The analysis -- well, due to a steam line break, okay,  
16 because it's greater than one, there's a high  
17 probability, I would say probably a hundred percent  
18 probability, that those -- if it's really more than  
19 one, that those welds will fail.

20 Now, we don't know how they're going to  
21 fail. They'll fail -- usually when these things fail,  
22 it means there is a crack. Okay. So, I have 20,000  
23 cracked welds and I don't know to what degree they  
24 crack.

25 JUDGE WARDWELL: Are there actually

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1 20,000, or was that just --

2 DR. HOPENFELD: Don't take the number  
3 literally.

4 JUDGE WARDWELL: Okay. I want to make  
5 sure what --

6 DR. HOPENFELD: I'm going back in my  
7 memory and I've been away from these numbers for some  
8 time. There are 10,000 tubes, roughly. Maybe I know  
9 Entergy will say it's 11,000. So, whatever. 10,000.  
10 They are welded on both sides of the plenum. So, it  
11 might be 20,000.

12 So, you have 20,000 welds and they are --  
13 they have exhausted their useful design usage factor.  
14 They are damaged. They are not something brand new  
15 that came in a box from Amazon. They have exhausted  
16 their usefulness. So, now what happens? What  
17 happens? Well, you have a steam line break.

18 Here the steam line break depends where  
19 the break is, but usually for analysis purposes we  
20 usually assume that the break occurs between the  
21 containment and the relief valve and the safety valve,  
22 not farther that you can isolate it. So, you can't  
23 isolate that.

24 So, when you have a steam line break like  
25 that, you impose 2,000 pounds on the primary side

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1 because now you open to the atmosphere.

2 After you scram the reactor, the pressure  
3 in the steam generator goes down. So, you impose that  
4 pressure and now you have a leak, a direct path for  
5 the primary fluid to go directly to the -- to bypass  
6 the containment and go directly to outside.

7 If the operator doesn't operate, doesn't  
8 do things properly, you deplete the water and you  
9 uncover the core. So, what you have to do, you have  
10 to keep the core cool. You have to keep adding water.  
11 But at the time, you will not lower the level, too.  
12 You will stop the leak. The only way to do it to stop  
13 the leak when the leak is large, is to minimize the  
14 levels on both sides.

15 JUDGE WARDWELL: Is it your position that  
16 the sensitivity of the plant's integrity is -- has a  
17 higher degree of potential impact associated with any  
18 potential failure of the tube-to-tubesheet welds than  
19 other components that are also tracked for fatigue?

20 DR. HOPENFELD: This, in my mind, is very  
21 critical --

22 JUDGE WARDWELL: You think that's the most  
23 critical component.

24 DR. HOPENFELD: In my mind it is, because  
25 of the numbers they came up with.

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1 JUDGE WARDWELL: Okay. Thank you.

2 DR. HOPENFELD: If they came up with small  
3 numbers, I wouldn't worry about it.

4 JUDGE WARDWELL: I'm not worried about it.  
5 I'm just -- the welds are your most critical --

6 DR. HOPENFELD: That --- in this case,  
7 yes.

8 JUDGE WARDWELL: Entergy, would you like  
9 to comment on that position of Dr. Hopenfeld?

10 MR. AZEVEDO: This is Nelson Azevedo for  
11 Entergy. First of all, the CUFens for the tube-to-  
12 tubesheet welds are all below one. So, they're, I  
13 believe, 0.3 and 0.8. We were just looking at them on  
14 one of the exhibits.

15 JUDGE WARDWELL: We don't need the number,  
16 but that's fine. Below one is fine.

17 MR. AZEVEDO: I apologize. So, they're  
18 less than one. So, the idea that they have -- we have  
19 cracks, I'm not sure how to respond to that, because  
20 we feel that we don't have cracks. The CUFs are  
21 within the allowables.

22 JUDGE WARDWELL: Do you believe that the  
23 plant safety is any more sensitive to failures of  
24 those than they are of any other particular components  
25 or other components within the plant that are tracked

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1 for fatigue?

2 MR. AZEVEDO: No, I don't feel that that's  
3 the case. They're part of the reactor coolant  
4 pressure boundary just like many other components.

5 JUDGE WARDWELL: Thank you. Dr. Hopenfeld  
6 also mentioned something about pressure wave theory  
7 and Reynolds number theory.

8 Do you know what he was talking about in  
9 regards to that? And how have you handled or not  
10 handled that particular application of those theories  
11 to your fatigue analysis, if at all?

12 And if you don't know what he was talking  
13 about, that's fine, too. And I'll try to have him  
14 clarify.

15 MR. GRAY: This is Mark Gray for Entergy.  
16 I believe that that was in reference to the loadings  
17 that were used for the surge line analysis. The --

18 JUDGE WARDWELL: Excuse me. Is that what  
19 you were referring to, Dr. Hopenfeld?

20 DR. HOPENFELD: That's correct.

21 JUDGE WARDWELL: Thank you. Continue.

22 MR. GRAY: The surge line transients were  
23 developed consistent with a Westinghouse Owners Group  
24 program where stratification of the line is  
25 considered.

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1           The transients consider two effects of the  
2 stratification. One effect is the overall bending  
3 moment that occurs from the stratification in the  
4 line, which is different than if you assume the line  
5 to be at a uniform temperature. Those bending loads  
6 are included in the analyses of the nozzles.

7           The other aspect of the stratification on  
8 the nozzle at the hot leg, which is, you know, two --  
9 in this evaluation, I should say, two locations that  
10 are controlling or evaluated. The hot leg nozzle,  
11 which is -- enters the hot leg on a horizontal from a  
12 horizontal aspect on the surge line, and then the  
13 nozzle on the bottom head of the pressurizer, which is  
14 vertical. So, the stratification occurs in the nozzle  
15 when, and only when, the reactor coolant pump is not  
16 running.

17           When the reactor coolant pump is running,  
18 stratification can occur in the line, but not in the  
19 nozzle, because of the turbulence caused by the  
20 reactor coolant pump in the loop.

21           So, when the -- when the nozzle is  
22 stratified, that only occurs when the reactor coolant  
23 pump is off. And this has all been discussed in WCAP  
24 12639, which I can find that exhibit number for you.  
25 WCAP 12639 is the documentation of the Owners Group

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1 studies of surge line stratification.

2 When the stratification occurs in the hot  
3 leg nozzle, there is an out-surge that has to come  
4 from the pressurizer to create that hot layer on the  
5 top. And then the cold layer is fed by the hot leg  
6 water.

7 Since the surge line is an open line,  
8 there's no valves in it or anything. You get this  
9 communication between the hot and the cold.

10 When the temperature difference is very  
11 high, the stratification is more severe as far as its  
12 effect on the stresses. So, when you evaluate the  
13 nozzle, you evaluate the nozzle for the fact that this  
14 stratification comes and goes.

15 It was analyzed conservatively for those  
16 local effects by just assuming that it steps from  
17 stratified condition to a non-stratified condition and  
18 back.

19 So, those cycles are considered in the  
20 fatigue evaluation of the nozzle, as well as the  
21 bending moments coincident with that same thing  
22 happening in the line, because you get a range of load  
23 which gives you a range of stress from that.

24 A question that was raised was with  
25 respect to when you have the stratification layer,

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1 there has also been observed historically not in surge  
2 lines, but in feedwater lines back in the late '70s,  
3 a term called "thermal striping." Which what happens  
4 is that layer, that interface between hot and cold  
5 layers will begin to fluctuate at a very high  
6 frequency. This caused, actually, cracking in  
7 feedwater nozzles.

8 Number one, the presence of thermal  
9 striping in feedwater nozzles caused them to fail in  
10 a rather short period of time, because it's a high-  
11 cycle fatigue phenomena.

12 Those -- because of those failures, there  
13 were studies done of feedwater lines and nozzles in  
14 particular really to investigate the cause of the  
15 cracking which identified this striping phenomenon.

16 That's also in WCAP 9693, which is also an  
17 exhibit. Let me see if I can pull that up.

18 (Pause.)

19 MR. KUYLER: Your Honor, that's Entergy  
20 Exhibit 217, WCAP 9693.

21 MR. GRAY: And actually the surge line  
22 WCAP is 218. So, anyway, not to get into lots of  
23 detail, but you can look in 9693, I think it's in  
24 section -- it's a big volume. Section 1073. And I  
25 can confirm that. I have notes on that where it

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1 pretty much gives the conclusions of a whole testing  
2 program where they had to simulate what was happening  
3 in the feedwater lines to determine what it took to  
4 get this fluctuating interface at very low flow rates.

5 And feedwater lines are a little different  
6 at this weld. The aux feed water is very cold coming  
7 in. So, you get an even higher temperature  
8 differential, which gives you a higher Richardson  
9 number, which is the dimensionless quantity that's  
10 used to determine whether you can have stratification  
11 or not.

12 So, with those high Richardson numbers in  
13 the feedwater line, you -- they had to get in  
14 conjunction with the high Richardson number and the  
15 stratification, a high enough flow in that cold layer  
16 coming in so that -- and there were a number of  
17 conditions that are summarized in WCAP 9693.

18 One is you have to have a persistent flow  
19 of that cold layer. And it has to be a high enough  
20 flow characterized by the Reynolds number that creates  
21 this condition where that interface becomes unstable.

22 So, they describe two different  
23 conditions. A stable interface with the low flows,  
24 and a -- the wavy interface, is what they call it, for  
25 the high flows. That occurs in feedwater lines

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1 because of the conditions under which stratification  
2 occurs in that continuous flow.

3 In surge lines, the characteristics of the  
4 stratification transients is discussed in WCAP 12639.  
5 We observed at least 15 plants worth of data. You're  
6 not going to observe striping in thermal couples on  
7 the outside of the pipe. So, you don't see that.

8 The feedwater testing had to put sensors  
9 on the inside in the test loop. So, the -- but the  
10 characteristics of the transients when the  
11 stratification comes and goes was observed in 12639.  
12 It was used to develop the distributions of the cycles  
13 of stratification that I described before.

14 What happens is the stratification is not  
15 a sustained situation in the surge line because of  
16 this communication back and forth between the hot leg  
17 and the pressurizer. So, as a result of that, you  
18 don't have that sustained condition.

19 Number two, as I mentioned before, the only  
20 conditions under which the hot leg nozzle is  
21 stratified is when the reactor coolant pump is off.  
22 When the reactor coolant pump is off, you don't have  
23 a source of spray flow, because any appreciable  
24 velocity or flow, Reynolds number, again, for that  
25 difference to cause a wavy interface.

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1                   And number three, WCAP 12639 though it  
2                   does consider striping because it was in the early  
3                   days of, you know, the development of surge line  
4                   stratification, it states very clearly and references  
5                   studies that thermal striping in the surge line is  
6                   inconsequential. Insignificant, I think the word is  
7                   what it uses.

8                   JUDGE WARDWELL:   Okay.   Thank you.   I'm  
9                   all set.

10                  CHAIRMAN McDADE:   That concludes the  
11                  questions we have directly on Contention 26.   I  
12                  propose to take a 10-minute break before we start  
13                  considering Contention 38.

14                  Is there anything else that we need to  
15                  take up?

16                  DR. LAHEY:   Your Honor, I'd like to try to  
17                  clarify for the record something that came up under  
18                  26.

19                  CHAIRMAN McDADE:   Okay.   Hold that for  
20                  just a second, Dr. Lahey.   Ms. Sutton or --

21                  MR. KUYLER:   Yes, Your Honor.   There were  
22                  two items that I believe Your Honors had asked our  
23                  witnesses to look into yesterday, substantive matters  
24                  on this contention that I believe Mr. Gray has some  
25                  responses to.

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1 CHAIRMAN McDADE: Okay. Specifically with  
2 regard to the methodology used to address thermal  
3 coupling?

4 MR. KUYLER: Yes.

5 CHAIRMAN McDADE: Is that the first one?

6 MR. KUYLER: Yes, Your Honor.

7 CHAIRMAN McDADE: Okay. Mr. Gray.

8 MR. GRAY: Yes, Your Honor. The question  
9 was to where do we have an example in the record  
10 showing how we treated the thermal couple data, the  
11 sensors from the plant and how those were used for  
12 incorporation into the transients and the transient  
13 binning that I described.

14 Entergy 689, which is WCAP 12191, Section  
15 2.6 describes the process used to characterize the  
16 system transients based on the Delta-T. The  
17 corresponding -- and that's for the charging system,  
18 by the way.

19 The corresponding use of those -- of that  
20 information is documented in Entergy 727, which is  
21 calculation CN PAFN 0921. In Appendix A.3.1 of that  
22 calculation, it describes how that information was  
23 applied to the stress model to calculate fatigue.

24 CHAIRMAN McDADE: Okay. Thank you, Mr.  
25 Gray.

1 MR. GRAY: I would like to also answer  
2 another thing that was brought up, if I may.

3 CHAIRMAN McDADE: Can you give us general  
4 life here of what it is before you jump into it?

5 MR. GRAY: Yes. Dr. Lahey stated that we  
6 used elastic plastic analysis from MB 3228 of the  
7 code. And we -- and I stated that we did not. I  
8 would just like to clarify what may have occurred with  
9 that.

10 CHAIRMAN McDADE: Please.

11 MR. GRAY: Okay. While MB 3228 of the  
12 ASME code allows you to do a plastic analysis, the  
13 section of MB 3228 that describes that is 3228.3.  
14 This is commonly referred to as elastic plastic  
15 analysis where you calculate strains. And from those  
16 strains, you use those in your analysis. We did not  
17 do that elastic plastic analysis.

18 What he may have been confused by in our  
19 calculations and documentation is the fact that when  
20 you do the linear elastic analysis of MB 3200, MB  
21 3228.5, which I mentioned yesterday in my testimony,  
22 describes a factor called K-E. It's a penalty that  
23 you put on your elastic stress when you exceed certain  
24 limits. And so, it allows you to exceed those limits  
25 of stress equations when you penalize your usage

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1 factor calculation.

2 That's called a simplified elastic plastic  
3 correction factor in the code. So, you could see the  
4 words "elastic plastic" with respect to the Ke penalty  
5 factor, but it's not the same as doing a 3228.3  
6 plastic analysis.

7 CHAIRMAN McDADE: Okay. Thank you. Okay.  
8 Dr. Lahey, before you proceed, what I was thinking it  
9 might be appropriate to do, there's a couple of  
10 references there to Entergy 689 and 727 relating to  
11 methodology and I think we're probably going to want  
12 you to comment on those methodologies.

13 And it may be appropriate for us before  
14 you begin to, you know, augment your testimony, to  
15 take that break to give you the opportunity to take a  
16 look at those two exhibits, see whether or not you  
17 need additional time to review them before you  
18 comment.

19 I mean, it's -- when we move on from 26,  
20 it's not like this is a strong wall, you know, we can  
21 come back to it later. A lot of these contentions  
22 obviously are interrelated, but I would like to give  
23 you the opportunity to at least take a look at those  
24 two exhibits and that may be helpful in some questions  
25 that we have when you come back.

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1 DR. LAHEY: I'll do that over the break,  
2 Your Honor.

3 CHAIRMAN McDADE: And it may well be, I  
4 mean, we're only going to take, you know, we'll break  
5 until 10 minutes after 10:00. It may be that you'll  
6 need additional time. And if so, just, you know, let  
7 us know.

8 Is there anything else we should take up  
9 before the break, Ms. Sutton?

10 MS. SUTTON: No, nothing further, Your  
11 Honor.

12 CHAIRMAN McDADE: Mr. Kuyler?

13 MR. KUYLER: Nothing further, Your Honor.

14 CHAIRMAN McDADE: Brian Harris.

15 MR. HARRIS: No, Your Honor.

16 CHAIRMAN McDADE: Okay. We'll stand in  
17 recess then to 10:10.

18 (Whereupon, the proceedings went off the  
19 record at 9:55 a.m. and resumed at 10:10 a.m.)

20 CHAIRMAN McDADE: The hearing will come to  
21 order.

22 MR. SIPOS: Judge McDade, this is John  
23 Sipos for the State of New York. Dr. Lahey would like  
24 some additional time to review those documents.

25 CHAIRMAN McDADE: Okay. Should we then

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1 take the additional testimony from Dr. Lahey up after  
2 lunch? Would that be appropriate?

3 DR. LAHEY: That would be fine. I could  
4 do them both at the same time after lunch.

5 CHAIRMAN McDADE: Okay. And we will  
6 determine, I mean, there may or may not be significant  
7 questions after that, but you indicated that you had  
8 certain things that you wanted to clarify.

9 DR. LAHEY: Yes.

10 CHAIRMAN McDADE: And that may lead to  
11 additional questioning by the Board. But at this  
12 point, then, we might as well move on to 38. Before  
13 we do, I believe Dr. Duquette is the only potential  
14 witness who has not yet been sworn at least looking  
15 out at the gallery of witnesses.

16 Dr. Duquette, would you please rise?  
17 Would you raise your right hand? Do you swear that  
18 the testimony you will give in this proceeding subject  
19 to the penalties of perjury will be the truth, the  
20 whole truth and nothing but the truth?

21 DR. DUQUETTE: I do.

22 CHAIRMAN McDADE: Okay. Please be seated.  
23 and for the record, would you please state your full  
24 name?

25 DR. DUQUETTE: My name is David Duquette.

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1 CHAIRMAN McDADE: Okay. Dr. Duquette, a  
2 couple of things that we've mentioned to other  
3 witnesses before you were here. It's necessary for us  
4 to maintain a transcript.

5 If a question is asked generally to the  
6 intervenor witnesses and you're the one who is going  
7 to respond, if you could state your name first to make  
8 sure that the court reporter is able to attribute it  
9 to you as opposed to Dr. Lahey or Dr. Hopenfeld.

10 If the question is directly to you, for  
11 example, if I ask, Dr. Duquette, would you comment on  
12 something, there's no need for you then again to  
13 repeat your name, you know, because it will be clear  
14 on the record who it is who's testifying.

15 Also, we just took a break. We'll  
16 probably go now until lunch. But if any witness needs  
17 a break, you know, before the Board, you know, decides  
18 we need a break, they should just simply, you know,  
19 let us know and we can accommodate that.

20 I think those are the only bits of  
21 information that I really needed to bring out to you  
22 that you wouldn't already be aware of. So, with that,  
23 I want to --

24 MR. BESSETTE: Your Honor, this is Paul  
25 Bessette for Entergy. I just want to introduce Martin

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1 O'Neill has joined us as Entergy counsel for this  
2 contention.

3 CHAIRMAN McDADE: Yes, we are very  
4 familiar with Mr. O'Neill from Track 1 and from all of  
5 the pleadings.

6 Before we go further, I wanted to talk a  
7 little bit about what we intend to do now. We're  
8 moving on to Contention 38.

9 There's a lot of overlap between the  
10 various contentions and it is not our intent at this  
11 point to revisit issues regarding the adequacy of the  
12 AMP for RVIs that were covered, you know, by Judge  
13 Wardwell the first two days of this hearing.

14 And, likewise, we don't intend to revisit  
15 issues relating to metal fatigue and CUF values and  
16 environmental adjustments and the various WESTEMS  
17 issues that were covered by Judge Kennedy. It's not  
18 our intent. Although some of those are applicable to  
19 Contention 38 and Riverkeeper TC5, the combined  
20 contention, we are not going to revisit them.

21 Likewise, with regard to the license  
22 conditions that are a part of Contention 38, we --  
23 there are sort of two aspects to that. One has to do  
24 with enforceability, and the other has to do with  
25 adequacy in order to provide reasonable assurance.

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1           The first part of that, the  
2 enforceability, is primarily a legal contention. So,  
3 there's going to be minimal testimony that we're going  
4 to be eliciting on that just simply to ensure that we  
5 understand how in practice this is going to be carried  
6 out by the Agency. So, we're going to be focusing  
7 primarily on the adequacy of these individual  
8 commitments in order to provide reasonable assurance.

9           That said with a preface, I want to know,  
10 I mean, the parties have submitted detailed questions  
11 that they propose the Board to ask. As you know from  
12 the first few days of this, many of those questions  
13 were not asked by members of the Board. And part of  
14 that is a -- the concept of why we're having this  
15 hearing and what the Board is hoping to get out of it.

16           All of the parties to this have submitted  
17 detailed presentations and detailed testimony. Many  
18 issues are clear and it isn't necessary for the Board  
19 to go through those again.

20           When the parties were preparing their  
21 questions, obviously you had no way of knowing what,  
22 if anything, the Board understood from the  
23 submissions. But, so, in those instances where the  
24 Board felt that it didn't need clarification, we  
25 simply didn't go forward and ask those particular

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1 questions. I say that as a preface to this.

2 In the Track 1, we had questions at the  
3 end of the hearing from the parties and the question  
4 arises as to how to handle that in this Track 2  
5 proceeding. And what we would be looking for or, in  
6 any event, even possibly amenable to are not to allow  
7 parties to go through all of the questions that they  
8 propose that weren't answered, but only questions that  
9 were specifically addressed where their own party, one  
10 of their own witnesses, said something that you  
11 believe is either incorrect or perhaps misleading the  
12 way it came across, or that an opposing party's  
13 witness testified to that you believe was misleading  
14 or incorrect and had not already been addressed.  
15 Because in many instances, we've gone back and forth  
16 and the differences between the positions of the  
17 witnesses were very clear.

18 So, what we would be looking for is a very  
19 small universe. And what we would like counsel to do  
20 is after lunch, to be prepared to discuss with us  
21 before we begin testimony again, how you want to  
22 proceed in that regard whether there are any  
23 additional questions that you think need to be asked  
24 in order to clarify or complete the record. And then  
25 if so, whether it would be more efficient for you to

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1 advise us generally as to those issues you wish us to  
2 consider, or alternatively to allow counsel to ask  
3 questions.

4 We did allow counsel to ask questions at  
5 the Track 1 hearing. Those questions were short.  
6 They were focused. None of the parties took more than  
7 30 minutes. And we certainly would envision if it  
8 were sent to the parties, to ask some questions  
9 relatively short, relatively focused on those areas  
10 that I just addressed.

11 Are there any questions with regard to  
12 what I've just gone through from Entergy?

13 MR. BESSETTE: No, Your Honor. Thank you.

14 CHAIRMAN McDADE: From the staff?

15 MR. HARRIS: No, Your Honor. Thank you.

16 CHAIRMAN McDADE: New York?

17 MR. SIPOS: No, not now, Your Honor.

18 CHAIRMAN McDADE: Riverkeeper?

19 MS. BRANCATO: No, thank you.

20 CHAIRMAN McDADE: Okay. Thank you. Okay.

21 Dr. Hiser, some -- and basically, you know, one of our  
22 purposes also in addition to clarify sometimes is to  
23 summarize, you know, so we have in one place in the  
24 record what perhaps in the exhibits and the testimony  
25 is spread out over a relatively long period of time.

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1           And nothing that I say is evidence. It's  
2           only something that you say is evidence, but sometimes  
3           I'll ask a question, I'll sort of summarize and ask  
4           you whether or not it accurately reflects the position  
5           of the NRC staff so that it's on the record.

6           And then it is your testimony, you're the  
7           one who's swearing to it under oath, because I'm not  
8           under oath, and you are in a much better position to  
9           speak with confidence about what the NRC's position is  
10          than am I.

11          Okay. That said, is it the position of  
12          the NRC staff that license commitments made as part of  
13          the license renewal are part of the CLB and are  
14          enforceable under the ongoing oversight process  
15          established by Part 50, specifically 10 CFR 54.33? Is  
16          that something that you feel --

17          DR. HISER: I would just need to review  
18          54.33, Your Honor.

19          CHAIRMAN McDADE: Okay. Let's strike the  
20          particular citation. Is it the general view without  
21          getting into the legal citation, that these license  
22          commitments become part of the CLB?

23          DR. HISER: As incorporated -- in  
24          particular as incorporated through a license condition  
25          in the UFSAR, they are.

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1 CHAIRMAN McDADE: Okay. Now, most license  
2 commitments are captured in the FSAR, the Final Safety  
3 Analysis Report. Some are made as license conditions  
4 due to high regulatory or safety significance,  
5 correct?

6 DR. HISER: Yes, that's correct.

7 CHAIRMAN McDADE: Okay. And there are  
8 also others that I believe are referred to as  
9 regulatory commitments; is that correct?

10 DR. HISER: Within the context of license  
11 renewal, I don't --

12 CHAIRMAN McDADE: Yes.

13 DR. HISER: -- believe we use that  
14 terminology. We have -- applicants make commitments  
15 that are -- would be incorporated in the UFSAR. And  
16 those are the only commitments that are -- pertain to  
17 license renewal.

18 CHAIRMAN McDADE: Okay. In this  
19 particular instance we've got -- we have commitments  
20 30, 41, 42, 43, 44 and 49. Which category do these  
21 commitments fall in?

22 DR. HISER: Those would be under the  
23 license renewal commitment that would be incorporated  
24 in the UFSAR that once the license is -- renewed  
25 license is issued for the plant, then that would

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1 become a part of the CLB for the plant.

2 So, each of those commitments would be  
3 included within the discussion that we had several  
4 questions ago.

5 CHAIRMAN McDADE: Okay. Now, some of  
6 these commitments are ongoing, for example, such as  
7 Commitment 30. And others are commitments that are  
8 completed and then they can be closed; is that  
9 correct?

10 DR. HISER: Yes, that's correct.

11 CHAIRMAN McDADE: Okay. Commitment 43 and  
12 49, the technical analysis for IP3, is that complete?

13 DR. HISER: If I can just review records  
14 for a moment?

15 CHAIRMAN McDADE: Okay. As I understand  
16 it, there were two, you know, with regard to IP3.  
17 There's a question of it being complete with regard to  
18 IP3. there's an indication that Entergy will close  
19 the commitment for IP3 prior to the PEO. And I'm just  
20 trying to get what the status is as far as the  
21 completion of the commitment with regard to IP3.

22 DR. HISER: If you could repeat the  
23 commitment numbers.

24 CHAIRMAN McDADE: These have to do with  
25 Commitments 43 and 49. I believe they're addressed in

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1 the Entergy answer -- testimony -- well --

2 DR. HISER: That is my understanding. For  
3 IP2, those are closed. For IP3, they are still open.

4 CHAIRMAN McDADE: Okay. And what does  
5 that mean in this particular context that Entergy will  
6 close the commitments? What still needs to be done in  
7 order to close the commitments?

8 DR. HISER: What is needed -- actually,  
9 closure may not be the correct work, but really  
10 completion of the action that's specified in the  
11 commitment is what would be necessary for the  
12 applicant to be able to state that they had fulfilled  
13 the commitment. So, whatever action is specified  
14 would need to be completed.

15 CHAIRMAN McDADE: Okay.

16 JUDGE WARDWELL: While you're looking, may  
17 I ask Entergy under your testimony, I think it was  
18 Answer 113, Page 69 through 70, you state that the  
19 limiting location reviews required by Commitments 43  
20 and 49 have been completed for both IP2 and 3; is that  
21 correct?

22 MR. AZEVEDO: This is Nelson Azevedo for  
23 Entergy. That is correct, Your Honor.

24 JUDGE WARDWELL: So, in your position as  
25 far as your position is concerned, what is left to be

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1 done in regards to closing out 43 and 49?

2 MR. AZEVEDO: So, after we closed it for  
3 Unit 2, there's still some calculations that need to  
4 be completed. And those have been completed and  
5 they've been reviewed. They've been -- it was part of  
6 the NRC onsite audit back, I believe, in August. So,  
7 but those are complete.

8 JUDGE WARDWELL: Is there any reason why  
9 those particular limiting locations weren't identified  
10 as part of your initial application rather than have  
11 to be put off as a commitment? Because if we had run  
12 our hearings at any reasonable amount of schedule,  
13 they would still be outstanding.

14 MR. AZEVEDO: Well, you know, the only  
15 thing I'd say is these calculations are extensive  
16 calculations and they took time and we just didn't  
17 feel that we needed to complete the Unit 3 portion  
18 when we completed the Unit 2 portion.

19 So, the Unit 3 portion was extended beyond  
20 the Unit 2 portion. That's why they were still open,  
21 but again they were completed early this year and the  
22 commitments are closed.

23 JUDGE WARDWELL: Okay. Thank you.

24 MR. DOLANSKY: This is Bob Dolansky for  
25 Entergy. Judge McDade, you had mentioned earlier

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1 Commitment 30 you thought was open. I believe  
2 Commitment 30 is complete.

3 CHAIRMAN McDADE: Well, Commitment 30 is  
4 ongoing; is it not? It has continuing obligations.  
5 It's been accepted by the NRC staff, and the NRC staff  
6 has determined that it provides adequate assurance and  
7 there are actions that need to be continually done  
8 over the course of the period of extended operation in  
9 the event the license is granted, correct?

10 MR. DOLANSKY: You are correct. We closed  
11 it.

12 CHAIRMAN McDADE: Okay. And compliance  
13 with Contention 30 then would be monitored, as you  
14 indicated earlier, Dr. Hiser, under the FSAR and/or  
15 the --

16 DR. HISER: Actually, I would say that  
17 that item is completed. This is the original  
18 commitment made in the original application regarding  
19 the reactor vessel internals aging management.

20 With the submission of the AMP by the  
21 applicant and the inspection plan, then that  
22 effectively completed this commitment. So, we would  
23 consider that to be complete.

24 CHAIRMAN McDADE: But the commitment also  
25 includes then doing what is in the AMP that was

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1 submitted. You will monitor compliance. It envisions  
2 various actions will be taken over the next 20 years.

3 DR. HISER: I guess the way that I would  
4 interpret the commitment when it says "evaluate and  
5 implement the results," I think the development of the  
6 AMP, the development of the inspection plan fulfilled  
7 the commitment and implementation of the program  
8 inspections, analyses, et cetera, is just a part of  
9 implementation then of the AMP. So, I think from my  
10 personal perspective, I would consider 30 to be  
11 completed.

12 CHAIRMAN McDADE: Okay, but it is now part  
13 of the FSAR, correct?

14 DR. HISER: It is a part of the FSAR that  
15 would be identified as being completed. And this  
16 happens many times. As we review applications and  
17 applicants make commitments, sometimes they're  
18 completed before it becomes a part of the FSAR.

19 MR. COX: Judge McDade, I'd like to  
20 clarify that also. This is Alan Cox for Entergy. The  
21 commitment was to submit the inspection plan and the  
22 program. That was done.

23 That program has been incorporated into  
24 the FSAR supplement. So, in that sense it will be an  
25 ongoing commitment. It's now part of the FSAR that's

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1 described there. Any changes to that will be done  
2 under 5059. So, in essence, that's how that will be  
3 controlled going forward.

4 MR. TURK: Your Honor, this is Sherwin  
5 Turk.

6 CHAIRMAN McDADE:: Yes, Mr. Turk.

7 MR. TURK: Just as a point of information  
8 if we're looking at the SER supplement Number 2 where  
9 there is a list of the commitments and the status as  
10 of the time of the --

11 CHAIRMAN McDADE: Yes.

12 MR. TURK: -- SER 2 issuance, you'll note  
13 that there's a date of December 15 -- or December 12,  
14 2015, for IP3. That's the date that the Unit would --  
15 the original license would expire and that would then  
16 be going into the period of time to renewal until a  
17 decision is made by the NRC as to whether license  
18 renewal should be issued.

19 There were some recent correspondence from  
20 Entergy that it might be worthwhile to note at this  
21 point. Entergy, as you know, for Unit 2 sent in a  
22 status report before Unit 2 entered the period of time  
23 to renewal. And at that time they indicated that the  
24 license commitments had been implemented for Unit 2.

25 There was also recent correspondence

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1 regarding Unit 3. It may be that it's important for  
2 the witnesses to explain to you what has happened with  
3 regard to Unit 3 so that you understand the status  
4 currently.

5 CHAIRMAN McDADE: Okay. Thank you, Mr.  
6 Turk.

7 Are you prepared to do that, Dr. Hiser, or  
8 --

9 MR. TURK: Or perhaps the Entergy  
10 witnesses could address that, Your Honor.

11 MR. STROSNIDER: this is Jack Strosnider  
12 for Entergy and I'm familiar with some of what's been  
13 referred to. And I don't know that these are exhibits  
14 on the docket, but in the case of Unit 2 as an example  
15 what Entergy committed to do, two things.

16 One was to submit a letter to NRC  
17 confirming complete implementation of Unit 2 license  
18 renewal commitments required to be implemented prior  
19 to entering the period of extended operation. And the  
20 date for that to be completed was August 2013.

21 The second commitment was to modify the  
22 Unit 2 updated Final Safety Analysis Report,  
23 incorporate Unit 2 materials set forth in Appendix A  
24 of the application, and develop a new appendix into  
25 the Unit 2 FSAR, as well as updating correspondence

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1 sections of the UFSAR with new or modified information  
2 programs and transmit a letter to NRC confirming that  
3 that had been completed. The completion date that was  
4 established for that was September 28, 2013.

5 So, essentially this would confirm  
6 completion of the commitments that were to be  
7 completed before entering the period of extended  
8 operation and to put into the updated FSAR those  
9 commitments that will be ongoing throughout that  
10 period of extended operation, which, as was noted,  
11 would put them under the control of 5059.

12 That's in an August 19, 2013 letter to --  
13 actually, this is to Entergy from the NRC, but I think  
14 what was being referred to is that's the general  
15 philosophy of how this -- how these commitments are  
16 managed in terms of being completed before entering  
17 the period and what needs to be continued during the  
18 period of operation -- extended operation.

19 MR. COX: This is Alan Cox again. That's  
20 correct and that was a description of what was agreed  
21 upon for IP2. Similar actions are being done for IP3  
22 prior to their PEO, which begins in December.

23 CHAIRMAN McDADE: Okay. Thank you, Mr.  
24 Cox. Let me move on to Entergy. Can you explain what  
25 peak editing under the WESTEMS system is, and explain

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1 why and how it is done, you know, perhaps specifically  
2 addressing with regard to the pressure spray nozzle  
3 evaluation for IP2?

4 MR. GRAY: This is Mark Gray for Entergy.  
5 This is a technique that is employed in the analysis.  
6 It basically when you do a fatigue analysis whether it  
7 be with a computer program or manually, you have to  
8 select the maximum and minimum stress states to form  
9 your stress cycle pairs as dictated by the ASME code  
10 in MB 3222.4(e) (5).

11 The way that you do that has developed  
12 over the years. Different analysts use different  
13 techniques. In the computer program that was used,  
14 the program does an automated accounting for those  
15 peaks and valleys, maxima and minima.

16 When it does that, there are two different  
17 quantities of stress that are -- that have to be  
18 employed because of their effect on the elastic  
19 plastic penalty factor, as well as the total stresses  
20 in the analysis.

21 So, the program since it's an automated  
22 approach, is developed as a tool for the engineer to  
23 use. And in that regard, it will select more -- it  
24 can potentially select more peaks and valleys than are  
25 really needed for the evaluation.

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1           In the practical application of the  
2 program when those peaks and valleys are reviewed, the  
3 analyst can then, if needed, identify those times that  
4 are redundant with others.

5           Typical example. If the analyst defines  
6 his transient for a heat-up, it goes from a stress-  
7 free condition to some stress state at the end of the  
8 transient. For a cool-down, you do just the opposite.

9           So, the end of the heat-up, a stress  
10 state, is the same as the beginning of the cool-down.  
11 Well, the program doesn't know that those are really  
12 the same state. It will select them both.

13           So, the analyst has the option of leaving  
14 that conservatism in there and having more fatigue  
15 pairs than really required and leaving that  
16 conservatism and still have an acceptable answer, or  
17 the analyst has the option to do a re-analysis with  
18 those results eliminating the redundant stress states.  
19 This is what we call peak editing. So, he removed  
20 those states, re-analyzes and documents the final  
21 result.

22           CHAIRMAN McDADE: Okay. In your pre-file  
23 testimony, Dr. Lahey and Dr. Hopenfeld, you both  
24 address the issue of peak editing and had criticisms  
25 of it. In light of what Mr. Gray has just said, let

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1 me ask Dr. Lahey first, then Dr. Hopenfeld, Can you  
2 explain any continued concerns you have with the use  
3 of peak editing?

4 DR. LAHEY: Your Honor, I don't recall  
5 having expressed any concern about peak editing. I  
6 understand the process. I think if it's done by  
7 experienced analysts, there's nothing wrong with it.

8 CHAIRMAN McDADE: Okay. Dr. Hopenfeld.

9 DR. HOPENFELD: I feel the same, except  
10 one thing I do not understand, it was mentioned you  
11 see the Fen if you look at the data, shows that  
12 increases with the strain decreasing and it's a  
13 substantial change. So, what it says is really that  
14 during transients, the length of the transients, the  
15 strain may decrease.

16 Now, it's not clear how that was accounted  
17 or I couldn't tell without really going just from the  
18 description was provided. Maybe it was okay, maybe  
19 not, but I have no problem.

20 This is a standard procedure, and I  
21 mentioned before the pagoda or the raindrop procedure  
22 of how to put these things together and how to  
23 identify and count the transients. That aspect of it  
24 I'm not worried.

25 I do -- there is a lot of judgement in

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1 there. And what I do worry about in some of the  
2 expression I heard yesterday about that these things  
3 are in the code, about the Fen and so forth, that  
4 there -- if they rationalize that everything is in the  
5 code, it doesn't -- they can come up with any number.

6 I have no way of -- to determine what  
7 their uncertainties were, but the main thing is that  
8 I was concerned is, oh, I didn't understand how do  
9 they treat the effect of the Fen being increased with  
10 strain decreased.

11 CHAIRMAN McDADE: Okay. Thank you, Dr.  
12 Hopenfeld.

13 JUDGE WARDWELL: Just to make sure I  
14 understand this also, Dr. Lahey, do you agree that the  
15 term "peak editing" and "user intervention" are the  
16 same in this particular -- certainly in regards to  
17 Commitment -- I believe it's 44.

18 DR. LAHEY: It's my understanding, Your  
19 Honor, that the US NRC when they refer to user  
20 intervention, they're talking specifically about peak  
21 editing. When I use that term, it's more general.

22 It has to do with the injuring judgments  
23 and other things the analysts can do to the code.

24 JUDGE WARDWELL: Okay. Thank you. And,  
25 Entergy, is that your understanding also in regards to

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1 that for -- in regards to Commitment 44, the user  
2 intervention, if that term is seen as the same as peak  
3 editing?

4 MR. AZEVEDO: This is Nelson Azevedo, for  
5 Entergy. That's correct, Your Honor.

6 JUDGE WARDWELL: Thank you.

7 CHAIRMAN McDADE: With regard to  
8 Commitment 41 for the steam generators, there's an  
9 option either to redefine the pressure boundary, or to  
10 inspect the tube-to-tubesheet welds.

11 There was a process for License Amendment  
12 277 that has been completed. And with regard to the  
13 other unit, it has not been.

14 Can you explain briefly the sort of  
15 theoretical justification for taking the tube-to-  
16 tubesheet welds out of the definition of reactor  
17 boundary, pressure boundary, Entergy?

18 MR. DOLANSKY: This is Bob Dolansky with  
19 Entergy. First, just to clarify, that option is in  
20 Commitment 42, not 41.

21 CHAIRMAN McDADE: I'm sorry.

22 MR. DOLANSKY: So, that's called H star  
23 analysis. So, when we talk about the H star analysis,  
24 what that does is that takes the -- in very high level  
25 -- I'll just give a high-level overview. You have the

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1 tubesheet which is approximately 22 inches thick. And  
2 the tubes are inserted into the tubesheet.

3 They're rolled into the tubesheet, which  
4 means they're pressed up against the hole in the  
5 tubesheet. So, there's an interference fit. When  
6 it's manufactured, a little piece of the tube is left  
7 at the bottom of the tubesheet. That piece of tube is  
8 then welded to the tubesheet on the primary side.  
9 That makes the tube-to-tubesheet weld.

10 So, what H star does is it takes -- it  
11 does an analysis that shows that the -- under all  
12 accident-required conditions under current licensing  
13 basis loads and so forth, that no matter what happens  
14 seismic, you know, LOCA loads, shock loads, whatever  
15 you want to call it, that the tubes would not pull out  
16 even if that weld were not there.

17 So, by doing that, they determine how much  
18 of that tube you need inside the tubesheet to  
19 withstand all the required forces. And that's called  
20 your H star distance.

21 So, at IP2 we got the H star analysis  
22 done. And that basically determined using round  
23 numbers, approximately 19 inches from the top of the  
24 secondary side of the tubesheet, you go down 19  
25 inches, which leaves approximately three inches on the

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1 bottom, but you don't need that to maintain your  
2 pressure boundary.

3 So, we redefined the pressure boundary  
4 from the weld at -- on the primary side to  
5 approximately three inches up inside the tubesheet.

6 MR. AZEVEDO: Your Honor, this is Nelson  
7 Azevedo. Let me just add a little bit to what Mr.  
8 Dolansky just said.

9 In addition to the structural component to  
10 make sure the tube stays in place, the interference  
11 fit between the tube and the tubesheet hole also make  
12 sure that the leakage, if there is any leakage, is  
13 within acceptable limits. So, the interference fit  
14 there's two things; leakage, and provide the  
15 structural integrity for the tube.

16 MR. DOLANSKY: Right. And thank you,  
17 Nelson. This is Bob Dolansky again with Entergy. So,  
18 effectively what we've done is we've said that the  
19 bottom three inches of the tube could go away, could  
20 totally be gone and we would meet for both leakage and  
21 structural, we would meet all requirements under all  
22 accident conditions.

23 CHAIRMAN McDADE: Okay. Now, with regard  
24 to Indian Point 2 in September of 2014, there was a  
25 license amendment that was granted by the NRC.

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1           What is the current status with regard to  
2 Indian Point 3? You had the two options. One was to  
3 redefine the boundary. The other was to inspect the  
4 tube-to-tubesheet welds.

5           What's the current status?

6           MR. DOLANSKY: This is Bob Dolansky with  
7 Entergy. Commitment 42 is very, very specific. It  
8 was written in a very specific and clear way. So,  
9 under Option 1 analysis, IPEC will perform an  
10 analytical evaluation of the tube-to-tubesheet welds  
11 in order to establish a technical basis for either  
12 determining that the tubesheet cladding and welds are  
13 not susceptible to PWSCC, or redefining the pressure  
14 boundary in which the tube-to-tubesheet weld is no  
15 longer included and, therefore, is not required for  
16 the reactor coolant pressure boundary function.

17           So, that second part is what we did for  
18 Unit 2. And the last sentence, the redefinition of  
19 the reactor coolant pressure boundary must be approved  
20 by the NRC is a license amendment request, that's what  
21 we did with H star. We basically submitted that as a  
22 license amendment request. The staff reviewed it and  
23 approved it.

24           For IP3, our plan -- the plan for IP3 is  
25 to do the first part of Option 1, which is to

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1 establish a technical basis for determining that the  
2 tubesheet cladding and welds are not susceptible to  
3 PWSCC. So, that -- when we do that, that would not  
4 require the -- we don't have -- that would not be a  
5 license amendment request.

6 So, we would plan to do -- to determine  
7 that the tubesheet cladding welds at IP3 are not  
8 susceptible to PWSCC, and that's how we plan to  
9 address it for Unit 3.

10 CHAIRMAN McDADE: Okay, but the license  
11 amendment is not in effect for Unit 3 at this time.  
12 And the question is, at this time, you're indicating  
13 that you are required to and will pursue the technical  
14 justification for Option 1.

15 Where do we have reasonable assurance in  
16 the IP3 license renewal application at this time that  
17 we will -- that the tubesheet welds will continue to  
18 maintain their intended function?

19 We don't have the license amendment and we  
20 don't have the technical analysis completed at this  
21 time. So, if we're looking just at the IP3  
22 application for license renewal, where does the  
23 reasonable assurance come from?

24 MR. DOLANSKY: This is Bob Dolansky with  
25 Entergy. I believe our steam generator program

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1 provides the reasonable assurance that the steam  
2 generators are maintained in a manner that they can  
3 perform their required safety function.

4 CHAIRMAN McDADE: Okay, but we had a  
5 situation where as part of the license renewal the  
6 staff addressed questions to Entergy. And in  
7 response, Entergy suggested that they would do one of  
8 two things in order to answer the staff's concern in  
9 this regard. That they could either, as you did,  
10 apply for a license amendment establishing that this  
11 is not part of the pressure boundary and, therefore,  
12 does not present a safety issue, or provide the  
13 technical, you know, justification with regard to the  
14 tube-to-tubesheet welds.

15 Let me move -- Dr. Hiser, can you be of  
16 assistance on this?

17 DR. HISER: Yeah, I think -- this is Allen  
18 Hiser of the staff. I think if we looked at 54.29  
19 where it requires renewed license -- and I'll try to  
20 cut out a lot of the words -- renewed license may be  
21 issued if the Commission finds that actions have been  
22 identified and have been or will be taken with respect  
23 to managing the effects of aging with the  
24 implementation of this commitment and the  
25 implementation of that commitment within the UFSAR

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1 that then is controlled by 50.59 and through NRC  
2 inspections -- well, let me backup.

3 The imposition of the commitment and it  
4 being incorporated in the UFSAR is sufficient to  
5 provide the staff with reasonable assurance consistent  
6 with 54.29.

7 CHAIRMAN McDADE: And I guess where I'm  
8 hung up on, Dr. Hiser, is this: The concept provide  
9 technical justification, it sort of assumes that once  
10 you do the analysis, you may or may not be able to  
11 technically justify it.

12 If you haven't done the analysis yet, you  
13 can assume based on general knowledge that you will be  
14 able to do it. But it seems that the Agency was  
15 asking for Entergy to provide this technical  
16 justification and you haven't yet received that  
17 technical justification.

18 I mean, isn't it conceivable that the  
19 technical justification simply can't be provided?

20 DR. HISER: Well, the commitment has two  
21 pieces to it; Option 1, Option 2.

22 CHAIRMAN McDADE: Yes.

23 DR. HISER: If the applicant is unable to  
24 complete Option 1, whatever NRC approval is necessary,  
25 then Option 2 would become operative and they would be

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1 required to do the inspection consistent with the  
2 completion date for that commitment.

3 So, if the analysis is not necessary right  
4 now, it would be necessary that they demonstrate that  
5 they meet Option 1, or perform the inspections that  
6 are covered by Option 2.

7 CHAIRMAN McDADE: Okay. So, that brings  
8 us to the next question. We have the technical, I  
9 mean, the -- there are actually multiple options. One  
10 was changing, you know, the license amendment which  
11 they did for IP3, the technical justification or the  
12 inspections. So, let's get down to the inspections  
13 themselves and whether or not the inspections are  
14 capable of providing the reasonable insurance.

15 Dr. Duquette, you had issues with regard  
16 to the adequacy and the nature of the inspections and  
17 can you elaborate on that?

18 DR. DUQUETTE: Duquette, New York State.  
19 Yes, I am very positive about wanting to see a  
20 physical inspection of what's going on in the system.  
21 Everything I've seen indicates that there aren't any  
22 analyses that are available at least at the present  
23 time, or anything in the system that would make me  
24 feel comfortable with any kind of a paper analysis  
25 that would make me feel comfortable that you couldn't

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1 get stress corrosion cracking in the tube-to-tubesheet  
2 welds.

3 And so, I think the Option 2, which is the  
4 inspection, is the only one that makes any sense.

5 CHAIRMAN McDADE: Well, at this point, you  
6 know, one of the things that you raises is saying that  
7 there was not an adequate inspection technique.  
8 Entergy proposed to use and identify EVT1 as the  
9 inspection technique that they would use.

10 What criticisms do you have? Why would  
11 you think that EVT1 would not be adequate to  
12 accomplish that function?

13 DR. DUQUETTE: I thought I -- in my  
14 testimony, I'd have to go back and review it, but that  
15 there was no industry-accepted technique at the  
16 present time. I don't think I meant there was no  
17 adequate technique to do that inspection.

18 I think that there are physical methods to  
19 do the inspection. Today it's being done in other --  
20 in foreign steam generators, to my understanding. And  
21 so, I think there are techniques that could -- that  
22 can be used.

23 I didn't see in anything that was  
24 presented to me where Entergy or the NRC had indicated  
25 any specific technique, except for a statement that

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1 there are techniques that are available. I agree with  
2 that, but I would like to see what technique that they  
3 are going to use.

4 CHAIRMAN McDADE: Okay. Well, I believe  
5 in the testimony Entergy indicated that it would be  
6 EVT1. Am I correct there?

7 MR. DOLANSKY: Yes, you are correct. Our  
8 plan is to do an EVT1.

9 CHAIRMAN McDADE: Okay. And are you  
10 familiar with that inspection technique, Dr. Duquette?

11 DR. DUQUETTE: I don't think I am.

12 CHAIRMAN McDADE: Okay. Mr. Dolansky, Can  
13 you briefly explain? I know we had it the other day.  
14 We had some detailed discussion of EVT1, but could you  
15 just sort of briefly explain the method?

16 MR. DOLANSKY: Yes. EVT -- this is Bob  
17 Dolansky with Entergy. Again, just to start at the  
18 same point, in Contention 25 we went in some detail  
19 about performing an EVT1 to inspect for stress  
20 corrosion cracking.

21 So, I think it's -- I would say that it's  
22 understood through the industry that that's an  
23 acceptable method, but an EVT1 is a very detailed,  
24 close-up, visual examination. It uses a character  
25 card.

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1           When you calibrate the EVT1, you have to  
2 do a character card. I believe it's 0.044-inch height  
3 with open case letters such as an O or a C or an E,  
4 not something with like a P or a Q that has a tail  
5 that would make it a little easier to see.

6           You have to be within a certain distance.  
7 Off the top of my head, I don't remember all the  
8 details. You have to be within a certain distance and  
9 there's a certain scan speed that you have to  
10 maintain. And it's -- basically an EVT1 is an  
11 accepted approach to look for cracking.

12           Does that answer the -- I think that's  
13 relatively high level. If anybody else remembers or  
14 wants to add anything --

15           CHAIRMAN McDADE: No, I think that should  
16 be sufficient. Based on what Mr. Dolansky just said,  
17 Dr. Duquette, it's my understanding that the purpose  
18 of the inspection is to detect cracking.

19           Is there any reason to believe that that  
20 method would not be sufficient to detect cracking?

21           DR. DUQUETTE: No, I think it would be --  
22 it would detect cracking. And as I indicated, I  
23 think, a few minutes ago, I would feel far more  
24 comfortable with a physical inspection, which is what  
25 that technique implies and probably would work just

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1 fine.

2 CHAIRMAN McDADE: Okay. Now, with regard  
3 to once -- and I shouldn't say "once," rather if  
4 cracking is detected, there is specific actions to be  
5 taken, correct?

6 MR. DOLANSKY: Any cracking that were  
7 detected would be put into our corrective action  
8 program, absolutely, yes.

9 DR. DUQUETTE: I'm sorry, I didn't hear  
10 the answer.

11 MR. DOLANSKY: This is Bob Dolansky with  
12 Entergy.

13 DR. DUQUETTE: Duquette, I didn't hear the  
14 answer to that.

15 MR. DOLANSKY: If any cracking were  
16 detected, it would be put into the Entergy corrective  
17 action program just like we do in Section 11 or vessel  
18 internals, you know, New York State 25.

19 We go out and perform inspections on an  
20 EVT1. If we found anything, it would be put into our  
21 corrective action program.

22 CHAIRMAN McDADE: Okay. And that -- and  
23 I believe there's reference to SPR-LR Revision 2,  
24 which is New York State 161, that the corrective  
25 actions would need to be consistent with that; am I

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1 correct?

2 MR. DOLANSKY: I don't know the SPR.  
3 Could we bring that up and I could look at it? I'm  
4 not sure what --

5 CHAIRMAN McDADE: New York 161.

6 (Pause.)

7 MR. COX: Your Honor, this is Alan Cox for  
8 Entergy.

9 CHAIRMAN McDADE: Yes.

10 MR. COX: The Standard Review Plan for  
11 license renewal is what you've called up here. And,  
12 again, that's the NRC's guide for reviewing license  
13 renewal applications.

14 There are discussions in there about the  
15 corrective action program. I'm not sure if that's  
16 what you're referring to, but it is the same  
17 corrective action program that Mr. Dolansky referred  
18 to in saying that the inspection results would be  
19 entered into that program and evaluated under that  
20 program.

21 CHAIRMAN McDADE: And I guess my question  
22 was that that corrective action program of necessity  
23 needs to be consistent with the provisions of SPR-LR  
24 Revision 2. And specifically 8.1-6 to 8.1-7.

25 Dr. Hiser, is that correct?

1 DR. HISER: Yes, that's correct.

2 CHAIRMAN McDADE: Okay. Let me go on to  
3 something else. Talking about the -- we've got the  
4 tube-to-tubesheet welds. We're also talking about the  
5 divider plate.

6 Can you explain very briefly what the  
7 divider plate is?

8 MR. DOLANSKY: This is Bob Dolansky with  
9 Entergy. Can we go to the Entergy pre-file testimony?  
10 I'll give you the page.

11 CHAIRMAN McDADE: I believe maybe Answer  
12 130 you discuss it briefly.

13 MR. DOLANSKY: Yes, sir.

14 MR. COX: That's Entergy 698 would be the  
15 exhibit number.

16 MR. DOLANSKY: We'll start on Page 81 and  
17 then go to Page 84. So, if we can pull up Page 81 --

18 CHAIRMAN McDADE: Yeah, I'm not looking to  
19 have you go through the entire several pages. Just  
20 very briefly what is the divider plate?

21 MR. DOLANSKY: Okay. Basically -- this is  
22 Bob Dolansky with Entergy. When reactor coolant comes  
23 in from the reactor, it's -- the hottest comes from  
24 the reactor, goes through the steam generator at the  
25 large U-tube -- through the tubes, which are large U-

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1 tubes.

2 Comes in what's called the hot leg, the  
3 channel head, goes up through the tube. As it's going  
4 through the tube, it transfers the heat to the  
5 secondary feedwater and then it goes out the cold leg  
6 side of the steam generator.

7 So, hot water comes in the channel head,  
8 goes through the tube and comes out on the cold side.  
9 There's a divider plate in the middle that just keeps  
10 those two sides separate in the channel head.

11 CHAIRMAN McDADE: Okay. And it's not part  
12 of the coolant system pressure boundary, is it?

13 MR. DOLANSKY: That is correct. And, in  
14 fact, at IP3 there's a little thing called a mouse  
15 hole. There's actually a hole in the bottom of the  
16 divider plate to allow some -- when we shut down and  
17 drain, it allows water to communicate between both  
18 sides.

19 CHAIRMAN McDADE: And why -- what is it  
20 made out of?

21 MR. DOLANSKY: It's made out of --

22 CHAIRMAN McDADE: Is it Alloy 600 or Alloy  
23 690 or --

24 MR. DOLANSKY: We have it in our  
25 testimony. I just have to find it. Give me one

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1 moment, please, Your Honor.

2 CHAIRMAN McDADE: Well, let me follow. Is  
3 it a material that's particularly susceptible to  
4 cracking?

5 MR. DOLANSKY: Yes, it's a material that  
6 is susceptible to PWSCC. Yes, Your Honor. Bob  
7 Dolansky with Entergy.

8 CHAIRMAN McDADE: Okay. And what are the  
9 implications of cracking in the divider plate?

10 MR. DOLANSKY: Um --

11 CHAIRMAN McDADE: You indicated that it's  
12 not part of the pressure boundary and there actually  
13 is in it, you know, designed a hole.

14 If there is a crack in the divider plate,  
15 what consequence is that to the operation of the  
16 reactor -- in the steam generator, rather?

17 MR. AZEVEDO: Your Honor, this is Nelson  
18 Azevedo. Maybe I can start and some of my colleagues  
19 can jump in.

20 It depends if the crack is big enough, it  
21 could allow coolant to bypass the tubes themselves.  
22 So, the water will come in through the hot leg side  
23 and go out the cold leg side without going through the  
24 tubes.

25 So, if you imagine after a design basis

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1 accident, you wouldn't be able to remove heat from the  
2 primary side. If the divider plate was gone, then the  
3 water just bypassed the tubes. So, you lose that  
4 ability.

5 CHAIRMAN McDADE: Okay. So, although it  
6 does not -- it is not part of the pressure boundary,  
7 it, nevertheless, plays a significant safety function.

8 MR. AZEVEDO: It plays a function. I'm  
9 not sure if it's a significant safety function.  
10 Again, maybe somebody can jump in.

11 MR. STROSNIDER: This is Jack Strosnider  
12 for Entergy. So, I don't have the reference right at  
13 hand, but the Electric Power Research Institute  
14 actually has evaluated that condition.

15 They postulated a large thru-wall crack in  
16 the divider plate, which would allow this  
17 communication between the hot leg -- between the hot  
18 side of the channel head and the cold side.

19 And they looked at that from an accident  
20 perspective and concluded that it would not -- that  
21 you could still meet all the design basis accident  
22 conditions that you could -- that you could manage  
23 those appropriately even with a large crack in that  
24 component.

25 CHAIRMAN McDADE: Thank you. Dr.

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1 Hopenfeld.

2 DR. HOPENFELD: Yes. With regard to the  
3 plant, the plate may not play a very -- as EPRI said,  
4 it may not play a very important role. It doesn't  
5 have an important role in the design basis accident.  
6 However, there is a certain sequence of events,  
7 especially a station -- after a station -- for a  
8 station blackout.

9 You get into a situation that's called  
10 "high and dry." And you get into the severe accident,  
11 but I don't want to get in too far. What happens  
12 there, we depend on cooling the core by natural  
13 circulation.

14 If that plate is not there, which is not  
15 going to be there especially if the hole is very big  
16 or the whole thing is gone, so you would have all the  
17 coolant bypassing the tubes up and you are not going  
18 to be removing the heat from the core. So, there is  
19 a concern, but it's during severe accidents.

20 However, we have spent -- or Westinghouse  
21 spent huge amount of money. This is not a trivial  
22 case even though it's a severe accident, and we have  
23 spent huge amount of studying on this. And all those  
24 studies are -- rely on 1/7th scale tests that were  
25 done at Westinghouse somewhere in the '70s.

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1           There have been I don't know how many  
2 studies and reviews over that. So, all the  
3 information we have is based on those studies where  
4 the plate was there.

5           Now, they remove the plate. So, what you  
6 have done something to the plate. Basically what I  
7 mean, it's being removed because it's not functioning  
8 anymore. Now, you've done something that you affect  
9 the consequence of what's going to happen during  
10 severe accidents.

11           Now, I don't know what the legalities are.  
12 But if I remember correctly, there are some things --  
13 if you do something to the plant that affects the  
14 severe accident, you have to explain it. Now, what  
15 EPRI has done, it just didn't carry it far enough.

16           What they have done is okay for normal  
17 operation, just small break LOCAs, but it's not  
18 correct, due to a -- or a situation where you get into  
19 the natural circulation.

20           Mr. Strosnider knows exactly what I'm  
21 talking about, because we discussed EPRI over the  
22 years.

23           MR. STROSNIDER: Your Honor.

24           CHAIRMAN McDADE: Just before you --

25           MR. STROSNIDER: I'm sorry.

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1 CHAIRMAN McDADE: Dr. Lahey.

2 DR. LAHEY: Richard Lahey, New York. I  
3 also reviewed the EPRI report and --

4 JUDGE WARDWELL: Excuse me. Is this the  
5 2014 report I saw references to in this commitment  
6 testimony -- or really it was a statement of position  
7 by Entergy.

8 DR. LAHEY: I have to look back at --

9 MR. O'NEILL: Your Honor, this is Mr.  
10 O'Neill for Entergy. Before we delve any further into  
11 the details of the EPRI report, I think the witnesses  
12 are referring to the October 2014 EPRI report that's  
13 New York State exhibit NYSR0544A through D. I just  
14 want to remind the Board and the parties that that is  
15 a proprietary document.

16 JUDGE WARDWELL: And, Mr. Strosnider, is  
17 that your belief, the report you were referring to?

18 MR. STROSNIDER: Jack Strosnider for  
19 Entergy. Yes, I do believe that is the report.

20 DR. LAHEY: So, since it's proprietary,  
21 does that mean I can't discuss it or --

22 CHAIRMAN McDADE: Right now, I mean, as  
23 far as the details go. Discuss what your concerns  
24 are.

25 DR. LAHEY: All right. My concerns are

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1 always focused on the safety significance. They did  
2 an analysis of a thru crack and came up with a flow  
3 area, which was relatively small in terms of flow  
4 bypass from one side to the other through the plate.

5 However, when they looked at the accident,  
6 the largest load that you could put on it, it appeared  
7 that what they did is took the high pressure on one  
8 side and atmospheric pressure on the other, which is  
9 what you would get instantaneously with a loss of  
10 coolant accident, and then concluded it could  
11 withstand that.

12 It was not at all clear that they did it  
13 as an impulsive load. In fact, it appears they did it  
14 as a static load. And from my previous testimony, you  
15 know, there's a huge difference between hitting  
16 something with a sledgehammer and pushing your hand  
17 against it with the same force.

18 So, it's not at all clear to me that they  
19 can't break out the welds and blow out the plate  
20 completely. It's a fairly thick plate. It's a couple  
21 inches thick. And so, the analysis needs to be done.

22 I asked about it at my testimony. The  
23 response I got back was not much. I mean, it did not  
24 clarify that issue, in my mind, but I -- the safety  
25 significance of it if you lose that plate or

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1 significantly create a bypass between one side of the  
2 lower plenum of the steam generator and the other, you  
3 no longer can use that generator to steam off to  
4 remove energy.

5 So, if at the same time -- if the event  
6 which causes all this would be a seismic event, for  
7 example, and you lose offsite power and then you lose  
8 your steaming capability of a steam generator, you  
9 have a big problem. You really need the steam  
10 generators to allow for the ability of the operators  
11 to bring in water separately to cool the core.

12 CHAIRMAN McDADE: Okay. Is it this sort  
13 of synthesis of your opinion that it is ill-advised  
14 for Entergy to rely on the EPRI report?

15 DR. LAHEY: If my understanding of the  
16 EPRI report is incorrect and they have actually done  
17 a shock analysis and they have concluded based on  
18 those impulsive loads that it can withstand it, then  
19 I'm okay, but I don't see that.

20 I mean, we talked about the analysis  
21 yesterday, I think it was, which had to do with the  
22 shock loads on the bolts. The baffle former bolts.  
23 And those were not the biggest shock loads you can get  
24 by far, because of the way they did it.

25 So, it's a question what did they really

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1 do? And even though we have raised that in our  
2 previous testimony, there has really been no response.  
3 So, as far as I'm concerned, you can't really rely on  
4 it until you know in detail what was done, what code  
5 was used, what break time was used, how strong it was.  
6 Is it the maximum strength, or not?

7 MR. STROSNIDER: Your Honor, Jack  
8 Strosnider for Entergy.

9 CHAIRMAN McDADE: Yes.

10 MR. STROSNIDER: Two comments that I'm  
11 comfortable I can make without getting into  
12 proprietary aspects of this. The first is with regard  
13 to Dr. Hopenfeld's discussion about severe accidents,  
14 I'll point out severe accidents are also known as  
15 beyond-design basis accidents, meaning that they are  
16 not part of the current licensing basis. They are  
17 used in probabilistic risk assessments that go beyond  
18 the current licensing basis and beyond the design  
19 basis accidents that need to be analyzed under Part 54  
20 under license renewal. So, they're really not within  
21 the scope of this discussion.

22 With regard to the EPRI analysis, the one  
23 thing I would point out is that that analysis was done  
24 using the design basis loads. And I think I can say  
25 that with, you know, that's pretty well known.

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1                   And, you know, that document is available  
2                   for review. And if Dr. Lahey has specific comments on  
3                   the analysis, which is available for him to look at,  
4                   then we would want to hear those specific comments,  
5                   but, you know, big picture they analyzed the design  
6                   basis accidents in that evaluation. And that's what  
7                   is, you know, required under Part 54 for license  
8                   renewals is to maintain that design basis. So, that's  
9                   what they did all of this, Your Honor, in the interest  
10                  of safety.

11                  CHAIRMAN McDADE: Okay. Thank you. Dr.  
12                  Lahey.

13                  DR. LAHEY: Yeah, I -- certainly I did  
14                  review this document. I have expressed this concern.  
15                  I have gotten no feedback on what was actually done.  
16                  And as you know, it -- when you say you did a design  
17                  basis accident, it matters a lot what sort of  
18                  technique you used for it.

19                  If you used a code which is a large-volume  
20                  standard loss of coolant accident code, you certainly  
21                  do not get the kind of impulsive loads that will  
22                  really occur.

23                  If you use a separate code like the  
24                  Westinghouse code we talked about yesterday and you  
25                  apply the right break size and the right break opening

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1 time, you can get that resolved.

2 No details were given. In fact, it looked  
3 from reading the report, like it was sort of a static  
4 load or a quasi-static load.

5 MR. LOTT: Your Honor, this is Randy Lott  
6 for Entergy. I believe that the study that Dr. Lahey  
7 is referring to is what's called the EPRI Phase 2  
8 report, which, again, I believe is Entergy 523.

9 I'm trying -- I'm struggling to say, I  
10 mean, I'm familiar with the report in some -- to some  
11 extent and clearly it was taken, first of all, to  
12 evaluate the purely hypothetical case of a complete  
13 severing of the weld at the top of the -- between the  
14 tubesheet and the divider plate.

15 There's other testimony that we filed that  
16 indicates that, A, this is a highly improbable  
17 circumstance and that we do not predict that a  
18 complete cracking of this would grow along that  
19 interface.

20 Then as was suggested, it was looked at  
21 what the effect of opening that gap would be on the  
22 leakage through the divider plate, and found that that  
23 was acceptable in all cases.

24 The people that do that study also did  
25 consider LOCA forces on the failed -- the divider

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1 plate with the failed weld. And what they determined  
2 was that the failure itself actually made the stresses  
3 on the -- that would be afforded from the LOCA  
4 analysis when it was done, would reduce them due to a  
5 smaller Delta-P across the plate and also due to  
6 increased flexibility in the system.

7 So, when they looked at the analysis, they  
8 said we do not need to redo the current licensing  
9 basis analysis, because what we've already done in the  
10 current license base remains the controlling  
11 condition, the limiting condition.

12 So, therefore, as Dr. Lahey -- as we've  
13 just demonstrated in our previous testimony on the  
14 baffle bolts of other, we certainly understand the way  
15 that these LOCA forces are applied in these  
16 conditions. And the study simply concluded that there  
17 was no need to go through that entire process.

18 Again, it was just a purely hypothetical  
19 study in the first place, because we think that the  
20 failure of this weld is highly unlikely. And I'll  
21 also suggest that this is a massive structure and it's  
22 not going to simply disappear. And there's no  
23 evidence that it will simply disappear. So, there's  
24 no -- hardly any place for it to go.

25 MR. DOLANSKY: This is Bob --

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1 CHAIRMAN McDADE: Okay. Thank you, Dr.  
2 Lott.

3 MR. STROSNIDER: Jack Strosnider from  
4 Entergy. Just to add one more --

5 CHAIRMAN McDADE: Before you --

6 MR. STROSNIDER: Sorry.

7 CHAIRMAN McDADE: Mr. Dolansky first.

8 MR. DOLANSKY: Yes. Thank you, Judge.  
9 this is Bob Dolansky with Entergy. I just want to  
10 kind of take a step back. We're starting to talk  
11 about the loads and all that stuff.

12 EPRI report has many, you know, contains  
13 a lot of information. To me, the really important  
14 part of the EPRI report is that they've looked at the  
15 possibility of this cracking occurring and said it  
16 can't.

17 This issue was originally driven from  
18 foreign operating experience. French plants had  
19 cracking. They saw the cracking. They did  
20 significant amount of work, research and destructive  
21 testing on these components after they were removed.

22 Additionally, EPRI did a lot of work to --  
23 and the result of that work is that this is not a  
24 concern. The cracking is not a concern. We can, you  
25 know, go further down and discuss the, you know, the

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1 evaluations on whether it will fail or not and all  
2 that stuff, but to me the real crux of the matter is,  
3 and what New York State 544A really talks about is  
4 that this is not a concern, because this isn't going  
5 to happen.

6 And what we thought was happening in  
7 France when the issue was first raised, the more  
8 research we did and the more destructive testing they  
9 actually did on some of the steam generators that had  
10 this that they took out of service and actually  
11 destructively removed the metal and did the testing,  
12 it turned out that there was no cracking going through  
13 the wall. It was just in a very shallow, cold work  
14 surface. So, to me, that's the whole issue.

15 And as a slight aside, I just -- Dr. Lahey  
16 says that he's concerned about safety and I understand  
17 that. And I just want to put it on the record that  
18 I'm very concerned about safety, too. I work at that  
19 plant every day.

20 CHAIRMAN McDADE: Okay. I think that's --

21 MR. DOLANSKY: I care about safety a great  
22 deal. And to imply that he's worried about it because  
23 of safety, and I'm not worried about safety, that's  
24 not the case. I care about safety as much as anybody  
25 else and I want to make sure that we do the safe thing

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1 at the plant.

2 CHAIRMAN McDADE: Okay. I certainly have  
3 not interpreted the testimony of Dr. Lahey in any way  
4 as questioning the commitment to safety on the part of  
5 Entergy as a company or on the witnesses who have  
6 presented testimony on behalf of Entergy. The  
7 question just simply is interpreting the data, whether  
8 or not the data supports the thesis that you have.

9 And in this regard, and I think it was  
10 clear from the record and I didn't ask a lot of  
11 questions about it, of what Entergy views as the  
12 significance of that report.

13 And what I wanted to just make sure I  
14 understood is why Dr. Lahey believed that reliance on  
15 that report is, in his view, not warranted, as I  
16 understand it, based on a lack of data in the report  
17 with regard to the shock loads that were present and  
18 the -- some of the methods that were used; is that  
19 correct, Dr. Lahey?

20 DR. LAHEY: Yeah. I, you know, all these  
21 comments are things you can see in the report. That  
22 doesn't really answer my primary concern. What I'm  
23 interested in is when they say it can survive LOCA  
24 loads.

25 How did they get those LOCA loads? If you

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1 don't do it right, you can say you ran a LOCA, but the  
2 pressure difference versus time is not impulsive, you  
3 know. It's a different sort of loading of the plate.  
4 And a two-inch plate with secure welds should handle  
5 that very nice.

6 If you do a shock load, however, that's  
7 what remains to be done. And if -- then if the welds  
8 are weakened by stress corrosion cracking and things  
9 of this nature, that's an additional thing that needs  
10 to be studied.

11 I haven't seen that data. So, until I see  
12 that data, I can't be really comfortable that that's  
13 been done.

14 CHAIRMAN McDADE: Okay. Do you have any  
15 follow-up on this?

16 JUDGE WARDWELL: Not really.

17 MR. STROSNIDER: This is Jack Strosnider  
18 for Entergy. The one other comment I wanted to make  
19 earlier very briefly is when you talk about the  
20 hypothetical problem that Dr. Lott described in terms  
21 of the size of crack that was evaluated, that crack  
22 would be easily visible for anybody doing any kind of  
23 work in the channel head. It wouldn't require any of  
24 these advanced methods. It's a very, very large  
25 crack.

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1           So, just to reemphasize, very unlikely  
2           it's going to happen in the first place. If a crack  
3           did form, it would be seen during inspections well  
4           before it got to the size that's been evaluated. So,  
5           I just wanted to give that practical perspective on  
6           this.

7                   CHAIRMAN McDADE: Okay. Thank you. I'd  
8           like to move on to some issues with regard to the  
9           timing of the inspections with regard to Indian Point  
10          2 within ten years of the PEO, with Indian Point 3 at  
11          the first refueling outage. These generators were put  
12          into service, Indian Point 2 in 2000, Indian Point 3  
13          in 1989.

14                  So, these steam generators will be in  
15          place for a significant period of time prior to the  
16          beginning of the period of extended operation for  
17          Indian Point 3 and already the period of extended  
18          operation for Indian Point 2.

19                  How is it determined that these would be  
20          appropriate times for the inspection? I believe Dr.  
21          Duquette suggests that, you know, it would be good  
22          engineering practice or necessary engineering practice  
23          to have a baseline inspection prior to the start of  
24          the period of extended operation, you know.

25                  Here, we have these occurring afterwards

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1 and significantly into the life of the steam  
2 generators. How are these periods for inspection  
3 arrived at and what's the basis behind them?

4 MR. AZEVEDO: Your Honor, this is Nelson  
5 Azevedo for Entergy. Let me just start by saying that  
6 these locations, excuse me, are inspected every time  
7 we go into the primary side. That's every other  
8 refueling outage there is a visual inspection.

9 It's not the EVT1, it's not the detailed  
10 visual inspection that we're talking about, but they  
11 are visually inspected. So, if there were gross  
12 issues going on, those would be picked up.

13 As far as the EVT1 and the schedule of  
14 that inspection, that was really based on the work  
15 that the French have done and the EPRI have done that  
16 basically concluded this is not an issue, you know.  
17 These are flaws that are very shallow, have no --  
18 essentially no structural impact, and they pose no  
19 safety significance. So, that's why that time frame  
20 was chosen.

21 CHAIRMAN McDADE: Mr. Cox.

22 MR. COX: Yeah, one other factor. This is  
23 Alan Cox for Entergy. The operating experience in the  
24 industry for this type of material under these  
25 temperatures and operating condition shows that it

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1 takes a number of years for this to develop.

2 If you inspected a steam generator after  
3 20 years of operation, just based on the industry  
4 experience with this you would not expect to see any  
5 kind of -- you would not expect that time frame to  
6 have been long enough to develop stress corrosion,  
7 cracking.

8 CHAIRMAN McDADE: Okay. What are the  
9 lifespans of these generators, the anticipated  
10 lifespan of the generators?

11 For example, Indian Point 2 went into  
12 service in 2000.

13 MR. AZEVEDO: This is Nelson Azevedo for  
14 Entergy. Is the, you know, for 60 years, if I  
15 understand your question correctly. These generators  
16 are anticipated to be good for the remainder of the  
17 life of the plant.

18 CHAIRMAN McDADE: Okay. And for Indian  
19 Point 2 -- Three, rather, that went into service in  
20 1989, likewise you would anticipate that that  
21 generator would be used for the full period of  
22 extended operation.

23 MR. AZEVEDO: That is correct, Your Honor.

24 MR. DOLANSKY: I'd just like to add that  
25 I'm the program owner for the steam generators. We go

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1 into those steam generators, as Mr. -- this is Bob  
2 Dolansky for Entergy -- every other outage,  
3 effectively, every four years. And both generators --  
4 all four generators at both units, both the tubing and  
5 the tube-to-tubesheet, you know, the channel head, and  
6 the secondary side, we do inspections on all those  
7 areas and they are all in very, very good shape. We  
8 see no problem with them reaching the end of the  
9 period of extended operation.

10 CHAIRMAN McDADE: Okay. The IP2 steam  
11 generator was replaced in 2000. What, if any,  
12 relevance do the reasons of why that was replaced have  
13 to what we're considering now?

14 MR. DOLANSKY: I think the relevance is  
15 that both the IP3 and IP2 steam generators were  
16 replaced because of the tube material that they had.  
17 The tube material was degrading. And that was mill-  
18 annealed Alloy 600. Both steam generators were  
19 significantly upgraded.

20 Unit 2, IP2, has thermally-treated Alloy  
21 600, which is a very good material. And Unit 3, even  
22 though it's older, it has thermally-treated Alloy 690.  
23 And that's really -- I would say that's the best  
24 material for steam generator tubes. So, the  
25 significant upgrade in tube material after they were

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1 replaced is the reason.

2 CHAIRMAN McDADE: Okay. And can you  
3 explain just very briefly what is the difference  
4 between mill-annealed tubing and the thermal-treated?

5 MR. GORDON: Your Honor, this is Barry  
6 Gordon for Entergy. Mill-annealed was the original  
7 type of heat treatment to -- for Alloy 600. It was a  
8 wide range of temperatures and each mill essentially  
9 did it different ways and it didn't have an optimized  
10 microstructure as the thermally-treated tubes are.

11 Thermally-treated ones also have a  
12 subsequent heat treatment at a lower temperature that  
13 diffuses it. What you want to do in Alloy 600 is have  
14 chromium carbides on the grain boundaries. And with  
15 thermally-treated Alloy 600 has is a subsequent heat  
16 treatment at various temperatures and times that will  
17 produce a more uniform, homogenous, distribution of  
18 chromium around the grain boundary. So, it's not  
19 quite as depleted.

20 And the results, the testing results of  
21 the actual operating experience with this material has  
22 been outstanding, actually.

23 CHAIRMAN McDADE: With both the 600 TT and  
24 the 690 --

25 MR. GORDON: Well, 690 is --- has

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1 absolutely a perfect record. There is no --- well,  
2 since first introduced in the field, there has been  
3 absolutely no operating experience degradation of  
4 Alloy 690 with higher chromium.

5 CHAIRMAN McDADE: Okay. We've had  
6 significant testimony about the experience with the  
7 French reactors and their steam generators.

8 Do we know what the material was that  
9 these -- that experienced the observable cracking  
10 there? Was it mill-annealed, or was it the 600 or 690  
11 TT?

12 MR. GORDON: It was mill-annealed Alloy  
13 600 by and large.

14 DR. DUQUETTE: Duquette, New York. Just  
15 to clarify the record a little bit, I'm not sure if  
16 there's some confusion here, perhaps not, but the  
17 divider plate, which is where the cracking has been  
18 observed, is, as far as I know, always mill-annealed  
19 600 in both the French reactors and the reactors at  
20 Indian Point.

21 690 versus 600 is the tube material. And  
22 I don't think at the present time the tube material  
23 except when we talked about the tube-to-tubesheet  
24 welds, I don't think the tube material is an issue  
25 right at the moment.

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1           And so, if we back off to what the divider  
2 plate cracking is and what the French experience is,  
3 that was an Alloy 600, not 690. To my knowledge, the  
4 French haven't seen any cracking in their 690 either.  
5 And so, those are two different issues.

6           I don't know if it's appropriate now or  
7 not if the Board wants to entertain it, but there were  
8 several comments by Entergy about the French  
9 experience that perhaps this is the time to share and  
10 --

11           CHAIRMAN McDADE: Well, let me just ask  
12 one thing before we get to that, Dr. Duquette.

13           DR. DUQUETTE: Of course.

14           CHAIRMAN McDADE: And in the testimony  
15 that was provided by Entergy when you discuss the  
16 divider plates, you indicated that they were made of  
17 Alloy 600 both at -- and I believe both at the IP2 and  
18 IP3; is that correct?

19           MR. DOLANSKY: Yes.

20           CHAIRMAN McDADE: And was this the 600 TT,  
21 or the mill-annealed 600; do you know? I don't  
22 believe it's specified in the testimony.

23           MR. GORDON: This is Barry Gordon from  
24 Entergy. I would assume it's -- I think they assume  
25 it's the mill-annealed Alloy 600. The more

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1 susceptible material.

2 CHAIRMAN McDADE: Okay.

3 MR. DOLANSKY: To go to what Dr. Duquette  
4 said really when we're talking about mill-annealed and  
5 thermally-treated, we're talking about the tubes, not  
6 so much the divider plates. And the tube -- what --  
7 the tube material really comes into the discussion  
8 when we're talking about the tube-to-tubesheet weld.

9 CHAIRMAN McDADE: Okay. Thank you. Dr.  
10 Duquette.

11 DR. DUQUETTE: I think I agree with that.  
12 I think that's what I said. Until we --

13 CHAIRMAN McDADE: Okay. Dr. Duquette --

14 DR. DUQUETTE: -- talk about the tube-to-  
15 tubesheet weld --

16 CHAIRMAN McDADE: Excuse me. Dr. Duquette  
17 --

18 DR. DUQUETTE: -- the tubes are not --

19 CHAIRMAN McDADE: Okay. When you're  
20 talking, you're talking to us. We're not having the  
21 witnesses talk back and forth to each other. It's  
22 sort of, you know, in follow-up we'll talk to the  
23 other potential witnesses.

24 DR. DUQUETTE: I apologize.

25 CHAIRMAN McDADE: Anyway, Dr. Duquette,

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1 you thought that you wanted to raise with regard to  
2 the French experience that you felt is relevant that  
3 we should --

4 DR. DUQUETTE: Well, the French experience  
5 --

6 CHAIRMAN McDADE: -- take into  
7 consideration?

8 DR. DUQUETTE: -- is brought up as a  
9 trivial problem. Number one, I have done a lot of  
10 other consulting in other kinds of plants. If I saw  
11 cracks of that nature in almost any component in any  
12 plant that I inspected, I would certainly be  
13 concerned.

14 But in the French experience, they noted,  
15 and I think they were correct, that the cracking took  
16 place in the cold work -- in the thin cold work skin  
17 that was on their divider plates.

18 CHAIRMAN McDADE: And actually I wanted to  
19 get into that. Before we go further, can you explain  
20 what cold warping is --

21 DR. DUQUETTE: Oh, surely.

22 CHAIRMAN McDADE: -- and why it's  
23 significant?

24 DR. DUQUETTE: If you roll a plate, for  
25 example, at room temperature or near room temperature,

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1 it's called cold rolling. And so, there are two --  
2 there are several ways to process materials.

3 There's hot rolling, which would mean that  
4 you would roll it at relatively hot -- high  
5 temperatures. And cold rolling usually means at near  
6 room temperature you process the material. It could  
7 be wire drawing, it could be cold rolling to make  
8 plate.

9 There are lots of ways to cold roll  
10 materials. And so, cold rolling usually strengthens  
11 the material. And when you do that, you usually lose  
12 some ductility in the material.

13 CHAIRMAN McDADE: Okay. And am I correct  
14 that the -- in the French experience, the only  
15 observed cracking was in cold rolled material?

16 DR. DUQUETTE: The French plates seemed to  
17 have been preferentially cold rolled. That is they  
18 had more cold rolling in the surfaces than they did in  
19 the body of the material. And that can happen if you  
20 do a light amount of cold rolling or grinding on the  
21 surface, something that deforms the surface  
22 preferentially.

23 Many plates are cold rolled heavily. The  
24 automobile you're driving, for example, will have been  
25 cold rolled right through the entire steel that's in

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1 it so that the entire steel has the same properties.

2 And so, cold rolling -- surface cold  
3 rolling, which is what the French reported, could have  
4 come from grinding, it could have come from machining  
5 the plate, it could have come from doing a light cold  
6 roll at the end of the process for making the plate,  
7 but the experience is that cold rolling decreases the  
8 immune -- I won't say immunity. It increases  
9 susceptibility to primary water stress corrosion  
10 cracking. That's well established.

11 And the problem with Indian Point is we  
12 have no idea what the condition of those plates are  
13 whether they're heavily cold rolled, or lightly cold  
14 rolled, or completely annealed or cold rolled at all.  
15 We just don't know anything about them, as far as I  
16 know, or at least we haven't seen any evidence from  
17 the original manufacturer having supplied them as to  
18 what their condition is.

19 Under the worst of cases, the last pass  
20 that they were -- when they were made into plate, they  
21 were heavily cold rolled, and it's quite possible that  
22 they're cold rolled from the surface right through the  
23 body of the plate. That's not unusual for lots of  
24 cold rolling operations. In fact, it's quite commonly  
25 done to get uniform properties across plate.

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1 I would like to be able to say that the  
2 Indian Point situation has no cold rolling at all or  
3 that it's only a skin effect as the French saw, but we  
4 don't have any evidence of that yet. And until we  
5 look, we don't really know whether it's cracking or  
6 not and whether or not it's cold rolled or not.

7 And so, my argument would be that in the  
8 absence of knowledge we have to assume -- we don't  
9 have to assume, but I'm going to assume that there's  
10 a possibility that the plate that was provided by the  
11 manufacturer of the plate and put in place was  
12 heavily cold rolled. I have no way of knowing that it  
13 is not.

14 CHAIRMAN McDADE: Okay. Now, the SG tubes  
15 themselves, the 3,000 whatever tubes in each  
16 generator, are thermally treated, either 600 or 690  
17 thermally treated. That would suggest that there's no  
18 cold rolling with regard to the tubes and is it your  
19 issue that this is only -- your view that this is only  
20 an issue with regard to the divider plate?

21 DR. DUQUETTE: Not quite. Again, I'm not  
22 sure what we can say about the 2014 report or the 2012  
23 interim report that EPRI provided, but they laid out  
24 some scenarios for what I'll call destroying the  
25 pressure boundary by the cracks that form in the

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1 divider plate progressing into the tube-to-tubesheet  
2 welds by cracking the cladding that's on the tubesheet  
3 itself.

4 And so, there's a path that could be  
5 followed for a stress corrosion crack that would begin  
6 in the divider plate and then progress into other  
7 parts of the steam generator eventually perhaps  
8 compromising the pressure boundary.

9 CHAIRMAN McDADE: Okay. And in here, the  
10 part of the pressure boundary we're talking about are  
11 the SG tubes themselves.

12 DR. DUQUETTE: Would be the -- pressure  
13 boundary would be compromised by a crack that would  
14 occur in the tube-to-tubesheet welds. Because once  
15 you do that, you expose the inside of the --  
16 independent of the cold expansion of the tubes into  
17 the tubesheet once you've cracked the tube-to-  
18 tubesheet weld, you have a path for compromising the  
19 pressure boundary.

20 And I would argue that some discussion  
21 made earlier about allowable leaks if you broke enough  
22 of the welds in the pressure boundaries, I think you  
23 would probably exceed the ability for one tube to  
24 provide the leaking, which I think was the analysis  
25 that was done.

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1           That is if one tube-to-tubesheet weld were  
2           compromised, then the leak would be acceptable. If  
3           20,000 of them were compromised, I'm not so sure that  
4           would be correct, not that I'm suggesting that there  
5           would be 20,000 compromised all at the same time.

6           CHAIRMAN McDADE: Okay. If you could  
7           continue talking about the French experience and part  
8           of that I would also like you to address, I believe,  
9           Entergy has suggested that the lessons to be learned  
10          from the French experience are somewhat limited  
11          because you have differences with regard to the water  
12          chemistry programs, the thermal impact, the cyclical  
13          loading so that the concerns that you observed from  
14          the French experience would not be necessarily  
15          applicable to the Indian Point experience.

16          Have I misstated Entergy's position at  
17          all?

18          MR. DOLANSKY: No, Your Honor.

19          CHAIRMAN McDADE: Okay. Dr. Duquette.

20          DR. DUQUETTE: I can't disagree with that.  
21          There is certainly differences from the French  
22          experience, and I know something about that, and the  
23          US experience.

24          It's also a fact, and it has to be  
25          accepted, that only about 20 percent -- I believe the

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1 number is about 20 percent of the French reactors  
2 showed cracking in the divider plates. They saw it at  
3 Chinon. They saw it at Gravelines. They saw it in a  
4 number of places, but they certainly didn't see it in  
5 all of their steam generators.

6 And I believe that my understanding is  
7 that they now inspected all of their steam generators.  
8 So, it's not a problem that goes through the entire  
9 French fleet. I suspect it will not be a problem  
10 throughout the entire United States fleet or anyone  
11 else's fleet, as far as that goes, but the fact of the  
12 matter is that they did see cracking, they did  
13 identify with cold work, and I know I've said this,  
14 but we have no way of knowing what the cold work  
15 situation is at Indian Point 2 or 3. And so, I think  
16 there's some concern in that area.

17 I would like to see regular inspections.  
18 And that doesn't mean every other month, but regular  
19 inspections to be sure that if any cracks form there  
20 aren't growing. And if they're growing, they're not  
21 growing to eventually compromise the pressure  
22 boundary.

23 And so, I'm not suggesting we decommission  
24 the --

25 CHAIRMAN McDADE: I don't know if this is

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1 a good time for you to address it. I don't want to  
2 lose your train of thought, but --

3 DR. DUQUETTE: Okay.

4 CHAIRMAN McDADE: -- you just raised the  
5 issue of the timing of inspections. We had had the  
6 discussion earlier from Entergy, their explanation as  
7 to why the timing that they proposed, which is, you  
8 know, not until after the beginning of the period of  
9 extended operation and I believe about 22 years into  
10 the operation of IP2, and 28 years into the operation  
11 of IP3, you know.

12 Do you disagree with their explanation  
13 that inspecting earlier would be unnecessary because  
14 there is no basis to believe that cracking would occur  
15 that early in the operation given the nature of the  
16 materials?

17 DR. DUQUETTE: Well, the Indian Point 3  
18 reactor that was put in place in 1989 has been in  
19 service for quite some time.

20 And so, if there are cracks -- and I don't  
21 think anyone has looked at this point, at least have  
22 not seen any evidence in that. If there are cracks in  
23 those divider plates, I think we'd like to know that.  
24 And if we do see them, I think we'd like to know; A,  
25 are they growing, or are they so large that we have to

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1 do something about them?

2 And if they're growing --

3 CHAIRMAN McDADE: But do you disagree with  
4 the underlying premise that you would not expect --  
5 there would be no reason to believe that cracks would  
6 be -- would either originate or propagate early in the  
7 period of operation by the steam generator?

8 DR. DUQUETTE: I don't have an answer to  
9 that. The problem we've had with the inspections that  
10 have been so far by the French primarily, is that it's  
11 like a snapshot in time.

12 They saw cracks in the reactors. They  
13 did, in some cases, come back in and look a few years  
14 later. I think the first cracks were identified in  
15 about 2007. And I think some five years later they  
16 looked again and the cracks that they had seen in 2007  
17 had not grown in their case.

18 And I'm not surprised at that if it's only  
19 growing in a thin, cold warp layer, then it sort of  
20 ran out of steam in that cold warp layer.

21 I would certainly like to get into the  
22 1989 unit and see if there's anything there. It's  
23 been a long period of time that it's been in place.  
24 And if there's nothing there, I certainly would feel  
25 more comfortable about the unit that was put in place

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1 in 2000.

2 I don't see any -- I think Entergy has  
3 said that they have the capability of doing the  
4 inspections. Perhaps I don't know the economics of  
5 the situation, but I don't know why they wouldn't do  
6 them. I don't know why they would rely on an  
7 analytical process to eliminate the possibility when  
8 they could, in fact, look at them and indicate that  
9 they have the capability to do that. I'm not sure why  
10 the pushback on it.

11 CHAIRMAN McDADE: Okay. Well, let me go  
12 back. I believe Mr. Dolansky indicated that there is  
13 inspection that is done, a visual inspection at each  
14 outage that would demonstrate any gross abnormality,  
15 but what the inspections they're talking about  
16 pursuant to the license commitment has to do with the  
17 EVT1, the more detailed inspection.

18 And so, is the concern that you just  
19 raised not alleviated by the testimony of Mr. Dolansky  
20 as to the, you know, the sort of gross inspection on  
21 a periodic basis during refueling outages as opposed  
22 to the specific inspections, you know, identified, you  
23 know, in the license commitment, which would be, you  
24 know, not until the first outage after the start of  
25 extended operations for Indian Point 2, meaning

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1 basically 28 years into the life of a steam generator?

2 DR. DUQUETTE: Surely. I certainly would  
3 feel a lot more comfortable if someone from Entergy  
4 were to stand up and say that in their visual  
5 inspections that they do on a regular basis that they  
6 look specifically for cracks in the divider plate.

7 If they tell me that they've done that,  
8 have looked and have been very judicious about it  
9 knowing that they might be there, I might feel better  
10 about having to do a more detailed inspection.

11 I haven't heard that and I certainly  
12 haven't seen it in their written testimony or anything  
13 that was provided to me before this. So, to my  
14 knowledge, the visual inspection that they do in that  
15 area isn't looking specifically at the -- at least as  
16 far as I know, isn't looking specifically for the  
17 possibility of small, initiated cracks in the divider  
18 plate near the weld area.

19 I don't know if you would like Entergy to  
20 comment on that or not, but I'm not sure the visual  
21 inspection would see it unless you had someone who was  
22 qualified to look for the kind of cracking that we're  
23 talking about.

24 CHAIRMAN McDADE: Mr. Dolansky, do you  
25 wish to comment on that?

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1 MR. DOLANSKY: This is Bob Dolansky with  
2 Entergy. We have not done an EVT1 on the divider  
3 plate looking specifically for cracking. Our position  
4 is that if there were -- the size of the flaw to  
5 become structurally significant would be very large.

6 The examinations -- the visual inspections  
7 that we do are general visual inspections of the  
8 entire bowl area, including the divider plate. And  
9 when we perform those inspections if there were gross,  
10 you know, large flaws, gross abnormalities, they would  
11 be seen.

12 Additionally, if there were cracking that  
13 got through to a low alloy steel, that got through the  
14 cladding, we would expect to see evidence of that in  
15 the form of rust color or something like that. And  
16 that would definitely be seen in the general  
17 inspections that are performed every time we go into  
18 the steam generator bowls.

19 CHAIRMAN McDADE: Okay. Thank you. Dr.  
20 Duquette.

21 DR. DUQUETTE: Dr. Duquette, New York  
22 State. I think I understood that answer to mean  
23 unless it's a gross defect, it either wouldn't be  
24 picked up or wouldn't be recorded or no one would be  
25 very concerned about it.

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1                   Stress corrosion cracks start small and  
2 they can grow fairly rapidly in Alloy 600 if they  
3 haven't breached the cladding on the tubesheet yet.  
4 And I think the comment was if they had breached the  
5 cladding on the tubesheet, they would have seen some  
6 corrosion from the tubesheet through the crack in the  
7 cladding.

8                   That certainly makes me feel better about  
9 where we are, but it doesn't tell me anything about  
10 whether there are cracks in the divider plate now, how  
11 big they are, where they're going or whether they  
12 would have started into the cladding on the tubesheet  
13 without actually having reached the carbon steel  
14 underneath.

15                   My concern about stress corrosion cracks  
16 is they're not a single -- they don't just occur and  
17 they're there and they break something or don't break  
18 something. They grow as a function of time, and small  
19 ones will grow into big ones if they're growing at  
20 all.

21                   And so, my concern would be that if  
22 there's a small crack now that can be seen, I  
23 certainly would like to know that. And I certainly  
24 would like to know what its direction is going to be.  
25 And I'm sure we'll talk about this later, but I'd like

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1 to know what's going to be done about it if one is  
2 identified.

3 I think I heard this morning that if one  
4 is identified, it will go through some standard  
5 remediation process without defining what that  
6 remediation process is. So, that's another area of  
7 concern if you do find cracking.

8 I don't understand why as an engineer, I  
9 don't understand why having seen cracking in similar  
10 structures, a significant number of them, that they --  
11 there wouldn't be some concern about at least  
12 identifying them and finding out if they're going to  
13 be a problem.

14 I certainly think an examination of both  
15 steam generators at this point to allay the problem,  
16 put it aside and say we don't see any cracking at all,  
17 I certainly would then feel better about delaying a  
18 second inspection. But to have the first inspection  
19 well into the relicensing period seems, to me, to be  
20 -- I just don't think it's good engineering practice  
21 if you know that the component, it has shown cracking.

22 And, again, it's not a single steam  
23 generator in France. It was -- I think it was 18 or  
24 20 percent of the steam generators showed cracking in  
25 them. They explained the cracking, they indicated why

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1 they didn't see any expansion of it, but, again, we  
2 don't know what the condition of the divider plate is  
3 at Indian Point in either one of the steam generators.

4 I just would feel better if we had a  
5 baseline or a thorough examination of that area had  
6 been taken. If no one had ever seen a crack in a  
7 divider plate anywhere in the world, I'd say probably  
8 they're proceeding as they should be. But there are  
9 just too many of them in steam generators where the --  
10 we don't know what the condition is in our case.

11 And I'm not suggesting we cut samples out  
12 of a divider plate. I just think there should be a  
13 thorough inspection of the divider plate and should be  
14 a thorough and visual -- not just a visual inspection,  
15 but one at some magnification to see if the cracking  
16 is there. It's a comfort level, perhaps, more than  
17 anything else.

18 I don't think we're near disaster in any  
19 of them, or we probably would have seen it somewhere  
20 else in the US fleet, but I think it's just good  
21 engineering practice.

22 CHAIRMAN McDADE: Okay. I believe you  
23 testified that the rate of propagation of such cracks  
24 could be rather rapid. And I try to just sort of  
25 focus on what "rather rapid" means.

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1           You've heard the testimony from Mr.  
2 Dolansky with regard to what the inspections are at  
3 each outage. What is the period between outages?

4           MR. DOLANSKY: 24 months.

5           CHAIRMAN McDADE: Thank you, Mr. Dolansky.  
6 24 months. So, these --

7           MR. DOLANSKY: This is Bob Dolansky. Let  
8 me just clarify. We go into the steam generators  
9 typically every two cycles. So, we would go into the  
10 steam generator bowl area roughly every 48 months,  
11 every four years.

12          CHAIRMAN McDADE: Okay. Thank you.

13          DR. DUQUETTE: Everyone in the stress  
14 corrosion cracking field talks about rapid crack  
15 growth. For us, that can be a fairly slow crack  
16 growth compared to what most people might look at.

17                 We do know, for example, that the history  
18 of problems in the PWRs due to stress corrosion  
19 cracking hadn't been identified in -- I believe the  
20 first numbers that were reported were probably 10 or  
21 12 years after the steam generators were put in place  
22 with the mill-annealed tubes.

23                 And Mr. Gordon has a very nice table which  
24 I can show if you wish to, but I think it's included  
25 in the testimony I provided, indicating the number of

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1 problems that have occurred with stress corrosion  
2 cracking in various components in the steam  
3 generators. Some weren't identified until the 1990s  
4 and the steam generators had been in place for a very  
5 long time.

6 The whole steam generator issue for those  
7 of us who have done stress corrosion cracking for --  
8 I've done work for EPRI, for example, on stress  
9 corrosion cracking in some of their alloys. They take  
10 a long time in terms of numbers of years.

11 We do know, however, that once they  
12 initiate, they grow exponentially. Not a very high  
13 exponent, but they -- the rate of acceleration  
14 increases with time. So, they can take a very long  
15 time to initiate. They will also be slow to propagate  
16 initially. And as they get larger, will propagate  
17 faster.

18 So, I think if we saw no cracking  
19 whatsoever in a reasonably recent inspection of the  
20 steam generator divider plates and we saw no cracking  
21 at all, again, I would feel more comfortable with what  
22 we're seeing, but we don't know. We don't know what's  
23 there at all.

24 I'm not going to suggest that the cracks  
25 will grow over days or over months. It's certainly

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1 going to be over years. But if we do see some, I  
2 think the first thing one would want to do is come  
3 back in a few years and see what the growth rate has  
4 been hoping that they haven't grown catastrophically.

5 If we came back for a second inspection  
6 and saw no growth whatsoever or no new cracks, you  
7 probably want to stop right there. You probably  
8 wouldn't have to go beyond that point.

9 But I think -- there's an old German  
10 saying that one data point is worse than no data  
11 points. And I think that's probably true in this  
12 case. I think I'd like to see what's happening as a  
13 function of time.

14 Maybe get a baseline in the next year or  
15 two. Five years from now come back in and look at it  
16 again and see where we are.

17 CHAIRMAN McDADE: Okay. What we're trying  
18 to determine is whether or not the proposed inspection  
19 schedule provides reasonable assurance. And what we  
20 have from Mr. Dolansky is that this is looked at in a  
21 -- perhaps not the right word, but gross fashion on at  
22 least a 48-month. And that they then have this  
23 detailed inspection scheduled for Indian Point 3, the  
24 1989 reactor, I believe it will be in 2017. That they  
25 suggest that given the rate of propagation of these

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1 cracks in order for a crack to pose any issue, it  
2 would be identifiable in these periodic inspections  
3 and that you would be able to identify even a much  
4 smaller crack in the inspection that they propose for  
5 IP3 in 2017. And that given the rate of propagation,  
6 you would not expect a crack to cause any problem in  
7 the interim period.

8 Do you disagree with that? And if so,  
9 why?

10 DR. DUQUETTE: I'm very comfortable with  
11 the -- if they do a detailed crack analysis in 2017,  
12 I'm very comfortable with that. And I would like to  
13 see a second inspection at some time in the future.

14 Again, the testimony I think I've heard is  
15 there is a visual inspection of the bowl area. I  
16 think when I asked specifically if anything was done  
17 to look specifically at the divider plate, I'm not  
18 sure that I understood the answer, but I don't think  
19 anyone has looked specifically at the place where the  
20 French had observed cracking.

21 And if you look at the reports that are  
22 both public and in the EPRI reports, the cracks that  
23 were observed in the French reactors initially had to  
24 be looked at in something more than a visual manner.  
25 They're pretty small.

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1           Now, when they looked at the crack itself,  
2           there were fairly large cracks from a microscopic  
3           point of view. And there's some beautiful pictures  
4           that they produced, but visually they would have been  
5           very difficult to see without some other indication.

6           And so, the 2017 period, I think it's a  
7           great period. I'd like to see them both done in 2017.  
8           I think the earlier we identify no problem would make  
9           everyone -- would certainly make me more comfortable  
10          about the possibility of the cracks growing up into  
11          the cladding and possibly to the tube-to-tubesheet  
12          welds where they would possibly compromise the  
13          pressure boundary.

14          CHAIRMAN McDADE: Okay. Are there any  
15          provisions for follow-up inspections under the  
16          licensing commitment? In other words, if we have the  
17          inspection in 2017 as far as EVT1, is that going to be  
18          repeated?

19          MR. AZEVEDO: Your Honor, this is Nelson  
20          Azevedo for Entergy. That depends on what we find.  
21          If we find --

22          CHAIRMAN McDADE: Assuming you find no  
23          cracks in 2017 given the license commitment, there's  
24          no provision for follow-up inspection.

25          MR. AZEVEDO: There are currently no plans

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1 to go back if we find nothing. That's correct.

2 CHAIRMAN McDADE: Okay. And can you  
3 explain the justification for that?

4 MR. DOLANSKY: This is Bob Dolansky with  
5 Entergy. Again, to me the justification would be the  
6 French experience. I mean, the fact that the French  
7 saw cracking, they didn't actually do anything about  
8 it. They left it in service.

9 Then they removed steam generators from  
10 service for other reasons, did destructive testing.  
11 Turned out that the cracking was non-consequential.  
12 So, if we go out and inspect and see nothing, I would  
13 see no reason why we would need to go out again.

14 There's nothing that would drive me to  
15 feel that that's required or necessary, to be honest.

16 CHAIRMAN McDADE: Okay. But the  
17 inspection you would be doing -- and let's focus just  
18 on Indian Point 3 right now -- would be approximately  
19 28 years into the life of that steam generator,  
20 correct?

21 MR. DOLANSKY: Correct. 1989 to 2017,  
22 yes.

23 CHAIRMAN McDADE: Okay. And is it your  
24 position that if there was given the EVT1 inspection  
25 in 2017, 27 or so years into the life of that, you

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1 would have no reason to expect that there would then  
2 be cracking in -- during the continued -- cracking of  
3 any significance during the continued operation of  
4 that steam generator during the period of extended  
5 operation?

6 MR. DOLANSKY: That is correct, Your  
7 Honor.

8 CHAIRMAN McDADE: Okay. Dr. Duquette, do  
9 you --

10 MR. COX: This is Alan Cox. Let me add  
11 one thing to that. Mr. Dolansky indicated that we  
12 share Dr. Lahey's concern for safety. And one aspect  
13 of that is the safety of the people at the plant that  
14 are doing the work.

15 So, we've got an EPRI report that says  
16 that the investigation concluded that a crack running  
17 the full length and depth of the weld is not a safety  
18 concern, you know. So, I think the decision that we'd  
19 have to make at the plant is, do we want to spend the  
20 dose, I mean, if you do this inspection, you're  
21 putting people at some risk by the radiation exposure  
22 they're going to incur during the inspection. And if  
23 you've got a situation where there is no safety  
24 concern, it's hard to justify from a management safety  
25 perspective why you would subject people to that

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1 additional dose to go do that inspection. That's  
2 another consideration that would come into play in  
3 making the decision.

4 In the 2017, that is the -- that's the  
5 next available opportunity for doing an inspection.  
6 The unit -- that's the next outage, next refueling  
7 outage that will come up on IP3.

8 MR. STROSNIDER: And this is Jack  
9 Strosnider for Entergy and I just want to expand  
10 briefly on what Mr. Cox just said with regard to the  
11 -- we had some discussion earlier about this very  
12 large flaw that was demonstrated in the EPRI analysis  
13 did not impact the safety analysis.

14 You don't need to do an enhanced visual  
15 examination to see a flaw that size. Examinations  
16 that they're doing every 48 months when they go in and  
17 they look, you would see that kind of a flaw long  
18 before it got that big. So, you don't have to rely on  
19 the enhanced visual to maintain safety.

20 MR. AZEVEDO: Your Honor, this is Nelson  
21 Azevedo. May I add one additional point? The reason  
22 why this issue even came up was because of operating  
23 experience. In this case, overseas.

24 We will continue to monitor operating  
25 experience so if things were to change in the future,

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1 it would -- we evaluate that and determine whether it  
2 would be appropriate to go back and do inspections.  
3 So, I just wanted to point that out.

4 CHAIRMAN McDADE: Okay. Thank you. Dr.  
5 Duquette, do you see a need for continued inspections  
6 after, for example, IP3 after the 2017? And at what  
7 period and why?

8 DR. DUQUETTE: I have to back off on the  
9 safety issue as far as the personnel are concerned and  
10 what they can do. I think if you're going to do an  
11 inspection in 2017, that team will have had experience  
12 on how to do it and what they're doing.

13 And if I'm only suggesting one more  
14 inspection, say, five or eight years later, I don't  
15 think that the total dose that that team is going to  
16 see is going to be very much more. And so, I think  
17 I'm having a problem wrapping my arms around the fact  
18 that this is a safety issue for the people who are  
19 doing the inspection, because you're going to be doing  
20 one in 2017 anyway.

21 Looking at some more steam generators, I  
22 don't think it's going to expose people to that, but  
23 that's not my area of expertise. And so, I'll have to  
24 back away from there.

25 But the fact of the matter is the French

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1 experience is brought up both by me and by Entergy and  
2 Entergy is absolutely correct. The French explained  
3 why their cracking stopped where it did. I know I've  
4 said this, and I don't want to be too repetitious, but  
5 we don't know what the condition of the divider plates  
6 are or the welds or anything else in the machines that  
7 we have now.

8 In addition to that when they talk about  
9 not being able to see a small flaw, I'm not sure how  
10 much experience the people who are testifying have on  
11 identifying cracks in Alloy 600, but one comment that  
12 came up is correct.

13 If you penetrate through the cladding on  
14 the tubesheet and you begin to corrode the carbon  
15 steel underneath, you'll see that, but fine cracks in  
16 welds are really, really difficult to see visually.

17 So, if you get a crack on a weld or in a  
18 heat-affected zone, you're not going to see it  
19 visually unless you do something more than that in  
20 most situations especially in the welds. They're just  
21 very difficult to identify unless you've got really  
22 experienced people and somewhat of a more advanced  
23 technique.

24 So, I don't think that 48-month visual  
25 inspections are going to detect very much unless

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1 they've got -- and they're right -- a massive crack.  
2 But the -- when they -- when it was said just a few  
3 minutes ago that the EPRI report indicated there was  
4 no problem, that isn't quite true.

5           The EPRI report laid out several  
6 scenarios. They did indicate that they probably were  
7 not likely, but they -- it was a thorough enough  
8 report, I was very impressed with it, to point out  
9 that there is a scenario for a crack, for example, to  
10 progress up into the Alloy 600 cladding on the  
11 tubesheet, progress across that cladding and then  
12 intersect at least one or more of the tube-to-  
13 tubesheet welds. And if that happens, you have the  
14 risk of compromising the pressure boundary. It's as  
15 simple as that.

16           And I would argue that there's no way that  
17 a team that's looking at it visually is going to see  
18 the fine cracks that I have seen in stress corrosion  
19 cracking situations without doing something more than  
20 that.

21           I've analyzed thousands of cracks in my  
22 career and typically I have to use some technique  
23 other than just looking at it unless it's such a  
24 massive crack that I can drive a truck through it.

25           CHAIRMAN McDADE: Well, perhaps not to

1 drive a truck through it, but as I understand the  
2 position of Entergy is that well before the time that  
3 these cracks would become an issue, they would be  
4 observable through their periodic inspections. And  
5 that these inspections, I guess, for Indian Point 3 in  
6 2017, for Indian Point 2 probably in 2023,  
7 approximately ten years after the period of extended  
8 operation begins, that these more detailed EVT1 would  
9 be sufficient to ensure that these cracks would not,  
10 could not propagate undetected to the point where they  
11 would raise an issue as to the continued function.

12 Do you have a problem with that position  
13 and --

14 DR. DUQUETTE: As I indicated just a few  
15 seconds ago, yes, I do. My own personal experience is  
16 you can have very long cracks that are virtually  
17 invisible to the naked eye. I've seen them in paper  
18 mills, I've seen them in power plants and a number of  
19 other places where we had to do something more than  
20 just look at them to see that there were cracks  
21 present.

22 And so, I disagree that a visual  
23 examination in the kinds of structures you're looking  
24 at here will necessarily show you whether you have a  
25 crack that has to be dealt with. And at some point we

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1 should talk about "dealt with" as well, but I disagree  
2 that you necessarily would not -- that you would  
3 necessarily see a crack that was close to compromising  
4 the situation.

5 The cracks we're talking about are growing  
6 in welds, they're growing in welded material on the  
7 tubesheets, and they're progressing if they're going  
8 to compromise the pressure boundary by breaking the  
9 pressure boundary at the tube-to-tubesheet welds,  
10 you're again looking at welded materials where cracks  
11 are very difficult to see because of the structure of  
12 the weld itself.

13 CHAIRMAN McDADE: Well, let me go back and  
14 showing my ignorance, perhaps, of the process, but  
15 we're talking about the divider plate and the capacity  
16 for cold working on the divider plate. We're talking  
17 about the tubes where I concede there's no cold  
18 working given the nature of the particular product.

19 Is cold working an issue with regard to  
20 the welds? And if not, would welds be susceptible to  
21 cracking in the same way the divider plate would be or  
22 a cold-worked piece of metal would be?

23 DR. DUQUETTE: Cold-worked and mill-  
24 annealed Alloy 600 will accelerate the cracking  
25 problem. But Mr. Gordon testified just a little while

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1 ago, and he's correct, Alloy 600 that is mill-annealed  
2 is susceptible all by itself. And the weld material  
3 that you use to weld Alloy 600, which is about the  
4 same composition, is also susceptible.

5 Cold working will accelerate the process.  
6 You'll get earlier initiation and more rapid  
7 propagation, but that doesn't mean that you won't get  
8 propagation through welded Alloy 600 -- it's actually  
9 called Alloy 182, but you certainly will get cracking  
10 in that alloy. It just is not as rapid as it would be  
11 in a cold work material.

12 Cold work material, the numbers I've seen  
13 in a number of places, I think, including in the EPRI  
14 report, and they're out in the public. So, it's not  
15 anything that's secret. Cold working increases the  
16 crack propagation rate by about a factor of four, but  
17 there is a finite crack propagation rate. It's just  
18 that it goes four times -- about four times faster  
19 into material that's cold worked.

20 CHAIRMAN McDADE: Okay. It's after noon  
21 and I'm wondering if it may be a good time for us to  
22 break for lunch. I propose to break and come back at  
23 one o'clock.

24 Does that pose problems for anybody? Is  
25 that sufficient time? Does the staff need any

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1 additional time?

2 MR. HARRIS: No, Your Honor.

3 CHAIRMAN McDADE: Entergy.

4 MS. SUTTON: That's fine, Your Honor.

5 MR. SIPOS: Your Honor, the State would  
6 request 75 minutes. An hour and 15 minutes.

7 CHAIRMAN McDADE: Okay. Now, I've got to  
8 -- let's see. 75, 60, okay. So, we're talking about  
9 1:15?

10 MR. SIPOS: Yes.

11 CHAIRMAN McDADE: Okay. That's -- we'll  
12 stand in recess then until 1:15.

13 (Whereupon, the proceedings went off the  
14 record at 12:05 p.m.)

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

2 (1:15 p.m.)

3 CHAIRMAN McDADE: Okay. Please be seated.  
4 We're ready to proceed. Mr. Sipos, it looks like you  
5 might have something before we get started.

6 MR. SIPOS: Yes. I just actually for  
7 clarity of the record, I think there was a couple of  
8 homework assignments for Dr. Lahey. And I just -- I  
9 thought it would be helpful for the record if I just  
10 read the exhibits and their titles so that they are  
11 all in one place for the parties and the Board as they  
12 look back at it subsequent to the hearing. Would that  
13 be --

14 CHAIRMAN McDADE: Yes, please.

15 MR. SIPOS: Okay. So, the first exhibit,  
16 I believe, is Entergy Exhibit Entergy R681. And that  
17 is WCAP-17199-P, Rev 2 November 2015.

18 The next one is Entergy R689. That's  
19 WCAP-12191, Rev 5. And the cover page has an October  
20 2015 date.

21 Then the third one is Entergy Exhibit 727.  
22 And that is CN-PAFN-09-21, Rev 4 also with a November  
23 2015 date. I believe those are the three documents  
24 that you have discussed with Dr. Lahey.

25 CHAIRMAN McDADE: Okay. Thank you, Mr.

1 Sipos.

2 Okay. The question is whether we continue  
3 on 38, or go back to Dr. Lahey. We had talked about,  
4 you know, some matters that you wanted to bring up,  
5 Dr. Lahey. Why don't we get that out of the way now  
6 before we proceed on?

7 DR. LAHEY: Thank you, Your Honor. The --  
8 there's two basic things. One homework assignment or  
9 break assignment that you gave me on to look at  
10 thermal couple processing, signal processing. And the  
11 other one has to do with the discussion that we had  
12 yesterday, which was my self-imposed homework for last  
13 night because I was told that the answer to my  
14 question was in Entergy 681.

15 So, I -- all these documents,  
16 incidentally, I have seen before. I just don't carry  
17 numbers in my head, but they were not new documents to  
18 me. So, anyway, if you don't mind, I would just like  
19 to resolve the thing we talked about, clarify the  
20 record with the thing we talked about yesterday,  
21 which, just to remind you, we had discussed some  
22 problems with the heat transfer coefficient modeling  
23 in the WESTEMS code.

24 And I showed you a couple of areas in  
25 terms of thermal boundary layer effects and

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1 nodalization where if you get non-conservative  
2 results, these are two independent things that can  
3 lead to non-conservative results.

4 So, I was -- as I understood the testimony  
5 of Mr. Gray, I believe it was, which maybe I didn't,  
6 but it sounded like he said that you don't really need  
7 to worry about that, because we specify the transients  
8 and we adjust the duration of them so that we get the  
9 maximum stresses.

10 So, and he -- and when I ask -- or when  
11 you ask on my behalf where was all this documented, I  
12 was told 681. So, when I went back last night and  
13 went through 681, there was a lot of work shown in  
14 determining the transients. Some of them are more  
15 complicated than others such as the in-surges and out-  
16 surges of the pressurizer.

17 And then there were other components as  
18 well, but basically it was determining what is the  
19 temperature and the flow transients and the number of  
20 the various transients, but my question had to do with  
21 the thermal hydraulic analysis of these transients  
22 which lead to the stresses.

23 And in the document it was very clear, and  
24 in all other documents that I've read on this subject,  
25 it's very clear that once you have the transients, you

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1 then put them into this thermal hydraulics model that  
2 we talked about yesterday and you then determine what  
3 the stresses may be. So, it really doesn't resolve my  
4 concerns at all.

5 And so, my shock yesterday that I  
6 expressed, I mean, if we don't have to worry about  
7 heat transfer coefficients, what's the code for? It  
8 looks like they are indeed using the code. They break  
9 up various components into zones and pick constant  
10 heat transfer coefficients in the various zones. They  
11 don't have to be the same. And they try to pick ones  
12 that they believe are conservative.

13 But what I showed yesterday, these fully  
14 developed heat transfer coefficients cannot be  
15 conservative because of these two effects that I  
16 discussed. So, that's one thing I wanted to resolve  
17 and it might be I just misunderstood Mr. Gray, but it  
18 sounded pretty clear that's what they were saying.

19 So, that's all I have to say about that  
20 issue. And if you would like Mr. Gray to respond, we  
21 can do it, or do you want me to go on to the other --

22 CHAIRMAN McDADE: Why don't you go on, Dr.  
23 Lahey?

24 DR. LAHEY: Okay. The other issue is sort  
25 of a longstanding concern I've had and I've put it in

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1 previous testimony that I've submitted and it never  
2 was resolved to me is, how do you handle the thermal  
3 coupled measurements? Because you heard this morning  
4 even they make some measurements and infer the fluid  
5 temperatures from this in terms of stratification or  
6 the possibility of thermal striping and various  
7 others.

8 And the problem is the documents that I  
9 was given to review, which I have and I had previously  
10 seen these, is Entergy 689 and 727, they use the  
11 transients, but there's no indication at all in how  
12 they are processed. And I want to just remind you as  
13 to the concern and this is something that I've got a  
14 lot of experience with.

15 If you have an instrument in the fluid, a  
16 thermal couple resistance temperature detector or any  
17 other thing, there's a certain amount of heat capacity  
18 in this. There's inertia in it.

19 So, it will measure the temperature of the  
20 fluid and at steady-state you get a very -- if it's  
21 calibrated, you get a very nice result. But during a  
22 transient when it's changing with time, there's a lag.  
23 It takes a while for the device to come up to the  
24 temperature of the fluid. Either go down, or go up  
25 depending what the fluid is doing.

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1           And so, what you have to do, there's  
2 really two fundamental ways to treat it. One, you  
3 just write down the differential equation, which is  
4 the energy balance on the center itself, and it  
5 amounts to numerically differentiating the data. And  
6 you may know that's a noisy affair and you have to do  
7 it very carefully in order to get a reasonable answer.

8           The other way is to solve for the step  
9 solution or the impulse solution, which is the  
10 derivative of that, get what the stress people like to  
11 call the "Green's function" and then you convolute it  
12 by integrating -- it's called the Duhamel theorem, you  
13 integrate all these step solutions by what's going on  
14 in your signal and you get what the real temperature  
15 is, but you can't just take the temperature from the  
16 reading and use that as the temperature and nowhere do  
17 they talk about that at all.

18           And when I ask the question and I got a  
19 response in testimony from Entergy, I believe, it was  
20 we take care of it. We know about thermal couple lag.

21           I don't see anything like that and it's  
22 important.

23           JUDGE KENNEDY: Dr. Lahey, this is Judge  
24 Kennedy. As I understood it yesterday, they were  
25 taking peak and minimum values from the transient

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1 data.

2 Does that eliminate some of the concerns  
3 about the thermal lag effect in the thermal couples?

4 DR. LAHEY: If you're measuring what the  
5 peak and the minimum is, you need to make the  
6 correction to know what the real peak is and what the  
7 real minimum is.

8 JUDGE KENNEDY: What is the effect of  
9 calibrating the thermal couple? Is that an attempt to  
10 --

11 DR. LAHEY: You need to --

12 JUDGE KENNEDY: Would that not consider  
13 that effect?

14 DR. LAHEY: Sir, you need to calibrate  
15 your temperature sensor for sure, but during  
16 transients it has a certain inertia. So, it's like if  
17 you take a piece of metal and drop it in boiling  
18 water, it doesn't instantly come to the temperature of  
19 the boiling water. It takes a while because of its  
20 heat capacity, mass times the specific heat to heat  
21 up.

22 And depending on what the temperature  
23 sensor is and how massive it is, the more the inertia  
24 is. But in any event, you just don't get the right  
25 answer unless you make corrections.

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1 JUDGE KENNEDY: I mean, would you not get  
2 to the correct temperature? I mean, eventually it's  
3 going to reach the right temperature at some point.

4 DR. LAHEY: For steady-state. Yeah, if  
5 you go up and reach a steady state, you wait a while  
6 until it's all settled out, you can get a result, but  
7 there's all kinds of different transients that they're  
8 looking at. It's not just that particular one that  
9 was discussed in terms of the surge line.

10 JUDGE KENNEDY: Well, since my memory is  
11 failing me, maybe someone from Entergy could help us  
12 understand how the thermal couple data is used and  
13 whether it's adjusted for some of the effects that Dr.  
14 Lahey is concerned with.

15 MR. GRAY: This is Mark Gray for Entergy.  
16 Yes, there are -- one important aspect of  
17 understanding this is it's understood that there is a  
18 lag in the thermal couple. And it's also understood  
19 that the thermal couples were calibrated and the  
20 readings in the plant computer are used for operating  
21 the plant. So, they're pretty reliable temperature  
22 measurements, number one.

23 Number two, these transients don't happen  
24 in milliseconds. These transients happen in the  
25 actual plant data over minutes, in reality. The

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1 design transients are very conservatively estimated to  
2 occur over seconds. So, the bottom line is this --  
3 you're correct in saying that if there's any  
4 difference between where I started and where I ended,  
5 we are capturing the whole history of the transient.  
6 We're capturing that whole temperature history. So,  
7 that's not an instantaneous thing that happens.

8 And so we can, number one, be confident  
9 for the rate of these transients that we're getting a  
10 good reading as far as, again, what matters to stress.  
11 And what matters to stress is not the absolute  
12 temperature. What matters to stress is the change in  
13 the temperature.

14 And as long as we've looked at the whole  
15 excursion of the temperature range we have the Delta-T  
16 that we need. And that was -- that's Step 1, but the  
17 only thing that we discussed yesterday is the fact  
18 that that is not the temperature history that's being  
19 used in the stress analysis.

20 These results -- and that's what is  
21 discussed in the calc note reference that I gave you.  
22 These results are then binned according to severity so  
23 that every transient that's tracked as far as its  
24 overall Delta-T goes is not analyzed for its actual  
25 Delta-T. It's binned in a higher Delta-T.

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1           For example, everything that's counted  
2           between a Delta-T of 320 degrees and, say, 300 -- I'm  
3           making this up, because I'm not looking at the  
4           calculation, would all be assigned a Delta-T of 320  
5           degrees in the stress analysis. And, again, the key  
6           here is, is that the stress range is a function of the  
7           temperature change. So, these conservatisms are  
8           sufficient to account for a small lag in a thermal  
9           couple reading.

10           JUDGE KENNEDY: All right. Dr. Lahey,  
11           response.

12           DR. LAHEY: Go ahead.

13           JUDGE KENNEDY: No, I --

14           DR. LAHEY: Well, my understanding of  
15           that, I, you know, I'm filtering it down to we don't  
16           do anything. And, you know, I'm used to whole  
17           international meetings dealing with the inverse  
18           problem. There's textbooks on, you know, and the  
19           entire purpose of the textbook is how to treat the  
20           inverse problem. And I'm hearing we didn't do that,  
21           I mean, even though we're well aware of the lag.

22           So, if you just forget about data to  
23           benchmark your prediction and you just use some sort  
24           of prediction and then put all that through your  
25           WESTEMS code, which they're apparently doing, it's

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1 really getting pretty far from reality. I mean, why  
2 not -- why not at some point benchmark your result?

3 I'm -- what I was trying to show yesterday  
4 with the nodalization is it's very unlikely that  
5 they're tracking sharp temperature change fronts. And  
6 if you're not, you're not predicting the right kind of  
7 thermal stress.

8 JUDGE KENNEDY: I need to do a memory  
9 check again. Dr. Lahey, I thought yesterday in this  
10 discussion of the analysis of the transients, the  
11 thermal hydraulic analysis of the transients --

12 DR. LAHEY: Right.

13 JUDGE KENNEDY: -- that you agreed that  
14 the methodology they were using to capture the  
15 transient, again, from an analysis standpoint, that  
16 that methodology was okay and that that data was then  
17 transferred into the WESTEMS code and the stress  
18 analysis performed, but I didn't hear yesterday that  
19 you had any concern with the thermal hydraulic  
20 analysis that developed the transient data.

21 Did I mishear you yesterday?

22 DR. LAHEY: All these documents are  
23 associated with specifying the transients. All right.  
24 And what I'm talking about is making measurements of  
25 the transients to verify or disprove what you're

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1 predicting. And you need to do the inverse problem in  
2 order to do that.

3 JUDGE KENNEDY: I think I'm losing focus  
4 here. We started with the thermal couple data --

5 DR. LAHEY: Yes.

6 JUDGE KENNEDY: -- which, as I understood  
7 it, was your concern over their use of plant data to  
8 characterize the transient that was of interest. In  
9 that case, it was the pressurizer surge line nozzle,  
10 I guess. So, we -- it appeared we tried to address  
11 that.

12 This seems to be branching back to where  
13 we were under Contention 26 about thermal hydraulic  
14 methods.

15 DR. LAHEY: I'm trying to clarify the  
16 record on Contention 26, yes.

17 JUDGE KENNEDY: In regard to what, sir?

18 DR. LAHEY: In regard to my concern over  
19 how they measure -- on this particular question, how  
20 they measure the fluid temperature as a function in  
21 time because you heard just now, yeah, we're aware of  
22 the lag, we take care of it.

23 JUDGE KENNEDY: Do you have a problem with  
24 them using the peak steady-state values, both the peak  
25 and the minimum? Is that what you're saying?

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1 DR. LAHEY: If they know for sure what the  
2 peak and the minimum is, if it's taken during a  
3 transient with no correction, I have a serious  
4 problem. If it's for a long period of time and they  
5 know for sure what it is, that seems okay.

6 JUDGE KENNEDY: I'm going to ask Mr. Gray  
7 to verify this, but I understood him to say they take  
8 all of the transient data under consideration during  
9 the event.

10 Mr. Gray, can we go back to the transient  
11 data again?

12 MR. GRAY: Um --

13 JUDGE KENNEDY: The plant data.

14 MR. GRAY: Okay. The plant data that we  
15 get from the plant computer, number one, just to  
16 reiterate, we can have high confidence in that data.  
17 It's calibrated for the plant to use to run the plant,  
18 number one. So, this thermal couple data isn't  
19 something that is that much in question.

20 Number two, if we had an infinite decimal  
21 transient that occurred in the fluid, this lag could  
22 be a concern. Transients don't happen that way in  
23 plants. And this lag will occur in thermal couple,  
24 that's true.

25 But as you have said, if I have the

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1 temperature at the beginning and I have the  
2 temperature at the end and this is a transient that  
3 occurs over minutes, I will get that -- the maximum  
4 temperature change in the fluid.

5 That's reflected in the thermal couple  
6 data. There's nothing wrong with that. That's  
7 standard practice in interpreting the plant data. If  
8 I was trying to solve a fluids problem and I wanted  
9 very precise numbers, then I might do something more  
10 sophisticated.

11 We're trying to solve a stress problem and  
12 we're trying to use inputs that are comparable to the  
13 inputs that we use in our current licensing basis  
14 calculations to get stress. So, these are the  
15 temperature changes, for example, that you see at the  
16 regenerative heat exchanger outlet temperature.

17 These are used to run the plant. They're  
18 also sufficient for us to look at the temperature  
19 change, because it's the temperature change that  
20 influences the stress analysis.

21 When you do stress analysis, that's what  
22 you're concerned about. That stress range, that's a  
23 function of the change in the temperature. So, we  
24 haven't done anything abnormal or anything that's not  
25 typically done in the industry to calculate a linear

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1 elastic stress range according to the ASME code,  
2 number one.

3 Number two, I think there's still a  
4 misunderstanding of how the different pieces of the  
5 program were used. And the only thing that the  
6 thermal hydraulic model was used for was to process  
7 this temperature sensor data and to characterize it  
8 into bins of maximum Delta-Ts. That's all.

9 After that, those cycles that were counted  
10 with those maximum Delta-Ts were applied  
11 conservatively to the stress model, which includes  
12 various zones in the model that see different  
13 temperatures. That's done with a transfer function  
14 approach to get the stress in the component.

15 That stress is also then a function not  
16 only of the actual temperature differences for every  
17 cycle that was noted in the history that we got from  
18 the plant data, but all of those cycles that occur  
19 over a certain Delta-T range are all assigned a Delta-  
20 T of the highest range in that bin.

21 This is a very conservative way to do  
22 analysis. And this gives you maximum stress ranges  
23 that, in turn, are used in the fatigue usage  
24 calculation.

25 JUDGE KENNEDY: All right. Thank you.

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1 Dr. Lahey, I'll allow you to respond if you'll limit  
2 your response to --

3 DR. LAHEY: How long?

4 JUDGE KENNEDY: -- the use of thermal  
5 couple data --

6 DR. LAHEY: Yes, Your Honor.

7 JUDGE KENNEDY: -- in the manner that Mr.  
8 Gray just described.

9 DR. LAHEY: Sure. And the essence of the  
10 disagreement with one of his statements is we're  
11 trying to solve a stress problem, not a fluids  
12 problem, all right.

13 The problem is you can't decouple them.  
14 If you get your thermal hydraulics forcing function  
15 wrong, you get your stress result wrong. You just  
16 can't simply be sloppy in one and precise in the  
17 other. You have to be precise in both. So, that's  
18 the essence of the disagreement.

19 JUDGE KENNEDY: Does this take us back to  
20 the disagreement we had yesterday about the bulk  
21 temperature to surface temperature Delta-T, or is it  
22 more complicated than that?

23 DR. LAHEY: Well, one of the non-  
24 conservatisms is, in fact, how they treat their heat  
25 transfer coefficient and not including the developing

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1 part of the thermal boundary layer and the  
2 nodalization that they use.

3 I mean, the data that he's talking about,  
4 the process data has lags right in it. I mean, it's  
5 not really what the transient is. If it's a very slow  
6 transient, it's not bad. If it's a very rapid  
7 transient, it's terrible.

8 JUDGE KENNEDY: Would you like to put a  
9 time frame on very slow and very rapid, please? What  
10 would very rapid be to you?

11 DR. LAHEY: In seconds.

12 JUDGE KENNEDY: What would very slow be  
13 then?

14 DR. LAHEY: Very slow. Hours, I mean, you  
15 know, things that go on for a long time. Everything  
16 reaches equilibrium. If you go through a lot of the  
17 kind of transients that give you the biggest loading,  
18 you know, from the thermal hydraulics point of view,  
19 they're fairly fast transients.

20 JUDGE KENNEDY: What would be an event  
21 that would operate on the seconds time frame? What  
22 sort of accident will we be talking about?

23 DR. LAHEY: What sort of accident, you're  
24 asking?

25 JUDGE KENNEDY: Is it a loss of coolant

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1 accident? is it a reactor coolant pump trip? Is it  
2 a steam line break? Is it a --

3 DR. LAHEY: Well, you -- a number of  
4 things can happen fairly rapidly. Scrams happen  
5 rapidly. So do breaks, if you're interested in that,  
6 but I'm more interested here in the kind of -- they  
7 have a whole bunch of different transients that they  
8 analyze to come up with the net fatigue of a  
9 particular component.

10 So, if you're looking at, for example, the  
11 coarse spray line nozzle, then these events, they go  
12 on and off. Every time you're changing the pressure,  
13 you want to reduce the pressure, the spray will go on.  
14 And then if that's under control, it goes off and you  
15 go back and forth. And those are fairly rapid events.

16 JUDGE KENNEDY: All right. Thank you.  
17 Just one for clarification, the discussion that we  
18 just had about the thermal hydraulics calculation in,  
19 I assume, the WESTEMS code, is that the discussion  
20 that we had yesterday about the boundary layer in the  
21 front?

22 DR. LAHEY: Yes, sir.

23 JUDGE KENNEDY: So, we've taken a lot of  
24 testimony yesterday on this topic.

25 DR. LAHEY: But I wanted to clarify the

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1 record, because it sounded like at the end that we  
2 were told that don't worry about all this heat  
3 transfer stuff, you know, that isn't really the way we  
4 do it. But when I look back at all the documents that  
5 they quoted, that's the way they do it. On top of it,  
6 they get in there and specify what the transients are.

7 JUDGE KENNEDY: I'm sorry, is there  
8 something wrong with them specifying the transients?

9 DR. LAHEY: No.

10 JUDGE KENNEDY: Oh, okay.

11 DR. LAHEY: You have to determine the  
12 transients. I don't have any problem with that. I  
13 have a problem with saying that takes care of the  
14 issues that I had raised. It does not.

15 JUDGE KENNEDY: Okay. I just want to make  
16 sure I understood what you meant. Thanks.

17 MR. AZEVEDO: Your Honor, this is Nelson  
18 Azevedo. May I add just one additional point?

19 JUDGE KENNEDY: I'll take one more, sure.

20 MR. AZEVEDO: The primary load for the  
21 pressurizer surge line for the pipe is the Delta-T  
22 between the top of the pipe and the bottom of the  
23 pipe.

24 So, even if you were to assume that these  
25 RDDs lag by, say, a few seconds, you wouldn't expect

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1 that to have any measurable impact on the Delta-T from  
2 the top of the pipe to the bottom of the pipe.  
3 Because whatever the lag is for one, should be the  
4 same -- roughly the same for the others.

5 So, again, the primary load is the Delta-T  
6 between the top of the pipe and the bottom of the  
7 pipe, which introduce a bending moment, and I just  
8 don't see how this will have any measurable impact on  
9 that parameter.

10 JUDGE KENNEDY: All right. Thank you, Mr.  
11 Azevedo.

12 MR. GRAY: Your Honor, may I add one  
13 thing, too? This is Mark Gray for Entergy.

14 JUDGE KENNEDY: One last remark.

15 MR. GRAY: Okay. I think it's still very  
16 important to understand and I don't think it's fully  
17 understood how these things are being used, but the  
18 temperature load that's used in the stress analysis is  
19 not the identical temperature that's read from the  
20 plant computer data. It's more severe, it's more like  
21 a design transient, it still uses conservative heat  
22 transfer coefficients barring the other discussion,  
23 which I won't go back to.

24 And so, the bottom line is we are not  
25 using the actual temperature measurements in time that

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1 are gathered from that to feed that thermal hydraulic  
2 model to load the stress analysis. That's just not  
3 true. We are using something more conservative in  
4 these Delta-T bins.

5 JUDGE KENNEDY: And where does that Delta-  
6 T come from?

7 MR. GRAY: The Delta-T is what we get by  
8 binning the read temperatures. So, it's the  
9 temperature change that's important here.

10 JUDGE KENNEDY: The plant data.

11 MR. GRAY: And it doesn't occur -- these  
12 are not scrams. These are not, you know, high-rate  
13 transients, for example, in the charging line. This  
14 is a heat exchanger.

15 I turn off the letdown, the charging  
16 temperature responds -- it's a heat exchanger curve.  
17 We all have seen those and it's not fast. It's  
18 relatively slow. It's not seconds even though it is  
19 then analyzed in seconds.

20 JUDGE KENNEDY: All right. Thank you.

21 CHAIRMAN McDADE: Okay. Thank you. I  
22 think that takes care of our discussion there.  
23 Getting back to 38, I've got a question, Dr. Duquette.

24 I don't want to get into a discussion of  
25 the steam generator AMP. That's been handled by a

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1 joint stipulation which I should note was Entergy  
2 Exhibit 700, but there are some questions that I had.

3 You indicated that at Indian Point steam  
4 generators with a number of plugged tubes may be more  
5 susceptible to PWSCC than French reactors. But in the  
6 15 years of operation, the steam generator at Indian  
7 Point had only 48 out of approximately 13,000 tubes  
8 blocked.

9 Why would this be of a consequence? How  
10 would this affect the susceptibility to PWSCC?

11 DR. DUQUETTE: It's certainly not going to  
12 affect the susceptibility of PWSCC in the divider  
13 plate. It has to do with whether or not the crack  
14 will progress to the interface between the -- well,  
15 the diluted weld, the tube-to-tubesheet weld is the  
16 area that would be affected most.

17 And I was not aware of those statistics.  
18 And having heard them, I probably would back away from  
19 my testimony on that issue.

20 CHAIRMAN McDADE: Okay. Thank you. Just  
21 to clarify in that discussion, the discussion of AVB  
22 wear and TSP wear, Entergy, could you explain to me  
23 just very briefly what AVB wear and TSP wear is?

24 MR. DOLANSKY: This is Bob Dolansky with  
25 Entergy. Just to make sure it's very clear, that's

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1 Alpha Victor Bravo, AVB. And Tango Sierra Papa, TSP.

2 CHAIRMAN McDADE: Yes.

3 MR. DOLANSKY: AVB stands for anti-  
4 vibration bar. At the top of the tubes they bend over  
5 their U-tubes. So, at the top in the U-bend area they  
6 go through a final support plate. And then in the U-  
7 bend area they're not supported by a support plate.  
8 Instead they are supported by anti-vibration bars,  
9 which are inserted between the tubes to make sure that  
10 they don't vibrate too much.

11 TSP is tube support plate. So, as you go  
12 up from the tubesheet up the straight length of the  
13 tubes on both the hot and cold side of the steam  
14 generator, it goes through tube support plates. Those  
15 plates are placed every so often to provide support to  
16 the tubes. So, that's how the straight portion of the  
17 tube is kept from vibrating, and the AVB is how the U-  
18 tube portion of the tube is kept from vibrating.

19 CHAIRMAN McDADE: Okay. Thank you.

20 Dr. Hopenfeld.

21 DR. HOPENFELD: Can I make a comment with  
22 respect to just the last sentence before I forget?

23 CHAIRMAN McDADE: I'm sorry, Dr.  
24 Hopenfeld. You've got to move to the microphone. I  
25 couldn't hear you.

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1 DR. HOPENFELD: Yeah. Can I make a  
2 comment with respect to the vibration that he's  
3 talking about, I believe, is under normal operating  
4 conditions. I don't believe that the AVBs there can  
5 really -- were really designed to withheld the steam  
6 line break kind of vibration that you can get.

7 CHAIRMAN McDADE: Okay. Thank you.

8 Dr. Hiser, at one point, specifically  
9 Question 141 of your testimony, NRC 161, you used the  
10 term "verification inspection." I just want to make  
11 sure I understand what you mean by the term  
12 "verification inspection."

13 (Pause.)

14 CHAIRMAN McDADE: This is on Page 81 of  
15 your pre-file testimony, Question 141 -- or Answer  
16 141, fourth line down. You use the term "verification  
17 inspection."

18 And, again, it's just I want to make sure  
19 I understand is that a term of art or how exactly is  
20 that used?

21 DR. HISER: Actually, I believe it's Page  
22 61.

23 CHAIRMAN McDADE: Page 61, yes.

24 DR. HISER: Okay. The verification  
25 inspection is just an inspection to verify the

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1 effectiveness of the water chemistry program. So,  
2 it's not really a term of art. It's just the way that  
3 we laid the words out in that response.

4 CHAIRMAN McDADE: Okay. Thank you. Okay.  
5 Dr. Lahey, you submitted testimony that was critical  
6 of the inspection methodology acceptance criteria and  
7 corrective action criteria for divider plates.

8 In light of the testimony you've heard so  
9 far, is there anything you wish to say to elaborate on  
10 that testimony?

11 DR. LAHEY: Your Honor, I'm more concerned  
12 with the tube-to-tubesheet welds. The issue that I  
13 was concerned with is the safety issue, which we  
14 talked about before. And it has to do with the -- how  
15 the impact loads are calculated. We never get any  
16 information on that and it's very important how they  
17 do that.

18 CHAIRMAN McDADE: Okay. Dr. Kennedy, do  
19 you have some questions of Dr. Hopenfeld?

20 JUDGE KENNEDY: Yes, I have a couple  
21 questions, just loose ends that are dangling around on  
22 38. I'm going to address the first question to  
23 Entergy, but it's really a Dr. Hopenfeld question.

24 In the supporting testimony for Contention  
25 38, Dr. Hopenfeld asserts that the scope of metal

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1 fatigue analysis should be extended into the steam  
2 generator. And I guess first I'd like to ask Entergy,  
3 is metal fatigue a concern in the steam generator  
4 components internal? I'm assuming you mean its  
5 internals. And if not, why not?

6 MR. AZEVEDO: This is Nelson Azevedo for  
7 Entergy. Yes, Your Honor, the steam generators were  
8 analyzed for fatigue. In fact, there are fatigue  
9 locations in our reports.

10 JUDGE KENNEDY: So, they were analyzed.

11 MR. AZEVEDO: Yes.

12 JUDGE KENNEDY: So, they are -- does that  
13 mean they're within the scope of the fatigue  
14 monitoring program?

15 MR. AZEVEDO: They are within the scope of  
16 the fatigue monitoring program. Let me just remind  
17 you, though, that the secondary side does not see  
18 primary coolant. So, the Fen issue that we've been  
19 discussing does not apply to the secondary side.

20 JUDGE KENNEDY: So, you wouldn't apply the  
21 Fen factor to the secondary side components.

22 MR. AZEVEDO: That's correct, because  
23 that's a primary water side issue.

24 JUDGE KENNEDY: All right. Dr. Hopenfeld,  
25 this is the extension into the steam generator, the

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1 metal fatigue calculations.

2 DR. HOPENFELD: Sir, I would like to have  
3 an opportunity, also make a comment regarding the H  
4 factor because it's extremely important maybe later  
5 on, just the H factor that was just discussed a few  
6 minutes ago.

7 JUDGE KENNEDY: Can we close out this item  
8 and --

9 DR. HOPENFELD: Yeah, okay.

10 JUDGE KENNEDY: Do you have any additional  
11 concerns about metal fatigue in the steam generator  
12 and whether --

13 DR. HOPENFELD: Well --

14 JUDGE KENNEDY: -- it's being managed for  
15 aging?

16 DR. HOPENFELD: Yes, because metal fatigue  
17 has been experienced in a feed line break. It has  
18 been experienced in tubes on the top, the U-bands.  
19 And obviously those tubes sit in water. They don't  
20 sit in air. So, the same correction factor has to be  
21 applied.

22 The fact that the water is not radioactive  
23 is completely immaterial. What affects the ASME code  
24 does not take in effect of the environment, doesn't  
25 take effect in water.

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1           So, that's what the NRC in 1996 or  
2 whatever came up with the recommendation or with the  
3 requirement that they include correction for the  
4 environment. Why not do it to the secondary side  
5 where this is the most important part of the plant  
6 safety wise?

7           Most of the accidents we have, they were  
8 initiated in the secondary side. Most of the damages  
9 that we -- or leaks that we have on the secondary  
10 side.

11           JUDGE KENNEDY: So, your concern -- is  
12 your concern with the need to apply Fen factors to --

13           DR. HOPENFELD: Absolutely.

14           JUDGE KENNEDY: -- the secondary side?

15           DR. HOPENFELD: That's my whole thing.  
16 They have to apply that. Otherwise this is not a  
17 fatigue program. This is something else, but it's not  
18 a fatigue program.

19           JUDGE KENNEDY: I guess --

20           DR. HOPENFELD: I would just want you to  
21 understand there's absolutely no reason to -- just the  
22 fact that the water is radioactive in one side and the  
23 other one isn't, that's just has nothing to do with  
24 crack propagation or leakage or anything.

25           JUDGE KENNEDY: Well, let's see what we

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1 can find out here. I see the NRC in front of us.  
2 Your recommendation was to apply the Fen factors to  
3 the metal fatigue calculations.

4 Why are they not applied -- or should they  
5 be applied to the secondary side components?

6 MR. STEVENS: This is Gary Stevens of the  
7 NRC staff. Our guidance is clear that the Fen  
8 evaluations are limited to reactor coolant pressure  
9 boundary components.

10 JUDGE KENNEDY: So, is it the fact that  
11 the function is pressure boundary components, or the  
12 fact that they are subjected to a water environment  
13 that's on the primary side of the reactor coolant  
14 system?

15 MR. STEVENS: It's reactor coolant  
16 pressure boundary.

17 JUDGE KENNEDY: That is a pressure  
18 boundary.

19 MR. STEVENS: Correct.

20 JUDGE KENNEDY: So, in the case that Dr.  
21 Hopenfeld mentioned about the U-tube region of the  
22 steam generator tubes, would that constitute a reactor  
23 coolant system pressure boundary?

24 MR. STEVENS: This is Gary Stevens of the  
25 staff. I'm going to defer to one of my colleagues,

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1 because I'm not a steam generator expert.

2 MR. AZEVEDO: Your Honor, may I correct  
3 something I said before? I've been corrected. The  
4 Fens have been applied to all CUFs. I misspoke  
5 before.

6 JUDGE KENNEDY: Both primary and  
7 secondary?

8 MR. AZEVEDO: That is correct.

9 CHAIRMAN McDADE: Thank you, Mr. Azevedo.

10 JUDGE KENNEDY: Let's go to Mr. Hopenfeld  
11 then. Dr. Hopenfeld.

12 DR. HOPENFELD: I would like to understand  
13 that. I haven't seen any Fen correction into the  
14 secondary side. Would you please provide us with some  
15 reference to it?

16 There are references on the primary side,  
17 but there was nothing on the secondary side. They  
18 kept repeating in the testimony, this is brand now.  
19 they kept repeating in the testimony that they're not  
20 doing the secondary side.

21 JUDGE KENNEDY: Let's give Mr. Azevedo a  
22 chance to respond to that.

23 MR. GRAY: This is Mark Gray on --

24 JUDGE KENNEDY: Or Mark Gray.

25 MR. GRAY: -- behalf of Entergy. In the

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1 process of addressing the RAIs on the environmental  
2 fatigue, Entergy did do a screening process to  
3 determine limiting locations. And that was applied to  
4 all of the CLB locations that had a fatigue usage  
5 calculation.

6 So, even though I agree with Mr. Stevens  
7 that the regulation does not apply to secondary side  
8 components, because these had a CLB, Entergy also  
9 included those steam generator locations that had a  
10 CUF calculation in the screening process to determine  
11 the limiting locations for environmental fatigue.

12 JUDGE KENNEDY: Is there an exhibit within  
13 the testimony that --

14 MR. GRAY: Yes.

15 JUDGE KENNEDY: -- you would point to for  
16 that?

17 MR. GRAY: As soon as I put my glasses on.  
18 Wait a second. That's Entergy 683.

19 JUDGE KENNEDY: All right. Thank you.  
20 Dr. Hopenfeld --

21 DR. HOPENFELD: Yes.

22 JUDGE KENNEDY: -- did you hear the  
23 citation?

24 DR. HOPENFELD: I'm sorry?

25 JUDGE KENNEDY: Did you hear the citation

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1 that Mr. Gray gave?

2 DR. HOPENFELD: No, I didn't. I heard  
3 what he said that they did the CUFs for the secondary  
4 side.

5 JUDGE KENNEDY: Entergy 683 is what he's  
6 referring to.

7 DR. HOPENFELD: I don't -- I'll have to  
8 check. I don't --

9 JUDGE KENNEDY: I understand.

10 DR. HOPENFELD: I don't have it in my  
11 mind. But what I would like to say that I brought up  
12 this issue of effect of geometry change and the stress  
13 concentration. This is more important on the  
14 secondary side, because it's all over, because it is  
15 subjected to FAC.

16 And those of you that were at the FAC  
17 hearing, you saw what kind of surfaces we have there,  
18 what kind of geometry changes we have there. So, I  
19 haven't seen any calculation to indicate that that was  
20 taken in account.

21 Now, when the plant was designed, they  
22 didn't have any geometry changes on the secondary  
23 side.

24 JUDGE KENNEDY: I guess I'll turn to  
25 Entergy. I thought I heard either earlier today or

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1 yesterday in regard to stress concentration factors  
2 that geometry changes were the major consideration in  
3 the application of this concentration package.

4 Is that still true?

5 MR. AZEVEDO: Well, yeah. I think we're  
6 talking about different geometry changes, though. The  
7 geometry changes that I was talking about was going  
8 from a thin section to a thick section, for example.  
9 That's a geometry change.

10 I believe the geometry change that's being  
11 discussed now is changes from the way the plant was to  
12 what it is currently. So, the thicknesses changed  
13 over time perhaps as a result of phenomena like flow  
14 accelerator corrosion or some other phenomena. I  
15 believe that's what's being discussed right now.

16 JUDGE KENNEDY: Would that be a situation  
17 where the stress concentration factors would be  
18 applicable?

19 MR. AZEVEDO: Well, let me just say that  
20 the -- if we are talking about flow accelerator  
21 corrosion, which I don't know that we are, but if we  
22 are, first of all, this was discussed during the flow  
23 accelerator corrosion issue, but that is only  
24 applicable to balance-of-plant piping. And that  
25 piping was not designed to the same requirements as

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1 the piping that we've been discussing, the components  
2 we've been discussing.

3 So far the fatigue calculation that we've  
4 been discussing are mandated by ASME Section 3. The  
5 balance-of-plant piping that would be susceptible to  
6 flow accelerator corrosion, that's designed to a P31.1  
7 code, which is totally different, does not require an  
8 explicit fatigue analysis. Fatigue cycles are handled  
9 differently by stress reduction factors and that is a  
10 totally different type of analysis.

11 JUDGE KENNEDY: I appreciate that, Mr.  
12 Azevedo. I was presuming we were talking about metal  
13 fatigue.

14 Dr. Hopenfeld, were you addressing that in  
15 regard to metal fatigue?

16 DR. HOPENFELD: Yeah, I was addressing  
17 metal fatigue. I'll give you an example so maybe you  
18 can see where I'm coming from. Let's say just off the  
19 top of my head, let's say that the J-tube, that would  
20 be a good example, because the flow comes in there  
21 high velocity and turns around and it starts eroding  
22 around the band.

23 So, you have high erosion and you have  
24 very abrupt changes in the --- around the band in the  
25 surface in the thickness. These are concentration

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1 factors that has to be taken in account.

2 Another affect, which I didn't know until  
3 we had the meetings last -- two years ago, that some  
4 of the components they have, have extremely huge  
5 imperfection on the surface. I think it was called  
6 dilation, but they were huge, which we were told that  
7 they accept -- they escaped the initial screening and  
8 they were in the plant.

9 Because when I brought up the question of  
10 that this was a result of corrosion, say, no, that's  
11 the way that we got it from the factory. We just  
12 didn't catch it in time. NRC didn't catch it either,  
13 but there wasn't one component. There were several.

14 Now, these are concentration factors. You  
15 have to take into account when they designed the  
16 plant, they didn't know that they had all these  
17 components with dilation to them.

18 JUDGE KENNEDY: Are these components  
19 within the scope of license renewal, Dr. Hopenfeld?

20 DR. HOPENFELD: Well, they're on the  
21 secondary side.

22 JUDGE KENNEDY: Are they within the scope  
23 of license renewal?

24 DR. HOPENFELD: I think anything that is  
25 metal fatigue, wouldn't that be a scope or a license

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1 -- anything metal fatigue, in my mind, is a scope --  
2 within the license renewal.

3 JUDGE KENNEDY: I'm not sure, but I think  
4 Entergy knows. Mr. Azevedo, let's just take the J-  
5 tubes. Would they be within the scope of license  
6 renewal for Indian Point? Do you have J-tubes?

7 MR. AZEVEDO: Your Honor, this is Nelson  
8 Azevedo. Yeah, we do have J-tubes. They are part of  
9 the steam generator. So, I would consider part of  
10 license renewal.

11 JUDGE KENNEDY: So, they're within the  
12 scope.

13 MR. AZEVEDO: Yes.

14 JUDGE KENNEDY: Do you have a response to  
15 Dr. Hopenfeld's concern about these factors?

16 MR. AZEVEDO: The only thing I can say is,  
17 you know, the J-tubes are part of the secondary side  
18 of the steam generators. They're managed by the steam  
19 generator program. We do, do periodic inspections.  
20 We have no indication there was any significant  
21 degradation going on. And I'm not sure what else I  
22 can say.

23 JUDGE KENNEDY: What sort of aging  
24 mechanisms are accounted for in the steam generator  
25 program? What sort of effects are looked for?

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1 MR. COX: This is Alan Cox. The typical  
2 aging effect for the secondary side where you don't  
3 have to deal with the effects of radiation would be  
4 loss of material and cracking due to various  
5 mechanisms.

6 JUDGE KENNEDY: All right. Thank you.

7 DR. HOPENFELD: Can I make one comment  
8 here?

9 CHAIRMAN McDADE: Dr. Hopenfeld.

10 DR. HOPENFELD: I hear that the answer is  
11 that this is managed by a different program. Stress  
12 corrosion cracking is managed by a different program.  
13 Metal fatigue is a different program. These programs  
14 are related. They are not completely unrelated. A  
15 crack doesn't know whether it's stress corrosion was  
16 designated in one program or fatigue in another  
17 program.

18 The same thing, the J-tube doesn't know  
19 that they have been divided. It's a system. It's a  
20 management kind of thing that you have to look at the  
21 whole entire plant, not just in pieces here and there.  
22 That's why things falling in between the cracks.

23 MR. DOLANSKY: Judge Kennedy, this is Bob  
24 Dolansky.

25 JUDGE KENNEDY: Mr. Dolansky.

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1 MR. DOLANSKY: Can I just state something,  
2 please?

3 JUDGE KENNEDY: Go ahead.

4 MR. DOLANSKY: Bob Dolansky for Entergy.  
5 I'm not sure about the metal fatigue part, but I can  
6 tell you like if we talk about J-tubes in the steam  
7 generators, this last outage at each steam generator  
8 we went into the secondary side of the steam  
9 generator, we performed video inspections of the  
10 inside of the J-tubes on a representative sample of  
11 the J-tubes, and we did not see any evidence of any  
12 kind of corrosion or erosion or any evidence of any  
13 cracking in the J-tubes.

14 JUDGE KENNEDY: Okay. Thank you.

15 CHAIRMAN McDADE: Dr. Lahey, you had an  
16 issue?

17 DR. LAHEY: Yes. While we're talking  
18 about steam generators and fatigue, New York State  
19 000559 is a -- and Table 4.3-10, that's a part of the  
20 Indian Point license renewal application. And in this  
21 table, the -- for IP3 the CUF, it's not designated as  
22 CUFen, but it's the CUF, is 1.0 for the main feedwater  
23 nozzle.

24 Now, it's our understanding that when the  
25 -- when something reaches 1.0, then action has to be

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1 taken, but we have heard nothing more about this. And  
2 so, it's not clear to us where that stands. And it's  
3 an important thing, because it can induce all kinds of  
4 other problems if it breaks.

5 MR. COX: This is Alan Cox for Entergy.  
6 I just want to point out that the CUF, the C-U-F, has  
7 not reach 1.0. If every transient that's counted and  
8 considered in that analysis reached its assumed value,  
9 then you would reach 1.0. You still would not have  
10 exceeded 1.0, but that -- if that was to happen at  
11 all, it would be very near the end of the PEO and  
12 we're monitoring the number of those transients to  
13 ensure that they don't exceed those numbers.

14 CHAIRMAN McDADE: Okay. Dr. Hopenfled, go  
15 ahead.

16 DR. HOPENFELD: You have one. It's  
17 physically impossible that it's not going to be at  
18 least 10001 if we put -- if you put the correction  
19 factor.

20 If you look at the equation I have  
21 somewhere, the CUFen, the corrected CUF, it is  
22 multiplied by Fen, which is always more than one. So,  
23 if you look at that one, it's, you know, it's all  
24 probably two or three.

25 MR. AZEVEDO: Judge Kennedy, may I step in

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1 for a second?

2 JUDGE KENNEDY: Please.

3 MR. AZEVEDO: I don't have the exhibit  
4 here in front of me, but I can tell you for the  
5 feedwater nozzles, what we did was we calculated --  
6 the feedwater nozzles are different from the other  
7 components. What controls is the number of hours in  
8 standby where you're at aux feedwater, you have the  
9 cold feedwater going in and the hot feedwater coming  
10 out. And so, that number that you talked about gave  
11 us the allowable number of hours, which we now track.

12 So, that gives us the allowable number of  
13 hours that we can operate in Mode 2. So, obviously if  
14 we approach that, we will have to redo the  
15 calculation, but that's the reason why you'll see a  
16 high CUF to give us the highest number of allowable  
17 hours.

18 JUDGE KENNEDY: Just going back to the  
19 testimony yesterday, and I guess this -- I don't want  
20 to get into a discussion about whether it's 1.001 or  
21 -- but yesterday the testimony was that all CUFs in  
22 the plant are less than one.

23 I mean, I don't know if your -- I guess  
24 what I'm curious is what does that mean in the context  
25 of now in covering a component with a CUF of one, are

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1 there others that are higher?

2 And I do recognize that we're not at the  
3 end of life yet, but --

4 MR. AZEVEDO: I, you know, the allowable  
5 is 1.0 or less. So, 1.0 would still be accepted.  
6 Again, I don't have the actual list in front of me,  
7 but I believe the feedwater nozzle is the special  
8 case.

9 JUDGE KENNEDY: Yeah, I guess I'm just  
10 being a little sensitive to yesterday we heard a  
11 couple of individuals quote numbers that all CUFs for  
12 Indian Point 2 and 3 are less than one. And I'm just  
13 wondering how we reconcile that with this.

14 MR. O'NEILL: Your Honor, this is Mr.  
15 O'Neill. Is there any way we could pull this exhibit  
16 up just so the witnesses could see it?

17 JUDGE KENNEDY: That's a good point. I'm  
18 sure we can.

19 MR. O'NEILL: I believe this, and Dr.  
20 Lahey can correct me if I'm wrong, did you say it was  
21 New York State 00559?

22 DR. LAHEY: Until now, what we have heard  
23 is we fight hard to -- as they get darn close to 1.0,  
24 to keep below 1.0, because 1.0 is the action point.  
25 So, this seems like 1.00.

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1 JUDGE WARDWELL: If I understand you  
2 correctly, Mr. Azevedo, are you saying that from this  
3 table, 4.3-10, that the way you handle main feedwater  
4 nozzle is you set the cumulative use factor to one,  
5 calculate out the number of hours that it can be  
6 operated, because it is on standby a lot, and then  
7 you're tracking those hours to make sure it stays  
8 below that number of hours that is designated by the  
9 1.0?

10 MR. AZEVEDO: Well, yes. The only thing  
11 I need, I need to verify is whether we in fact set it  
12 to 1.0 or some other number. I will need to verify  
13 that, but that's -- in essence, that's correct.

14 MR. TURK: This is Sherwin Turk. I hope  
15 I don't mess this up, but my notes indicate --

16 CHAIRMAN McDADE: Me too.

17 MR. TURK: Pardon me?

18 CHAIRMAN McDADE: Me too.

19 MR. TURK: Early in the discussion  
20 yesterday, I don't know if this is the testimony  
21 you're thinking of, but I believe it was Mr. Gray --  
22 or, I'm sorry, Mr. Cox who said the limit is 1.0 and  
23 the recalculated number can be up to that number.

24 MR. SIPOS: Excuse me, Your Honor. This  
25 is John Sipos from the State of New York. I have --

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1 I'm going to object to what Mr. Turk is doing right  
2 now.

3 MR. TURK: I'm reading my notes, Mr.  
4 Sipos. You can read yours.

5 CHAIRMAN McDADE: The objection is noted.  
6 The objection is overruled. I will allow Mr. Turk to  
7 continue.

8 MR. TURK: I can't speak for the  
9 witnesses, Your Honor. There may be some other  
10 testimony as well.

11 CHAIRMAN McDADE: What's your point, Mr.  
12 Turk, succinctly?

13 MR. TURK: I was trying to -- because we  
14 don't have daily transcripts here, I was trying to  
15 determine what was said actually yesterday.

16 CHAIRMAN McDADE: Okay. And the witnesses  
17 can correct me as --

18 MR. COX: This is Alan Cox with --

19 CHAIRMAN McDADE: Judge Kennedy indicated  
20 that his recollection is that the testimony was that  
21 all of the CUFs were below one. I don't recall what  
22 I had heard, but I had recalled seeing this particular  
23 table, 4.3-10, and the 1.0.

24 And whatever was said, what I had heard  
25 was that it was one or below. And that's the

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1 testimony of Mr. Nelson Azevedo that you viewed it as  
2 1.0 was within spec.

3 MR. AZEVEDO: That's correct, Your Honor.

4 CHAIRMAN McDADE: And I just -- and just  
5 to clarify in response to Judge Wardwell's question  
6 that this is something that would be monitored, you  
7 know, since this is not in use constantly that you  
8 would monitor the number of hours that it would be  
9 used to make sure that, in fact, those number of hours  
10 were not exceeded and, therefore, the CUF did not go  
11 above 1.00.

12 MR. AZEVEDO: That's correct.

13 CHAIRMAN McDADE: Okay.

14 MR. O'NEILL: Your Honor, this is Mr.  
15 O'Neill. I just think we also need to be mindful of  
16 the context in which those discussions may have  
17 occurred. This appears to be the original LRA, right?  
18 And that number --

19 CHAIRMAN McDADE: Excuse me.

20 MR. O'NEILL: Okay.

21 CHAIRMAN McDADE: You talk to us, and then  
22 we'll talk to them.

23 MR. O'NEILL: Okay. Thanks, Your Honor,  
24 but I just want to emphasize that this appears to be  
25 the original LRA. And the discussion yesterday may

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1 have been taking place in the context of, you know,  
2 re-analyses, CUFen analyses that were done  
3 subsequently with respect to a primary side, you know,  
4 pressure boundary components and perhaps not secondary  
5 side components as addressed in the original LRA.

6 CHAIRMAN McDADE: I believe it was  
7 broader, but I think that the testimony of Mr. Azevedo  
8 today clarifies what the position is of Entergy.

9 So, at this point the Board has basically  
10 run out of questions. We have answered those  
11 questions that we had, clarified what we thought  
12 needed to be clarified, which then brings us back to  
13 the question that I posed at the beginning of today's  
14 session. And, again, focusing on the limitations that  
15 I put there of additional questions to correct or  
16 clarify testimony by your own witness that would  
17 otherwise be both material and misleading, or to point  
18 out testimony of opposing parties' witnesses that was  
19 incorrect or misleading and that has not already been  
20 inquired into or otherwise addressed by the Board.

21 With that limited universe, does Entergy  
22 have additional questioning that they feel is  
23 appropriate at this time?

24 MR. BESSETTE: Your Honor, we do  
25 appreciate the opportunity. We believe the board has

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1 done some thorough interrogation of the witnesses. We  
2 would have just a couple of wrap-up questions, but we  
3 would suggest if we could just have even just 20  
4 minutes to caucus. We were doing our homework at  
5 lunch.

6 If that would be appropriate, again, I  
7 think it would be a matter of minutes.

8 CHAIRMAN McDADE: Okay. And from New  
9 York, what's your view?

10 MR. SIPOS: All right. This is going to  
11 take a little while. John Sipos, State of New York.  
12 I'd like to review what has happened in this  
13 proceeding with Track 1 and Track 2.

14 In Track 1 on August 8, 2012, the State of  
15 New York filed a motion for cross examination. It was  
16 over the objection of the other -- the applicant and  
17 the federal regulator. And that was pursuant to  
18 Atomic Energy Act Section 274(1).

19 Your Honors and the Commission allowed  
20 limited attorney questioning at Track 1. There was an  
21 opportunity for the parties to file a request either  
22 under Part 2, or under the Atomic Energy Act, again,  
23 Section 274. And 274 is a specific reg for a  
24 sovereign state such as New York.

25 New York did not file such a motion. No

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1 other party filed such a motion. There was even a  
2 gentle reminder from the Board in one of the  
3 scheduling notes in September, I believe.

4 So, the State is surprised that at this  
5 late time in this Track 2 hearing on the fourth day of  
6 the hearing, there is now a suggestion that the  
7 parties could conduct cross examination or examination  
8 of their own witnesses or follow-up examination of  
9 other parties' witnesses. So, the State has a very  
10 serious concern and objection as to that.

11 CHAIRMAN McDADE: Okay. Mr. Sipos, during  
12 the Track 1 contentions, the Board allowed basically  
13 what I was just suggesting today at the request of New  
14 York. And New York not only had no objection, it, in  
15 fact, went ahead and did do the questioning as  
16 suggested, which the Board found to be helpful to it  
17 in reaching its initial decision.

18 There has been no further discussion from  
19 any of the parties with regard to whether the parties  
20 wished to ask any questions, present any questions  
21 other than in the written presentation of questions  
22 that was done by all of the parties.

23 And my question to you, I guess, at this  
24 point is if in the Track 1 contentions this was a  
25 procedure that New York requested and utilized, where

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1 is the prejudice to New York in the Track 2  
2 contentions to allow a similar limited questioning  
3 that would be available to New York and Riverkeeper to  
4 the same degree that it would be available to any  
5 other party?

6 MR. SIPOS: Your Honor, John Sipos for the  
7 State of New York. I'd like to respond with a few  
8 points.

9 The motion that was filed on August 8,  
10 2012, was for Track 1 and Track 1 only. It did not  
11 extend to other aspects of the proceeding and we were  
12 already --we had already split or bifurcated the  
13 proceeding. That is my recollection.

14 Secondly, there was in the scheduling  
15 order, or the modified scheduling order, an  
16 opportunity for the parties, like there was in Track  
17 1, to so request the opportunity for attorney-  
18 initiated questioning of the witnesses. And that  
19 deadline came and went, I believe, in the middle of  
20 October.

21 To my knowledge -- well, I can speak for  
22 the State of New York. The State of New York in that  
23 time did not so avail itself of that opportunity and  
24 I am not aware that any other party filed a motion  
25 that day seeking that pathway forward.

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1 So, in talking about --

2 CHAIRMAN McDADE: I understand, Mr. Sipos.

3 MR. SIPOS: -- the prejudice ---

4 CHAIRMAN McDADE: I understand. My  
5 question -- you had said that before. My question to  
6 you is not to repeat what you had said before, but it  
7 was specifically to address how if this was a  
8 procedure that was requested and utilized by New York  
9 in Track 1 for the Board to sua sponte allow this  
10 based on the Board's determination that it could  
11 potentially be helpful to us, where the prejudice to  
12 New York arises.

13 MR. SIPOS: Yes, I was going to get to  
14 that. The prejudice to New York arises from hearing  
15 about this for the first time on the fourth day of the  
16 hearing. There was no prejudice the last time,  
17 because the State moved in a timely, early manner and  
18 there were -- there was authorization from the Board  
19 and the commissioner.

20 This -- today is the first time I, as a  
21 State of New York representative, heard that there  
22 will be this possibility. If I had known in October,  
23 if I had known in mid-October/late October, the State  
24 would have prepared itself and operated differently in  
25 this Track 2 proceeding. So, here's --

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1           CHAIRMAN McDADE:  And, Mr. Sipos, again  
2 going back to my preface to this, you at least from  
3 the standpoint of the board could not have prepared  
4 yourself differently because this is not open-ended  
5 questioning.

6           This is questioning that as I've indicated  
7 a couple of times now, is very limited.  It is based  
8 only on the verbal/oral testimony that has come in at  
9 this particular proceeding where if you believe that  
10 one of your witnesses, and you may well not, but  
11 believe that one of your witnesses offered testimony  
12 that you believed might be either incorrect or somehow  
13 misleading, that you would have the opportunity while  
14 the witnesses are here, while we are here, to help  
15 correct the record.

16           Likewise, while your witnesses are here if  
17 you believe that there was testimony, verbal  
18 testimony, not the written testimony that came in, not  
19 the pre-filed testimony, not the exhibits, but the  
20 testimony of the witnesses that you believed was  
21 either incorrect or somehow misleading that could send  
22 the Board in the wrong direction, that you would be  
23 given a brief opportunity to make inquiry into that.  
24 And, again, based only on what has gone on here in the  
25 hearing over the last four days.

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1           So, it doesn't reflect anything with  
2 regard to the written testimony where you've had the  
3 opportunity to read and to submit written rebuttal and  
4 rebuttal testimony, as well as rebuttal statement of  
5 position, but it's solely limited to what has gone on  
6 here in the hearing.

7           And the question again in that limited  
8 circumstance and, you know, I've got an open mind on  
9 this, but I just -- as I sit here right now, I don't  
10 see what the prejudice would be to New York to afford  
11 you that opportunity that you may or may not take  
12 advantage of, but, likewise, to allow Entergy the  
13 opportunity, as was explained, for a very few limited  
14 number of questions that would serve the purpose, you  
15 know, for which I proffer this.

16           Again, you can choose to take advantage of  
17 it, or not, and that's fine. The question then would  
18 arise if Entergy chooses to take advantage of it, how  
19 is New York prejudiced given the limitations that I  
20 have put on their ability to ask questions? How would  
21 New York be prejudiced by that?

22           MS. SUTTON: Your Honor, this is Kathryn  
23 Sutton for the applicant.

24           CHAIRMAN McDADE: Excuse me, Ms. Sutton.  
25 Let me just get this from Mr. Sipos first.

1 MR. SIPOS: Judge, you are probably  
2 hearing some frustration on my part. My understanding  
3 coming into this proceeding having never been in an  
4 NRC proceeding, was that the rules were changed in  
5 2004 and there is the Citizen Action Network decision  
6 from the First Circuit. And that before that time  
7 there was allowance for attorney questioning along  
8 with discovery. And that the 2004 rulemaking in Part  
9 2 changed it.

10 So, this is -- and New York understands  
11 rules change. And as we said eight years ago, as  
12 Deputy Attorney General Mylan Denerstein said, we'll  
13 play on the court that the NRC provides for us, on the  
14 playing field that NRC provides for us.

15 CHAIRMAN McDADE: Okay. Am I correct, Mr.  
16 Sipos, and, again, my recollection is that with Track  
17 1 New York made the request.

18 MR. SIPOS: Yes.

19 CHAIRMAN McDADE: We granted the request.  
20 The opposing party appealed it and the Commission  
21 upheld the ruling of the Board to allow it.

22 MR. SIPOS: That is correct.

23 CHAIRMAN McDADE: Now, let me also go  
24 back. Ms. Sutton, I'm not quite certain what you  
25 wanted to say. I have a strange feeling it might have

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1       been that it's not worth the aggravation.

2                   MS. SUTTON:  Sort of along those lines,  
3       Your Honor.  We were responding to the sua sponte  
4       request that you posed today.

5                   CHAIRMAN McDADE:  Sua sponte offer, not  
6       necessarily a request.

7                   MS. SUTTON:  Yes, a request for an answer,  
8       an offer.  We're willing to withdraw that response and  
9       just rest the case.

10                  MR. TURK:  Your Honor, may I speak for a  
11       moment for the staff?

12                  CHAIRMAN McDADE:  Yeah, very briefly.  
13       Then we're going to take a quick recess and come back.

14                  MR. TURK:  I think the only issue is  
15       whether the Board would find it helpful for the  
16       parties to do any further questioning perhaps only of  
17       their own witnesses if for no other reason than simply  
18       to clarify statements that may have been made.

19                  And Mr. Sipos is correct that the rules  
20       were changed in 2004.  But as he pointed out when he  
21       was arguing for the right to cross examination, the  
22       rules do permit the board to allow questioning when  
23       they find it will help them in reaching their  
24       decision.

25                  MR. SIPOS:  Is that --

1 CHAIRMAN McDADE: We are going to take a  
2 very brief recess. We're going to recess for about 10  
3 minutes and then we will come back and either have  
4 further discussion on this or, you know, recess and  
5 close the hearing. So, we're going to stand in recess  
6 for 10 minutes.

7 (Whereupon, the proceedings went off the  
8 record for a brief recess at 2:29 p.m. and resumed at  
9 2:38 p.m.)

10 CHAIRMAN McDADE: Please be seated. Okay.  
11 The hearing will come to order. I didn't give Ms.  
12 Brancato a chance to be heard on this. Do you wish to  
13 be?

14 MS. BRANCATO: Yes, thank you. First,  
15 briefly, prior to the discussion about counsel  
16 pursuing clarifying questions, I just wanted to point  
17 out I believe Dr. Hopenfeld had indicated he wanted to  
18 make a statement and it was put on hold and shelved.  
19 So, if you're inclined to give him the opportunity to  
20 make one last comment that he had indicated --

21 CHAIRMAN McDADE: To make a statement  
22 regarding what?

23 MS. BRANCATO: It was about a particular  
24 issue that had been discussed. If Your Honors wanted  
25 to --

1 CHAIRMAN McDADE: Dr. Hopenfeld, what is  
2 the topic?

3 DR. HOPENFELD: First, I'd like to comment  
4 it's extremely important. I started and I thought I  
5 would get another opportunity to talk about it. And  
6 it has to do with the -- has to do with the factor of  
7 three uncertainty in the Fen calculations.

8 What the statement was made yesterday, all  
9 this was taken in the code. It's absolutely wrong.  
10 That Fen isn't uncertainty data. It has nothing to do  
11 with the code. As a matter of fact, it's not a factor  
12 of three, it's a factor of six, but I just didn't want  
13 to get into more detail.

14 The reason it's a factor of six because  
15 the Fen -- and I can go through the numbers with you.  
16 The Fen -- but I don't want to get into -- the main  
17 thing for the record I want to put in what the  
18 gentleman said is absolutely misleading, is incorrect  
19 that Fen has nothing to do -- the uncertainty of Fen  
20 have nothing to do with the ASME code.

21 ASME code doesn't know anything about Fen.  
22 Fen is something that was devised by the NRC by  
23 Argonne. It has nothing to do with the code. Those  
24 uncertainties are not -- the table that he was talking  
25 about, he was talking about the margins which were due

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1 to the variations in the surface roughness specimen  
2 counting loads, but has nothing to do with this, what  
3 I was talking about.

4 You can go through the basic -- the best  
5 thing to do, to call the people at Argonne. They  
6 developed this. Ask them. That's all.

7 CHAIRMAN McDADE: And what was the other  
8 point, Dr. Hopenfeld?

9 DR. HOPENFELD: Okay. My other point is  
10 maybe -- it will take a little bit more time.

11 CHAIRMAN McDADE: Excuse me. The other  
12 point you said will take some time?

13 DR. HOPENFELD: Yeah, little bit more  
14 time.

15 CHAIRMAN McDADE: Before you get into the  
16 point, just tell me what it is.

17 DR. HOPENFELD: It has to do with H star.

18 CHAIRMAN McDADE: With what?

19 DR. HOPENFELD: The H star, the 19 inches  
20 of height which allows -- which assumes that this area  
21 is not a safety area and we don't have to get -- we  
22 don't have to inspect it or we don't have to inspect  
23 it as often.

24 CHAIRMAN McDADE: Okay. I think, Dr.  
25 Hopenfeld, I'm going to cut you off here. That is the

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1 focus of a license amendment. Whether or not that  
2 license amendment was appropriately granted or not is  
3 outside the scope of this proceeding. So, I think  
4 that we have a good understanding of what it is from  
5 the testimony, and also from the documents that were  
6 presented.

7 And to a very large degree, that  
8 particular issue is outside the scope of this  
9 proceeding because it was the subject of a license  
10 amendment. But thank you, Dr. Hopenfeld.

11 MS. SUTTON: Your Honor, Kathryn Sutton  
12 for the applicant. Also, with respect to New York 38  
13 prior to the break, Mr. Azevedo made a statement that  
14 he would like to correct on the record.

15 CHAIRMAN McDADE: Okay. Thank you, Ms.  
16 Sutton. Mr. Azevedo.

17 MR. AZEVEDO: Yes, Your Honor. This is  
18 Nelson Azevedo. This relates to the answer to Judge  
19 Kennedy, I believe it was, whether we applied Fens to  
20 the secondary side. And at first I said we did not,  
21 and then I corrected myself. Turns out I was right  
22 the first time.

23 The Fen correction factors were  
24 specifically specified for the primary side. It's for  
25 primary waters, not for the secondary waters. So, we

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1 did not apply those primary water Fens to the  
2 secondary side CUFs.

3 CHAIRMAN McDADE: Okay. Thank you, sir.  
4 So, you thought you made your first mistake of your  
5 life, and you found out you didn't.

6 MR. AZEVEDO: I wish it was the first one.

7 CHAIRMAN McDADE: Okay. Ms. Brancato, do  
8 you have any comments on Mr. Sipos' objection?

9 MS. BRANCATO: Yes. Riverkeeper is  
10 generally in support of this position of the State of  
11 New York. In the absence of motions in accordance  
12 with the Board's scheduling order, we don't  
13 particularly think questions from the parties is  
14 necessarily appropriate.

15 CHAIRMAN McDADE: Okay. Thank you.

16 MS. BRANCATO: And just that Riverkeeper  
17 would prefer the alternative that you proposed if we  
18 are to ask clarifying questions, that we would compile  
19 them, submit them to you, and then you could determine  
20 whether such clarifications are needed.

21 CHAIRMAN McDADE: Okay. I think the  
22 situation given your position, given the position  
23 stated by Entergy, we are going to sustain Mr. Sipos'  
24 objection. And at this point in time, we're going to  
25 terminate the evidentiary hearing on the Track 2

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1 contentions.

2 What we would direct of the parties and if  
3 this schedule is not appropriate, let us know, and you  
4 can let us know by email, we would ask the parties to  
5 get together sometime within the next two weeks and by  
6 the close of business, not Thanksgiving week, but the  
7 week after that if you could, if possible, come up  
8 with a proposed schedule for post-trial briefing, the  
9 submitting of proposed findings of fact and  
10 conclusions of law, et cetera, that we're not looking  
11 to get anything other than just a proposed schedule,  
12 which, if possible, you know, if it can be done by  
13 agreement between the parties. So, if you can get  
14 together and discuss it and, if possible, present a  
15 joint suggestion to us.

16 Mr. Sipos.

17 MR. SIPOS: And, Your Honor, would that  
18 schedule include the possibility for the parties to  
19 review the transcript from the court reporter? We did  
20 that in Track 1 after the hearings.

21 CHAIRMAN McDADE: Okay. I'm not really  
22 sure what you mean.

23 MR. SIPOS: Like an errata sheet. The  
24 last time -- sometimes there's perhaps typos in the  
25 transcript. And I think last time --

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1 CHAIRMAN McDADE: The answer is yes. And  
2 I'm sorry I just misunderstood you, but we're not  
3 looking for the errata sheet by a week from Friday.  
4 All we're looking for is from you to come up with a  
5 proposed schedule, you know, realistically by when,  
6 you know, can this be done.

7 MR. SIPOS: Thank you.

8 CHAIRMAN McDADE: Yes, and any other  
9 proposed issues that come up post-trial. Again, what  
10 we're looking for is just a proposed schedule.

11 MS. SUTTON: Yes, understood, Your Honor.

12 MR. HARRIS: Understood, Your Honor.

13 CHAIRMAN McDADE: Okay. Is there anything  
14 else that the staff believes should be taken up at --  
15 before we close this evidentiary hearing?

16 MR. HARRIS: No, Your Honor.

17 CHAIRMAN McDADE: Entergy?

18 MS. SUTTON: No, Your Honor, other than to  
19 -- on behalf of Entergy and Westinghouse to thank the  
20 Board and all of the support here at the hearing.

21 MR. SIPOS: Similarly from the State of  
22 New York we'd like to thank Your Honors and your staff  
23 for checking up here and spending a week in the Empire  
24 State.

25 MS. BRANCATO: And Riverkeeper thanks you

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1 as well, of course.

2 CHAIRMAN McDADE: And before we do break,  
3 I would like to, you know, first of all very much  
4 compliment all of the witnesses. I am extremely  
5 impressed with your ability to answer the questions  
6 that we have posed.

7 We've had the opportunity to go through  
8 the documents and read them and focus on a particular  
9 question. You're sitting there not knowing what  
10 questions we're going to ask. So, these questions  
11 although you're very familiar with the record, come  
12 out of the blue. And your ability to locate the  
13 documents that are of reference and to answer the  
14 questions is truly impressive and I want to thank you  
15 very much.

16 And I also want to comment with regard to  
17 counsel, you know, we have had significant filings  
18 both in the preparation of the pre-trial testimony,  
19 and also in the preparation of the statements of  
20 position that were very helpful. And a lot of work  
21 went into that and they were all done in an extremely  
22 professional way that made this proceeding much easier  
23 for the Board. So, again, I want to thank you very  
24 much. We really appreciate -- recognize and  
25 appreciate your work in that regard.

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1                   This evidentiary hearing on the Track 2  
2 contentions is now closed. Thank you.

3                   (Whereupon, the hearing in the above-  
4 entitled matter concluded at 2:48 p.m.)

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