

**Official Transcript of Proceedings**  
**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

Date: Monday, November 16, 2015

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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

Monday, November 16, 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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## E-X-H-I-B-I-T-S

Entergy's

<u>Exhibit Nos.</u>	<u>Document</u>	<u>ID</u>	<u>Rec'd</u>
R681, R682, R683, R689, R690			4769
681, 682, 683, 689, 690			Withdrawn
R727, R728 and R729			4769
727, 728 and 729			Withdrawn
R31, R184, R186, R195, R529			4770
31, 184, 186, 195, 529			Withdrawn

NRC's

<u>Exhibit Nos.</u>	<u>Document</u>	<u>ID</u>	<u>Rec'd</u>
R101, R104, R105, R118, R147, and R161			4771
101, 104, 105, 118, 147, and 161			Withdrawn
168			4771

New York's

<u>Exhibit Nos.</u>	<u>Document</u>	<u>ID</u>	<u>Rec'd</u>
577, 578, and 579		4773	--
580, 581		4776	--

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

(12:00 p.m.)

CHAIRMAN MCDADE: Okay, we'll now go on the record. We're here in the matter of Entergy Nuclear Operations Inc., Indian Point Nuclear Generating Plant, Units 2 and 3, License Renewal. These are Docket Numbers 50-247-LR and 50-286-LR.

My name is Lawrence McDade, an Administrative Judge. With me are Michael Kennedy, and Richard Wardwell, also Administrative Judges with the ASLB, paid. What I would like to do initially is for the record, have counsel indicate who represents who. We'll start at my left, Mr. Turk for NRC.

MR. TURK: Thank you, Your Honor. I'm Sherwin Turk with the Office of General Counsel at NRC. To my left is David Roth. And to his left is Brian Harris. And Mr. Harris will be representing the staff with respect to Contention 25 today.

CHAIRMAN MCDADE: Okay. For Entergy?

MR. BESSETTE: Good morning Your Honor, this is Paul Bessette from Morgan Lewis representing Entergy. On my left is Kathryn Sutton. And on my right is Ray Kuyler.

CHAIRMAN MCDADE: Okay, thank you. For New York?

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1 MR. SIPOS: Good afternoon, Your Honor.  
2 John Sipos, Assistant Attorney General for the State  
3 of New York. On my left, or on your right as you're  
4 looking me, is Assistant Attorney General, Lisa Kwong.  
5 And on my right is Assistant Attorney General, Mihir  
6 Desai.

7 CHAIRMAN MCDADE: And Riverkeeper?

8 MS. BRANCATO: Yes, good afternoon, Your  
9 Honor. Deborah Brancato, Staff Attorney for  
10 Riverkeeper.

11 CHAIRMAN MCDADE: And with you Ms.  
12 Brancato?

13 MS. BRANCATO: This is Riverkeeper's  
14 expert, Dr. Joram Hopenfeld.

15 CHAIRMAN MCDADE: Thank you. Let's get  
16 started with the witnesses. And we'll just go from  
17 you know, your right to left.

18 MR. LOTT: My name is Randy Lott. I'm a  
19 consulting engineer with Westinghouse Electric,  
20 appearing on behalf of Entergy as an expert witness.

21 MR. COX: My name is Alan Cox. I'm a  
22 Consultant for License Renewal for Entergy.

23 MR. AZEVEDO: My name is Nelson Azevedo.  
24 I'm an Engineering Supervisor of the plant.

25 MR. DOLANSKY: My name is Bob Dolansky.

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1 I work at Indian Point for Entergy.

2 CHAIRMAN MCDADE: Okay, we have some  
3 Entergy people in the second row. Let's get them to  
4 identify themselves before we move to NRC.

5 MR. STROSNIDER: I'm Jack Strosnider. I'm  
6 a Consultant for Entergy on License Renewal.

7 MR. GRIESBACH: I'm Tim Griesbach. I'm  
8 Senior Associate with Structural Integrity Associates.  
9 And I'm a Consultant, expert witness for Entergy.

10 MR. GRAY: I'm Mark Gray. I'm a Principal  
11 Engineer from Westinghouse on behalf of Entergy.

12 MR. GORDON: I'm Barry Gordon. Associate  
13 with Structural Integrity and I'm an expert witness  
14 for Entergy.

15 CHAIRMAN MCDADE: Dr. Hiser?

16 DR. HISER: I'm Allen Hiser, Senior Level  
17 Advisor for License Renewal Aging Management at the  
18 NRC.

19 MR. POEHLER: Jeffrey Poehler, Senior  
20 Materials Engineer for the NRC.

21 MR. LAHEY: Richard Lahey, Professor  
22 Emeritus from RPI.

23 CHAIRMAN MCDADE: Okay. And Dr.  
24 Hopenfeld, you're not going to be testifying on 25.  
25 But why don't you introduce yourself at this point?

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1 DR. HOPENFELD: I am Joram Hopenfeld. I'm  
2 a Consultant for Riverkeeper.

3 CHAIRMAN MCDADE: Okay. At this --

4 MR. STEVENS: Your Honor, Gary Stevens,  
5 Senior Materials Engineer with the NRC.

6 CHAIRMAN MCDADE: I'm sorry, Mr. Stevens.  
7 At this point, would all the witnesses please rise,  
8 including Dr. Hopenfeld? What we want to do is to  
9 swear you. The testimony you give will be under oath.  
10 Will you please raise your right hands?

11 Will you swear or affirm subject to the  
12 penalties for perjury that the testimony you'll give  
13 at this hearing will be the truth, the whole truth,  
14 and nothing but the truth?

15 (Chorus of I do.)

16 CHAIRMAN MCDADE: Okay. Please be seated.

17 Now we're going to be having documents  
18 presented during the course of this hearing. Most of  
19 which are public documents that are already in the  
20 public domain. Available to the public on the  
21 electronic hearing docket through the NRC. There are  
22 also certain documents that are non-public which  
23 contain proprietary information.

24 When a document is called up, Mr. Welkie  
25 will bring up the public document. If for some reason

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1 any witness needs to refer to the non-public document,  
2 they need to so state. At that point we will put the  
3 non-public document up only for counsel and the  
4 witnesses. It will not be available to the public.

5 If not only referring to the document in  
6 order for reference, but also if you need to testify  
7 with regard to specifics of the non-public documents.  
8 Don't just do it okay, because that's going to have to  
9 be done at a closed session. And what we would ask  
10 you to do is to the degree possible, avoid discussing  
11 proprietary information.

12 And in many instances, if not all  
13 instances, you'll be able to discuss it for example,  
14 if a cumulative use factor is approaching one or  
15 exceeds one that testimony may be sufficient for our  
16 purposes. If you feel that you actually need to get  
17 into specific proprietary information, please stop and  
18 state that. So that we can then defer your answer on  
19 that particular question to the end.

20 And the end of a particular session where  
21 if necessary we'll take up documents that are  
22 proprietary in nature and need to remain non-public.

23 MS. SUTTON: Your Honor, Kathryn Sutton  
24 on behalf of Entergy. And I've spoken with Mr.  
25 Coldren who's here representing Westinghouse. Given

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1 the logistics and the layout of this room we have  
2 concerns that even the proprietary documents that are  
3 being shown to the witnesses, can be viewed by members  
4 of the public.

5 CHAIRMAN MCDADE: Okay, well I mean,  
6 here's the situation. I mean the document itself is  
7 proprietary only to the degree that you can actually  
8 read it. There's a separation between the witnesses  
9 and the individuals who are in the public. That  
10 although they would be capable of seeing that there's  
11 a document on the screen, it's inconceivable to me  
12 that they would be able to read the document.

13 Let's start with these rules. In the  
14 event a non-public document comes up, and there is an  
15 issue with that regard, to raise the objection at that  
16 point in time. And also one thing I did want, that I  
17 was remiss, we do have a representative of  
18 Westinghouse here that many of the proprietary, most  
19 of the proprietary documents are Westinghouse  
20 documents. Would the representative from  
21 Westinghouse, identify yourself for the record?

22 MR. COLDREN: Yes, Your Honor. Richard  
23 Coldren, Electric Property Counsel for Westinghouse.

24 CHAIRMAN MCDADE: Okay. And then we also  
25 have representatives of interested Government Agencies

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1 from Connecticut.

2 MR. SNOOK: The Assistant Attorney  
3 General, Robert Snook for Connecticut.

4 CHAIRMAN MCDADE: And Westchester County?

5 MR. INZERO: Yes. Good afternoon, Your  
6 Honor. Christopher Inzero, Assistant County Attorney  
7 for the County of Westchester.

8 CHAIRMAN MCDADE: Okay. Are there any  
9 other representatives of interested Government  
10 Agencies who have appeared?

11 (No audible response.)

12 CHAIRMAN MCDADE: Okay, apparently not.  
13 In the event that we do need to break for a non-public  
14 session, only individuals who have signed non-  
15 disclosure agreements that are on file can be present  
16 in the room. So I would direct that anyone who has  
17 not signed a non-disclosure agreement, if they are a  
18 representative of a party, they need to do so. Or  
19 understand that if we do have a non-public session,  
20 it'll be necessary for them to withdraw from the room.

21 MR. TURK: Your Honor, Sherwin Turk.

22 CHAIRMAN MCDADE: Yes, Mr. Turk.

23 MR. TURK: I just note that there is a  
24 video camera. I don't know if it's a member of the  
25 press or who's filming? But that camera would be able

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1 to zoom in on documents on the screen. So it may be  
2 appropriate to have some instructions for the  
3 videographer in terms of what they can film or not  
4 film.

5 CHAIRMAN McDADE: Well, I mean I believe  
6 that they would understand that they would, it would  
7 be a breach for them to zoom in on a non-public  
8 document. If we do have a non-public document to come  
9 up, we will give very specific instructions so that  
10 that will not occur. But thank you for raising that,  
11 Mr. Turk. I appreciate it.

12 MR. SIPOS: Excuse me Your Honor, John  
13 Sipos --

14 CHAIRMAN McDADE: Yes.

15 MR. SIPOS: -- for the State of New York.  
16 Good afternoon. There are also some pending motions  
17 --

18 CHAIRMAN McDADE: Oh, Yes.

19 MR. SIPOS: And I was just wondering if  
20 Your Honor wished to either take those up, or hear  
21 additional presentations on those?

22 CHAIRMAN McDADE: Well, I mean we're going  
23 to take them up here before we get started on the  
24 testimony. And the testimony today is going focus on  
25 Contention 25. You know the allegation that there's

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1 an inadequate Aging Management Program for certain  
2 reactor vessel internals, perhaps others. We will  
3 discuss that here shortly. There is a bit of a  
4 carryover with 26 and 38 as well.

5 But before we get started with the  
6 specifics on 25, we're going to be asking some general  
7 questions having to do with TLAAs and the GALL.

8 We have certain things to take up before  
9 we get started. First of all, we received last week  
10 certain corrected documents from Entergy. There was  
11 no objection. There was Entergy 727, 728, and then  
12 revised Entergy 681, 682, 683, 689, 690, and 729. So  
13 those documents are admitted.

14 (Whereupon, the above-referred to  
15 documents were received into evidence as Entergy  
16 Exhibits No. 727, 728, and revised Entergy Exhibits  
17 R681, R682, R683, R689, R690, and R729.)

18 The original documents have been revised.  
19 The documents are stricken, so that it will only be  
20 the revised documents that are part of the record.

21 Other issues with regard to the current  
22 status of exhibits. The following exhibits need to be  
23 stricken and based on the exhibit list that we have.  
24 The reason these are being stricken is because there  
25 have been revised documents already submitted.

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1           So it will be the revised document. So  
2           for example Entergy 31 will be stricken, and replaced  
3           by Entergy R31. And that goes with Entergy 31, 184,  
4           186, 195, 529, and NRC 101, 104, 105, 118, 147, and  
5           161.

6           (Whereupon, the above-referred to  
7           documents were received into evidence as Entergy  
8           Exhibits No. R31, R184, R186, R195, and R529.)

9           CHAIRMAN McDADE: We also have an issue  
10          Entergy Exhibit list does not indicate that there are  
11          both public and non-public exhibits for Entergy  
12          616,678, 679, 698, and 699. When at the conclusion of  
13          the hearing you submit a revised exhibit list, it  
14          should show, reflect that there are both public and  
15          non-public versions of those documents filed.

16          The same with the Staff documents, 168,  
17          196, and 197.

18          Another is a question, the staff indicated  
19          that NRC document 102, and 148 were superseded by 168.  
20          Does that mean that the staff is withdrawing 102 and  
21          148?

22          MR. ROTH: Yes, Your Honor. The testimony  
23          and the superseding documents covers both Contention  
24          26 and 38.

25          CHAIRMAN McDADE: Okay, so we receive 168

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1 and strike 102 and 148.

2 (Whereupon, the above-referred to document  
3 was received into evidence as NRC Exhibit No. 168.)

4 CHAIRMAN McDADE: There's also an  
5 indication Riverkeeper did not file redacted versions  
6 161, 162, and 163. Does Riverkeeper intend to file  
7 redacted versions of those documents? Those were  
8 testimony.

9 MS. BRANCATO: Yes, Your Honor. At the  
10 time of the submission, Entergy had not provided  
11 redacted versions to which the testimony responded to.  
12 So we had not done that at the time, but Riverkeeper  
13 would like to file redacted versions.

14 CHAIRMAN McDADE: Okay, and that reflect  
15 again on the revised exhibit list that you file at the  
16 conclusion of the hearing. That we have the non-  
17 public version which we will use in rendering our  
18 decision, but there should be a public version filed  
19 as well.

20 MS. BRANCATO: Yes.

21 CHAIRMAN McDADE: All right. In New York  
22 state exhibits, New York 369 is a multipart public and  
23 non-public document. Only the non-public exhibit is  
24 multipart. The public version is a single exhibit and  
25 does not have an A and B version. And that should be

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1 reflected on the revised.

2 I believe those are all the issues that we  
3 have with regard to exhibits. Does anybody have  
4 anything further with regard to exhibits, not counting  
5 the exhibits that were submitted last Friday by the  
6 state of New York?

7 (No audible response.)

8 CHAIRMAN McDADE: Okay, apparently not.  
9 We have a couple of motions. We had a motion to  
10 remove the proprietary designation on ten documents.  
11 It was filed by New York. When we originally  
12 addressed this, there was an appeal pending on a  
13 similar motion. That appeal has been resolved. In  
14 light of the result of that appeal, the motion to  
15 remove the proprietary designation for those ten  
16 documents is denied.

17 There was a motion filed on Friday, last.  
18 It was a motion to admit five documents, New York 577  
19 to 581. The first two are demonstrative exhibits  
20 prepared by Dr. Lahey, 579 is demonstrative exhibit  
21 filed by Dr. Duquette, and submitted by him. Those at  
22 this point are marked only for identification. They  
23 are not received in evidence. They may or may not be  
24 referred to, is my understanding. Is that they  
25 basically fall in the same category as the discussion

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1 of a white board that they could refer to, if it is  
2 necessary to answer our questions.

3 But if at this point, all they will be is  
4 marked for identification.

5 (Whereupon, the above-referred to  
6 documents were marked as New York Exhibit Nos. 577,  
7 578, 579 for identification.)

8 CHAIRMAN McDADE: The other two we have  
9 Exhibit 580 which is a paper that was presented at an  
10 International Symposium in August of 2007, having to  
11 do with stress corrosion cracking and the immunity to  
12 stress corrosion cracking. And may or may not exist  
13 with Alloy 690 and its metal welds. And also a  
14 discussion that the growth rate for cracking, even if  
15 it is not immune, is very low. The mid ten to the  
16 ninth millimeters or lower.

17 And there's also a slide presentation from  
18 I believe June of 2014, 23 slides discussing the same  
19 general area.

20 Question to New York, we received your  
21 motion on Friday. We received a reply from Entergy on  
22 Sunday. We're here in the later part of 2015, this is  
23 a document from 2007 that although on point appears  
24 cumulative to other documents that you've submitted.

25 Why should we receive these documents at

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1 this late point, and why is it not unfair to the  
2 witnesses from Entergy and the NRC staff to be  
3 presented with these documents on the eve of their  
4 testimony? Mr. Sipos, or anyone from New York.

5 MR. SIPOS: Yes, John Sipos for the state  
6 of New York.

7 Taking the second document first,  
8 Document 581, that is an NRC document or is a  
9 presentation to NRC from a year ago. And in the  
10 preparation for this hearing, Dr. Duquette reviewed  
11 that document and found that it would be germane to  
12 what he might, may be testifying about and the issues  
13 that are at the fore in Contention 38.

14 So it is a document that is not a  
15 surprise. It has existed and it ties into the 2014  
16 EPRI report that is also at issue in Contention 38.  
17 And so in going through the citations and in preparing  
18 for it, Dr. Duquette and the state disclosed that  
19 document. I believe we disclosed it a week ago and  
20 made it available. So the state submits there is  
21 little if any prejudice to Entergy or NRC staff  
22 regarding that.

23 As to Document, or is it proposed Exhibit  
24 580, the Andresen article, there are also citations I  
25 believe in the 2014 EPRI report, references to Dr.

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1       Andresen and some of the work that he has done in this  
2       area.  And again, in reviewing testimony, reviewing  
3       the documents and preparing for this hearing, Dr.  
4       Duquette believed that it was germane.

5                 We did disclose it.  We disclosed it a  
6       week ago.  And it's possible that he may refer to it.  
7       So we submit that there is good cause.  We would have  
8       preferred to have presented them earlier, the state  
9       would have.  But they were disclosed and the state's  
10      position is that there is little if any prejudice.

11                CHAIRMAN  McDADE:     Okay.     From the  
12      standpoint of the Board, we've been dealing with you  
13      know, with hundreds of pages of testimony and  
14      literally thousands, if not tens of thousands of pages  
15      of exhibits over a period of years at this point in  
16      time.  And these documents as I said, were received  
17      just simply last Friday.

18                The witnesses who arrive here today,  
19      probably would not have been made aware of the  
20      existence of these documents or the intended use of  
21      these documents by New York until today.

22                At this point we are not going to receive  
23      the documents in evidence.  If, you know, although I  
24      do have to say although we're not receiving them into  
25      evidence, they have been submitted.  And they have

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1       been read by the Board.

2                       (Whereupon,     the     above-referred     to  
3       documents were marked as New York Exhibits No. 580 and  
4       581 for identification.)

5                       So you know, the information that's  
6       contained in that, is contained in the minds of the  
7       Members of the Board. Even though the documents are  
8       not received in evidence and would not be referred to  
9       specifically in any initial opinion that the Board  
10      would issue.

11                      The point made by Entergy in their reply  
12      is getting these this late, it just simply, not that  
13      these are not potentially relevant documents, but that  
14      Dr. Duquette could have brought this to the attention  
15      of Counsel for New York and Counsel for Entergy and  
16      the Board months, if not years ago.

17                      MR. SIPOS: Could I just respond briefly,  
18      Your Honor?

19                      I take your point about the volume of  
20      exhibits. I think there's more than 625 exhibits in  
21      Track 2. There have been several thousand documents  
22      disclosed, 580 and 581 I think, each are less than 30  
23      pages as I said. We disclosed them last week and  
24      Contention 38 you know is a few days off.

25                      We would again, the state would

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1 respectfully submit that we have tried to be collegial  
2 with Entergy on the documents that they have  
3 presented. There has been a steady stream of  
4 disclosures from Entergy over the past two weeks,  
5 including documents that go to cumulative use factors.  
6 And we have not objected to those.

7 CHAIRMAN McDADE: Okay. The documents  
8 that were submitted by Entergy last week and received,  
9 681, 682, 683, 689, 690, 729, these were all revised  
10 documents were they not?

11 MR. SIPOS: Yes, they were to correct  
12 mistakes or discrepancies in the calculations  
13 apparently.

14 CHAIRMAN McDADE: Well, at this point this  
15 580 and 581 are not received. And having been late  
16 filed, if during the course of the hearing their  
17 relevance as opposed to cumulative effect becomes more  
18 relevant, the Board might reconsider. But at this  
19 point, the Board is you know, upset that at this late  
20 in the proceeding we're getting these documents  
21 offered into evidence.

22 And given you know, reading through them  
23 it doesn't appear that any new ground is reached in  
24 them that cannot be discussed by Dr. Duquette and Dr.  
25 Lahey in their testimony and through the other

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1 exhibits that have already been received.

2 That said, before we proceed further, from  
3 the NRC staff is there any other administrative  
4 matters that you wish for the Board to address?

5 MR. HARRIS: No, Your Honor.

6 MR. KUYLER: Not from Entergy, Your Honor.

7 CHAIRMAN McDADE: From New York?

8 MR. SIPOS: No, Your Honor.

9 CHAIRMAN McDADE: Riverkeeper?

10 MS. SUTTON: No, Your Honor, thank you.

11 CHAIRMAN McDADE: Okay, and two other  
12 preliminaries. We've got a lot of people here and a  
13 lot of people speaking. Most of the testimony that  
14 has been received has been submitted jointly by  
15 several witnesses. When we ask a question in most  
16 instances, it will not be directed to a specific  
17 individual, although in some instances it will be.

18 It will be for example, a witness  
19 addressed to New York right now, would be to Dr.  
20 Lahey, almost by default. Well, not almost. But to  
21 the others, would you please in answering a question,  
22 before you do, state your name. You can decide which  
23 one of you is going to be answering the question. But  
24 before you do, just state your name and say that this  
25 is Dr. Allen Hiser for the NRC staff. This is Mr.

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1 Alan Cox for Entergy. Just so we have on the record  
2 who it is specifically who's making the  
3 representation.

4 Likewise, if Counsel makes a statement,  
5 again to make it clear for the record, the Court  
6 Reporter's got a lot to do, he may not know all of you  
7 by face at this point in time, so please just state  
8 your name before you begin the statement and we'll  
9 move on from there.

10 Okay that said, as I indicated what we  
11 wanted to do before we get into a lot of the substance  
12 raised by Contention 25 is to discuss generally some  
13 issues relating TLAAs and the GALL.

14 Before we do that, Judge Kennedy, do you  
15 have anything further to take up before we move on?

16 JUDGE KENNEDY: I do not.

17 CHAIRMAN McDADE: Judge Wardwell?

18 JUDGE WARDWELL: No.

19 CHAIRMAN McDADE: Judge Kennedy.

20 JUDGE KENNEDY: As Judge McDade stated  
21 earlier, this is Judge Kennedy, I should follow the  
22 Chair's guidance. So this is Judge Kennedy. In  
23 looking over the contentions, the Board saw some  
24 common threads that went across more than one  
25 contention. So we have couple of leading edge issues

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1 that we wanted to address before we got into the meat  
2 of any particular contention.

3 You could argue, I drew the short straw.  
4 I have the first two overarching issues, which for  
5 want of a better characterization we called,  
6 compliance with GALL, and TLAAs versus AMPs.

7 We're going to take up the compliance with  
8 GALL first. And I have a series of questions that  
9 I'll direct to either the staff or to Entergy, at  
10 least that's my initial first cut at it.

11 I don't know who the best witness is, as  
12 Judge McDade has pointed out. I am under the  
13 presumption that the best witness is in the room, but  
14 if not, let's identify that and we'll deal with it.  
15 And so I will issue a question in the direction of  
16 either Entergy or the staff. And I'll leave it to you  
17 folks to select the most appropriate person to answer,  
18 or persons. Identify yourself, and provide an answer.

19 I'll ask my Board mates, if they have a  
20 follow-up questions to the initial question, that they  
21 chime in, identifying themselves as we go. And pose  
22 any follow-up questions.

23 Our hope is that by addressing some of  
24 these issues that go across more than one contention,  
25 that we can be a little more efficient as we address

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1 issues during each individual specific contention. I  
2 ask you to bear with us. Some of this ground may have  
3 been plowed under Track 1, if you all were here with  
4 us. But we thought it would be good for a complete  
5 record to try to revisit it and see how it all holds  
6 together today.

7 And that in particular in the area of  
8 compliance with GALL. We did a lot of this under  
9 Contention Track 1, but I think we've amplified the  
10 questions and I think we're interested in putting  
11 together a consistent record at this time.

12 CHAIRMAN McDADE: Judge Kennedy, this is  
13 Judge McDade again. There was one other  
14 administrative matter that I forgot to raise and I  
15 apologize for the interruption.

16 This is going to be a long hearing. We  
17 anticipate we're probably going to be going until 6  
18 o'clock or so this evening. We will probably be  
19 taking one or two breaks during the course of the day.  
20 But if any witness, for any reason, needs a break.  
21 Don't sit there and suffer in silence. You know, let  
22 us know and we can arrange to take a break.

23 The same goes for Counsel, although you  
24 know each party, most parties are represented by  
25 multiple people, so it may be possible for you know

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1 Counsel to step out and have their colleagues  
2 continue. But again, primarily for the witnesses, you  
3 know if for any reason you do need a break, let us  
4 know. And we will make arrangements for it. Judge  
5 Kennedy.

6 JUDGE KENNEDY: Taking a break, drink some  
7 water.

8 Let's start with compliance with GALL.  
9 Again from my perspective, the adequacy of individual  
10 aging management programs is at issue here in these  
11 contentions. So I thought it would be useful to just  
12 start some general discussion on GALL, compliance with  
13 GALL, and a number of side issues that go along with  
14 that.

15 It's my belief that in responding to  
16 challenges to the adequacy of a particular aging  
17 management program, to provide reasonable assurance  
18 that the effects of aging will be adequately managed  
19 so that the intended functions of components and scope  
20 for license renewal will be maintained consistent with  
21 the current licensing basis.

22 For the period of extended operation,  
23 again embedded in the regs, the commission has  
24 concluded that an aging management program that is  
25 consistent with GALL provides the requisite assurance,

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1 requisite reasonable assurance.

2           They go on to say that the NRC staff does  
3 not take the applicant's word on this, but rather asks  
4 them to confirm that a particular program is  
5 consistent with GALL. So that's where I'm starting  
6 from and I'm going to go through a series of  
7 questions. But that's sort of the overarching  
8 hypothesis here. Is that, this consistence with GALL  
9 is an important issue in trying to deal with the  
10 adequacy of any particular aging management program.

11           So let me first direct a question to  
12 Entergy, and we'll see how this works. You guys get  
13 to select. I'm interested in confirming what version  
14 of GALL was used to develop the license renewal  
15 application for Indian Point, Units 2 and 3?

16           MR. COX: This is Alan Cox for Entergy.  
17 The version of GALL that was in effect when we  
18 developed the licensed renewal application at Union  
19 Point, was Rev 1.

20           JUDGE KENNEDY: Rev 1 of GALL?

21           MR. COX: Right.

22           JUDGE KENNEDY: So then I guess to the  
23 staff, what version of GALL is used to review the  
24 application for the Indian Point license renewal?

25           DR. HISER: This is Dr. Allen Hiser for

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1 the NRC. The staff used Revision 1 for the GALL to  
2 review the Indian Point application because we issued  
3 Revision 2 of GALL in the midst of that review. We  
4 then directed requests for additional information to  
5 Entergy based on the operating experience that the  
6 staff had accumulated in developing Revision 2 of  
7 GALL.

8 So at that point, we had Indian Point  
9 address the operating experience that supported the  
10 changes in GALL Revision 2.

11 JUDGE KENNEDY: And so, do I take that to  
12 mean that the, as you use the term "operating  
13 experience" in the interim between Rev 1 of GALL and  
14 Rev 2 of GALL was important information and needed to  
15 be addressed as part of the Indian Point license  
16 renewal application?

17 DR. HISER: This is Dr. Allen Hiser again.

18 JUDGE KENNEDY: Sorry, should have  
19 directed the question.

20 DR. HISER: And yes, that is correct that  
21 the positions were addressed during the review of the  
22 license renewal application.

23 JUDGE KENNEDY: Did that affect, Dr.  
24 Hiser, did that affect any of the aging management  
25 programs that are at issue here in these contentions

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1 in front of us at Track 2?

2 DR. HISER: Yes, I would say that it at  
3 least addressed or resulted in changes to the aging  
4 management program for reactor vessel internals. It's  
5 a very difficult, actually it's a very difficult  
6 question to answer because initially in Revision 1 of  
7 GALL, there was no AMP for reactor vessel internals.  
8 There was a commitment process that was used.

9 JUDGE KENNEDY: All right, thank you. I  
10 will probably, I'm sure we're going to get into that  
11 as we get into the specific contention.

12 CHAIRMAN McDADE: Just if I could, this is  
13 Judge McDade. Dr. Hiser, we've heard that originally  
14 it was prepared, the license renewal application,  
15 looking at Revision 1 of GALL. Is it the position of  
16 the NRC staff that as we sit here today, the license  
17 renewal application as amended, is consistent with  
18 Revision 2 of GALL? Or is it in anyway inconsistent  
19 with Revision 2, or deficient pursuant to Revision 2?

20 DR. HISER: I don't believe that we had  
21 done a full accounting of the differences between the  
22 license renewal application for Indian Point in  
23 Revision 2 of GALL. So from that perspective, I would  
24 say that the application is likely a hybrid. Portions  
25 that were not, that the staff did not direct requests

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1 for additional information to Entergy would still be  
2 consistent with Revision 1.

3 Whether those are entirely consistent with  
4 Revision 2, I would expect that they are. But we did  
5 not make that comparison. What I can tell you is that  
6 the staff's review really is consistent with Revision  
7 2 of the GALL report.

8 And so the, and in terms of, the GALL  
9 report has certain positions that are advocated for  
10 aging management. And what we did with the request  
11 for additional information was to ensure that the  
12 operating experience that was reflected in GALL  
13 Revision 2, was accounted for by the applicant in its  
14 application.

15 CHAIRMAN McDADE: Okay, the Commission has  
16 determined that if an AMP is consistent with GALL that  
17 it is adequate. Is it the staff's position, the  
18 Commission position at this point, that in order for  
19 an AMP that we are reviewing today in November of 2015  
20 that it needs to be consistent with the current  
21 emendation of GALL, Revision 2?

22 DR. HISER: Not entirely. I guess what I  
23 would say is that the GALL AMPs are not requirements.  
24 What is required is adequacy of aging managements, of  
25 aging effects for the, in this case, reactor vessel

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1       internals.

2                   In general, a plant, an applicant that  
3 indicates that it will implement a GALL AMP, after  
4 verification by the staff that they in effect are  
5 implementing the GALL AMP, there is a presumption that  
6 that provides reasonable assurance.

7                   Applicants may propose alternatives to the  
8 provisions that are in the GALL AMPs. And from that  
9 position the staff, in the case of say Indian Point,  
10 where the application is prepared with Revision 1.  
11 The staff has issued Revision 2. The staff tries to  
12 bridge the operating experience and other differences  
13 between the two to ensure the adequacy of the proposed  
14 aging management by the applicant.

15                   CHAIRMAN McDADE: Okay, thank you.

16                   JUDGE KENNEDY: So Dr. Hiser, I'm sensing  
17 some conscious determination on the part of the staff  
18 that as changes are made from GALL Rev 1 to GALL Rev  
19 2 that if there was an ongoing, I guess sticking with  
20 the Indian Point Units, if there was some issues that  
21 were identified in that new information between Rev 1  
22 and Rev 2, how did the staff decide which, they'd have  
23 to go through all of the new information, all the  
24 applicable new information? How did you decide what  
25 to focus on?

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1 DR. HISER: Well, the staff issued a  
2 Regulatory Issue Summary in 2014. I believe it was  
3 2014 that identified the operating experience that  
4 formed the basis for changes to Rev 2 of the GALL  
5 report. And using that as a basis, we then evaluated  
6 license renewal applications that were on file at that  
7 point in time. And identified areas where we thought  
8 that the applicant needed to provide additional  
9 information.

10 And after that review, then we issued REIs  
11 to, in this case, Indian Point.

12 JUDGE KENNEDY: Dr. Hiser, just for the  
13 record. Is that an exhibit that has been entered for  
14 this proceeding? It doesn't sound familiar.

15 DR. HISER: It may have been 2012, and I'd  
16 have to --

17 JUDGE KENNEDY: I can give you some time  
18 to look that up. We can move forward and you can  
19 check on it. I'd be curious to know. I don't  
20 remember seeing that in the exhibit list. But it  
21 sounds important.

22 MR. COX: Judge Kennedy.

23 JUDGE KENNEDY: Mr. Cox.

24 MR. COX: This is Alan Cox with Entergy.

25 Let me add just a little bit of a clarification. The

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1 regulatory information summary that Dr. Hiser refers  
2 to, didn't cover every single change between GALL Rev  
3 1 and Rev 2. It did point out the areas that were  
4 considered most significant by the staff in Rev 2.  
5 And those were the areas that were the focus of the  
6 regulatory information summary and of the REIs that  
7 followed that.

8 JUDGE KENNEDY: Mr. Cox is it fair to ask  
9 you, would it be your opinion that, or your testimony  
10 that the important issues identified in that  
11 regulatory information summary were addressed as REIs  
12 to Entergy and then responded to?

13 MR. COX: I believe that would be correct.

14 JUDGE KENNEDY: Are you aware of any that,  
15 it sounds like you are not aware of any that were not  
16 responded to?

17 MR. COX: That's correct. I'm not aware  
18 of any that were not. I'm not, I don't have all of  
19 them committed to memory but I'm not aware of any  
20 significant issues that were identified in the  
21 regulatory information summary that were not addressed  
22 through REIs.

23 JUDGE KENNEDY: If a particular REI wasn't  
24 responded to, how would that evidence itself, I guess  
25 let's start with Mr. Cox since you were -- would there

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1 be a record of that? Are the responses to REIs  
2 tracked in a process that's transparent to the public?

3 MR. COX: The responses to REIs are  
4 submitted to the staff as a public document.

5 JUDGE KENNEDY: Again just for the record,  
6 and maybe I'll go back to Dr. Hiser, what's the  
7 current version, revision level of GALL?

8 DR. HISER: Right now for the document  
9 overall, is Revision 2. There are certain issues,  
10 certain AMPs where we have supplemented the guidance  
11 in GALL through Interim Staff Guidance or LR-ISG  
12 documents. Reactor vessel internals is one case that  
13 that has occurred.

14 JUDGE KENNEDY: Ultimately we would  
15 potentially see, that maybe Dr. Hiser, this isn't too  
16 speculative? Are we heading to a Rev 3 of GALL, is  
17 that how this seems to be working?

18 DR. HISER: It's another difficult -- this  
19 is that one --

20 JUDGE KENNEDY: That's fine. I'm not sure  
21 it's that important. I'm just curious if we've, it's  
22 been, this proceeding has been going on since 2007 and  
23 we've worked our way through at least one revision to  
24 GALL. I'm not sure if there weren't two, but it  
25 sounds like we started with Rev 1 and we're at Rev 2.

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1 But operating history seems to keep being accumulated.

2 DR. HISER: This is Allen Hiser. The  
3 situation that we are with license renewal  
4 applications is such that Revision 3 would only apply  
5 to a handful of plants. And because we have Revision  
6 2 with the supplements, with the ISGs, I don't believe  
7 the staff will expend the resources to update that.

8 JUDGE KENNEDY: Understand.

9 MR. KUYLER: Your Honor.

10 JUDGE KENNEDY: Where are we?

11 MR. KUYLER: This is Ray Kuyler for  
12 Entergy. Just the Regulatory Issue Summary that we  
13 were just talking about is RIS 2011-05. It's Entergy  
14 Exhibit 192.

15 JUDGE KENNEDY: I'm sorry, 192?

16 MR. KUYLER: Entergy Exhibit 1-9-2,  
17 000192.

18 CHAIRMAN McDADE: Thank you.

19 JUDGE KENNEDY: All right, thank you.

20 Trying to move forward, maybe pick some  
21 different topics. Within, in looking at the license  
22 renewal application, it appears that the aging  
23 management programs are organized into, for want of a  
24 better term, "categories". And one of the categories  
25 appears to be, "Consistent with GALL". And again,

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1 we're back to that consistent with GALL.

2 What does it mean? I'm going to start  
3 with Entergy first. What does it mean to be  
4 consistent with GALL? That term is difficult to grasp  
5 at least from my perspective. I guess I'll take  
6 anybody that wants to start. I think we're going to  
7 have some discussion on consistency.

8 MR. COX: This is Alan Cox with Entergy.  
9 I'll start with that question. When we say consistent  
10 with GALL, we are saying that we are doing, as you all  
11 described the program, if we say we're consistent with  
12 GALL, our program does the same things that the GALL  
13 program recommends.

14 And we would have the same preventive  
15 actions, the same detection of aging effects, methods  
16 that are defined, the same acceptance criteria would  
17 be the same if we were going to say our program was  
18 consistent with GALL.

19 If there are exceptions we would say it's  
20 consistent with GALL with exceptions and we would  
21 identify those exceptions.

22 JUDGE KENNEDY: So do I take that to mean  
23 if GALL has a specific acceptance criteria or a  
24 specific inspection criteria or methodology, to be  
25 consistent with GALL you'd have to use those criteria,

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1 those inspection techniques?

2 MR. COX: Yes, that's correct.

3 JUDGE KENNEDY: So if you substituted  
4 something, is that where you get into, you started to  
5 use the word enhancement or exception? What would be  
6 the process to move off of consistent with GALL?

7 MR. COX: We took an exception to, let's  
8 say the acceptance criteria in GALL, we would propose  
9 an alternative acceptance criteria along with a  
10 technical justification for why that was an  
11 appropriate acceptance criteriato effectively manage  
12 the effects of aging.

13 JUDGE KENNEDY: And that would be listed  
14 as an exception?

15 MR. COX: That would be listed as an  
16 exception. The program descriptions in Appendix B of  
17 the license renewal application have a section where  
18 they identify whether there are exceptions to the  
19 program.

20 JUDGE KENNEDY: So maybe to, Mr. Cox is  
21 you'd like to answer, what would then be an  
22 enhancement be, in the context of consistent with  
23 GALL?

24 MR. COX: In the context of consistency  
25 with GALL, an enhancement would be a change that if we

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1 had an existing program at Indian Point, and we  
2 determined that there was a particular aspect of that  
3 program that was not consistent with GALL, an  
4 enhancement would be a commitment to make a change in  
5 that program to where it is now consistent with GALL.

6 JUDGE KENNEDY: So maybe to the staff,  
7 what from your perspective is the impact or import of  
8 a licensee declaring their aging management program is  
9 consistent with GALL?

10 DR. HISER: This is Dr. Hiser, what  
11 consistency with GALL means is that the applicant is  
12 implementing the program that is nearly identical to  
13 what is in the GALL.

14 JUDGE KENNEDY: I guess that's the thing  
15 that, at least the Board is struggling with. That the  
16 word consistent has a definition. But when we have  
17 this discussion from a technical perspective, the -ly  
18 words start to creep in. We're trying to get our arms  
19 around how much latitude a licensee may have in,  
20 although still being consistent with GALL, could do it  
21 differently.

22 In other words is there a, and I guess  
23 I'll try and just, Dr. Hiser, is there a delta around  
24 consistent such that if the delta gets too large it  
25 becomes an exception or an enhancement? I guess I'm

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1 really struggling with how much, I mean it's not  
2 verbatim. Is it verbatim compliance with what's in  
3 GALL? Is it word for word what's in GALL?

4 DR. HISER: At one level it is. When an  
5 applicant identifies an AMP is consistent with GALL.  
6 We do an audit or an AMP consistency audit. And we go  
7 to the applicant site and we at one level compare  
8 their AMP to what's in GALL, word for word.

9 If there are things that are missing then  
10 we discuss with the applicant why the difference  
11 exists. If it is a significant difference, and I  
12 think the delta really is very small, then we would  
13 ask them at REI, and pursue them justifying that. And  
14 maybe at that point that would be identified as an  
15 exception to GALL.

16 JUDGE KENNEDY: And --

17 CHAIRMAN McDADE: Jim, just if a --

18 JUDGE KENNEDY: Go ahead.

19 CHAIRMAN McDADE: This is Judge McDade,  
20 just to clarify for myself here, that an applicant  
21 submitting an application does not need to have or  
22 even reference GALL with their AMP. But if they  
23 don't, then they have to demonstrate that the plan  
24 that they have will in fact adequately manage the  
25 effects of aging.

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1           If in fact they take advantage of the GALL  
2           and they not only represent, but demonstrate that  
3           their AMP in fact is consistent with all of the  
4           parameters of GALL, then there is a presumption that  
5           the plan is adequate.

6           On the other hand if they don't address or  
7           demonstrate that they are consistent with GALL, then  
8           they have to independently demonstrate the adequacy of  
9           the aging management. Am I correct in that regard?

10           DR. HISER: This is Allen Hiser, yes I  
11           would say that yes, you are correct.

12           CHAIRMAN McDADE: Okay, now when you have  
13           a situation here with the hybrid, where submitted  
14           under Revision 1, reviewed in part under Revision 2.  
15           From our standpoint, it's not just a representation  
16           that it's consistent with GALL. Do we need to find  
17           that it's consistent with Revision 2 in order to have  
18           that presumption of adequacy?

19           If it's not, if we can't find that it's  
20           consistent with Revision 2, do we have to aside from  
21           GALL, independently evaluate the adequacy of the aging  
22           management?

23           DR. HISER: I guess what I would say is  
24           that if the determination is made that it is  
25           consistent with Revision 2 of GALL, then there's a

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1 presumption that it provides reasonable assurance. If  
2 we are unable to find that it is consistent with  
3 Revision 2 of GALL, then we would make a sort of on  
4 its own merits, evaluation of whether the program is  
5 adequate to provide reasonable assurance.

6 So the consistency with GALL is one way to  
7 provide a presumption of reasonable assurance. If  
8 it's a plant specific program, we do have a more  
9 laborious process that we need to go through to  
10 demonstrate that it provides reasonable assurance.

11 CHAIRMAN McDADE: And that's what you've  
12 done in SER Supplement 2, that in certain instances  
13 you've determined that it's consistent with GALL 2.  
14 And in other instances you have determined that it,  
15 even though not consistent with GALL 2, nevertheless  
16 provides adequate assurance of aging management. Is  
17 that correct?

18 DR. HISER: Are you speaking specifically  
19 for the reactor vessel internals parameters?

20 CHAIRMAN McDADE: Yes.

21 DR. HISER: I guess I'd like to ask Jeff  
22 to address that.

23 MR. POEHLER: Mr. Jeffrey Poehler for the  
24 NRC. Actually for the reactor internals aging  
25 management program submitted by Entergy, we used for

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1 guidance for the staff's review we used the Interim  
2 Staff Guidance related to reactor internals,  
3 LR-ISG-2011-04. And that --

4 CHAIRMAN McDADE: Sorry, can you repeat  
5 the cite?

6 MR. POEHLER: Yes, LR-ISG-2011-04. And  
7 basically that Interim Staff Guidance updated the  
8 guidance of GALL Revision 2, specifically related to  
9 reactor internals. Mostly just to recognize that the  
10 approved version of MRP-227-A had been issued in 2012.

11 In practice there's not, there weren't a  
12 lot of changes from GALL Rev 2 in that guidance. So  
13 but we did use the, so that represented the most up-  
14 to-date NRC guidance for reactor vessel internals. So  
15 that was what we used when we evaluated the ten  
16 elements of the aging management program for reactor  
17 internals.

18 JUDGE WARDWELL: This is Judge Wardwell.  
19 Considering we opened this door, with Dr. Kennedy's  
20 permission, I'd like to explore this a little bit more  
21 as an example of the application of GALL.

22 Mr. Cox, when you submitted your  
23 application for this license renewal, when dealing  
24 with the reactor vessels internals, what did you  
25 submit at the time of, in 2007? Because there was no

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1 -- let me ask you this question, there wasn't an AMP  
2 in GALL 1 for reactor vessel internals. Is that  
3 correct?

4 MR. COX: This is Alan Cox for Entergy.  
5 That is correct. There was no AMP. There was  
6 direction in the, or guidance, recommendations, in the  
7 GALL report that said for reactor vessel internals an  
8 applicant should provide a commitment to participate  
9 in the industry efforts that were evaluating aging  
10 management of the vessel internals.

11 And to implement the resulting programs  
12 and guidance that came out of that industry effort as  
13 part of, you know to manage the effects of aging on  
14 the vessel internals.

15 It was essentially commitment, I believe  
16 it was Commitment 30 in Indian Point license renewal  
17 commitments that said we would follow that industry  
18 work and implement the results of that program.

19 JUDGE WARDWELL: And so then I turn to NRC  
20 staff, Dr. Hiser or your partner, you reviewed the  
21 commitment then in regards to your initial approval.  
22 What happened subsequently when GALL 2 came out, was  
23 that you used this internal staff guidance to then  
24 measure their commitment with GALL 2? Or how did you  
25 review it?

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1 DR. HISER: This is Dr. Hiser. When the  
2 main driving force that created a change in GALL and  
3 with the Indian Point application, was the industry  
4 submittal of MRP-227 Rev 0 report. The staff review  
5 of that report and subsequent safety evaluation. And  
6 then the industry submittal of MRP-227-A report. That  
7 provided for the first time an acceptable aging  
8 management program for reactor vessel internals for  
9 PWRs.

10 Based on that the staff, actually prior to  
11 that issuance, the staff put into GALL Revision 2, an  
12 AMP for reactor vessels internals that we believed  
13 would be consistent with MRP-227-A. However, that was  
14 about a year before 227-A was submitted and based on  
15 that, we ended up putting together the LR-ISG that Mr.  
16 Poehler described.

17 So that then the AMP for reactor vessel  
18 internals was consistent with MRP-227-A.

19 JUDGE WARDWELL: Which in turn was  
20 consistent or mirrored what was in Rev 2 in regards to  
21 the AMP for vessel internals that was contained  
22 therein?

23 DR. HISER: Well at that point when we  
24 issued the LR-ISG that Mr. Poehler mentioned, that  
25 superseded the reactor vessel internals AMP that was

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1 in Revision 2 of GALL. So that became the staff  
2 position on what an acceptable aging management  
3 program was for reactor vessel internals, was conveyed  
4 through the LR-ISG.

5 JUDGE WARDWELL: But still the, if a plant  
6 was doing it new now, they would look at still Rev 2  
7 of GALL and that AMP that's in Rev 2 of GALL. And  
8 then the guidance is how that AMP is really  
9 implemented. Is that correct?

10 DR. HISER: I have to apologize because I  
11 get hung up with Revision 2 versus the ISG. The  
12 Revision 2 that is the printed book, that version of  
13 the AMP is no longer valid. The version that is in  
14 the LR-ISG, that is the official staff position.

15 JUDGE WARDWELL: But that, so you're  
16 saying if I understand you correctly, GALL 2 at least  
17 in reactor vessel internals, the AMP that's contained  
18 therein has been modified and replaced by that which  
19 is contained in the ISG. Is that what you're saying?

20 DR. HISER: That is correct. And there  
21 are several other AMPs that are similar to that, that  
22 there are LR-ISG documents that supersede the printed  
23 version of GALL Revision 2.

24 CHAIRMAN McDADE: This is Judge McDade.  
25 I just want to before we move on, clarify something

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1 for myself here because I'm getting a little beyond.  
2 You make reference to MRP-227-A which just so I can  
3 find it again, that's NRC document 114 A through F.  
4 So when we go later.

5 What is the genesis of that? It's a  
6 material and reliability program. How was that  
7 generated?

8 DR. HISER: That was generated from an  
9 almost decade long industry activity to develop aging  
10 management guidance for reactor vessel internals.

11 CHAIRMAN McDADE: So it's an industry  
12 generated document?

13 DR. HISER: Yes.

14 CHAIRMAN McDADE: And then how is it used  
15 by the NRC in reviewing the adequacy of the plan, of  
16 the aging management?

17 DR. HISER: Well it was used by the NRC  
18 first, after acceptance of the report through the MRP-  
19 227-A designation. We use that as the basis for what  
20 we thought, what we consider to be an effective aging  
21 management program for reactor vessel internals.

22 MR. COX: Judge McDade. This is Alan Cox.  
23 Could I add a clarification here?

24 CHAIRMAN McDADE: Yes.

25 MR. COX: I think it might help to add a,

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1 to give a little bit of a time line to help explain  
2 how this evolved. The Rev 1 of GALL report was issued  
3 in 2005. Indian Point submitted the initial license  
4 renewal application in 2007. I believe about 2009 the  
5 initial Rev 0 of the industry document, MRP-227 was  
6 issued. That initial version I believe, and Dr. Hiser  
7 can correct me if I'm wrong here, but I believe that  
8 was the basis for the aging management program that  
9 was put into GALL Revision 2.

10 It was a draft, it had not been through  
11 formal NRC review yet, but it was the closest thing  
12 that we had. So that became Rev 2. After NRC  
13 completed their review and accepted MRP-227 it was  
14 reissues as MRP-227-A.

15 CHAIRMAN McDADE: That was what, December  
16 of 2011?

17 MR. COX: That's right. And then because  
18 it now, you know it provided things that were -- there  
19 weren't a lot of changes but there were some changes  
20 that were different from what Rev 0 had.

21 The NRC issued the ISG to basically bring  
22 GALL Rev 2 up to date to what was in MRP-227-A as it  
23 was approved. So that was kind of the sequence of  
24 events that led to where we are now. So if we were  
25 doing a license renewal application today, like we're

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1 doing one on the PWR down in Louisiana, we're looking  
2 at the ISG as the latest staff guidance for that  
3 particular reactor vessel aging management program.

4 That's a little bit of the history, the  
5 time line of how that evolved to where we are today.

6 CHAIRMAN McDADE: Okay, and is that  
7 consistent with your recollection, Dr. Hiser?

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

9 CHAIRMAN McDADE: Okay, Judge Wardwell.

10 JUDGE WARDWELL: When you've done your  
11 final review of, as you did your final review for  
12 reactor vessel internals, have you considered the  
13 review that's in the ISG as a, consistency with GALL  
14 as a consistency with GALL with additions, or  
15 enhancements, or as a site specific AMP?

16 DR. HISER: We would consider an AMP that  
17 matches what is in the LR-ISG to be the consistent  
18 with GALL version.

19 JUDGE WARDWELL: And do you consider  
20 their, Entergy's AMP for reactor vessel internals to  
21 be one that is GALL 2? Or is a site specific one that  
22 you had to compare and evaluate the details of their  
23 program to see if it is consistent with GALL 2, which  
24 as it's been updated in the ISG?

25 DR. HISER: I would say that it is one

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1 that is consistent with Rev 2, as embodied in the LR-  
2 ISG. But we still needed to verify that it was, that  
3 the Indian Point program was consistent with what was  
4 in the LR-ISG. We didn't just take their word for it  
5 that they said we are consistent with GALL. So you  
6 know we should, our program is acceptable.

7 JUDGE WARDWELL: Dr. Kennedy, will you  
8 move along please with the rest of this program?

9 JUDGE KENNEDY: I'll try to get us moving  
10 here again.

11 So does all of that, I guess this all  
12 started with the consistent with GALL discussion, and  
13 now we get to the reactor vessel internals which as I  
14 understand what Judge Wardwell was asking. He's  
15 really trying to ask is reactor vessel internals  
16 current aging management program that's been approved  
17 for Indian Point, viewed as consistent with GALL?

18 And I thought I just heard you say, that  
19 it is. Is that what I heard, Dr. Hiser?

20 DR. HISER: This is Dr. Hiser, yes. It is  
21 consistent with GALL.

22 JUDGE KENNEDY: So when Entergy writes  
23 their next application, they would list their reactor  
24 vessel internals as being a program consistent with  
25 GALL? And I'll let Dr. Cox, or Mr. Cox answer since

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1 he's writing an application.

2 MR. COX: We would say that, this is Alan  
3 Cox for Entergy, we would say that they program was  
4 consistent with GALL as modified by ISG 2011-04.

5 JUDGE KENNEDY: Okay.

6 JUDGE WARDWELL: And so you wouldn't  
7 consider it a plant specific GALL, it is a GALL, it is  
8 an AMP that's consistent with GALL 2?

9 MR. COX: That's correct. For it to be a  
10 plant specific AMP, it would be an AMP that is not  
11 based on a industry wide guidance document. The ISG,  
12 while it's not, it's a revision to GALL, it's not  
13 actually GALL Rev 2. It is still a generic industry  
14 guidance document. So when you compare, it's not  
15 going to be plant specific. Because it's going to be  
16 compared to a generic document.

17 MR. HARRIS: Your Honor, this is Brian  
18 Harris for the staff. The license renewal interim  
19 staff guide I believe that Mr. Poehler was referring  
20 to, is NRC Exhibit 214.

21 JUDGE KENNEDY: Thank you.

22 Dr. Hiser, you may have already answered  
23 this question but in my opening remarks I indicated  
24 that the Commission expects the staff to not take the  
25 applicant at their word, but to verify that the

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1 particular aging management program is consistent with  
2 GALL. How does the staff perform and document that  
3 verification or confirmation process?

4 DR. HISER: This is Dr. Hiser. The staff  
5 for AMPs that are consistent with GALL, performs an  
6 on-site audit at the applicant's facility. And we  
7 compare first of all their program, element by  
8 element, to what is in the GALL report. And then we  
9 also look at plant specific operating experience and  
10 things like that to verify that the AMP appropriately  
11 bounds the conditions at the plant.

12 JUDGE KENNEDY: Dr. Hiser, is that audit  
13 process also cover AMPs that are not consistent with  
14 GALL? I mean is it, it's not, is it limited to a  
15 consistent with GALL aging management programs?

16 DR. HISER: In general, it would cover  
17 AMPs that are consistent with GALL, and also programs  
18 that are consistent with enhancements, or with  
19 exceptions.

20 The only case that it would not cover,  
21 would be a plant specific AMP.

22 JUDGE KENNEDY: And where is this  
23 document? Did you, Dr. Hiser, did you let us know  
24 where this document --

25 DR. HISER: It is documented in the

1 staff's audit reports. For Indian Point they were  
2 Exhibits within, that we cited within our testimony.

3 JUDGE KENNEDY: Dr. Hiser, is that  
4 evidence itself at all in the Safety Evaluation Report  
5 for the Indian Point license renewal application?

6 DR. HISER: Yes, that would be cited  
7 within the SER.

8 JUDGE KENNEDY: So it is incorporated by  
9 reference. Is that, or is it, I mean is it --

10 DR. HISER: It is, I believe there are  
11 critical elements are described in the SER. And then  
12 it is referenced within the SER.

13 JUDGE KENNEDY: Thank you. I guess moving  
14 away from consistent with GALL, let me try another  
15 couple of questions here.

16 Within the Indian Point license renewal  
17 application, commitments for future actions are  
18 proposed. I guess I'm curious if the Board could hear  
19 from Entergy first, how these commitments are  
20 monitored and controlled from the licensee's  
21 perspective?

22 Entergy first.

23 MR. COX: I'll start, and if any of the  
24 plant folks have anything to add, they can add. This  
25 is Alan Cox for Entergy. But Entergy has a process

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1 for regulatory commitment management.

2 We would enter those commitments into that  
3 system. It's essentially a database. Identify what  
4 the commitment is? When it has to be done? Who's  
5 responsible for doing it? And then it would be  
6 tracked within that database to ensure that, if it  
7 gets accomplished as described and by the date by  
8 which it was due.

9 JUDGE KENNEDY: So there's an internal  
10 plant process to control the regulatory commitments.  
11 How are they documented and I'll say tabled with the  
12 staff? I mean is the staff aware other than the  
13 application, what the level of commitment is and what  
14 it is?

15 MR. COX: Well it is, it's submitted with  
16 the letter, I mean the commitment is a written letter  
17 to the staff. You know so it is provided to them in  
18 a letter.

19 Typically we would, if we had an REI that  
20 we responded to that resulted in a change to the  
21 commitment, we would update that commitment. And  
22 typically submit the entire commitment list associated  
23 with the license renewal application as an attachment  
24 to the letter that responded to that particular REI,  
25 or REIs.

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1 JUDGE KENNEDY: So if Entergy completes  
2 one of these commitments. In other words they've, at  
3 least in the licensee's mind, they've completed the  
4 actions that they committed to do. How is that  
5 communicated to the staff?

6 MR. COX: It's largely an internal  
7 documentation, except for license renewal, there is a  
8 provision to notify the NRC when we completed all of  
9 the commitments. There's not an individual  
10 notification for each commitment. But there is a  
11 notification that says we've completed all the  
12 commitments, or all the commitments that are due. For  
13 instance before the period of extended operation.

14 I wouldn't want to say all, license no  
15 commitments because there's a few of them are not due  
16 until sometime after the PEO. But there is a  
17 notification to the staff before the PEO, that the  
18 commitments that are due before the PEO have been  
19 completed.

20 JUDGE KENNEDY: And does that notification  
21 of the staff contain any details of the completion  
22 process? I mean is it literally just a letter that  
23 says at this point in time, we've completed all the  
24 commitments prior to, you entering the period of  
25 extended operation, or some example like that?

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1 MR. COX: I believe it's not much more  
2 than that. It would be a list I believe that shows  
3 commitments that have been completed.

4 MR. STROSNIDER: This is Jack Strosnider  
5 for Entergy. If I could expand on this response just  
6 a little bit. I think it's worth noting that the NRC  
7 also has an inspection procedure that they implement  
8 to verify commitments prior to entering the extended  
9 period of operation. And they have inspection  
10 procedures during operation where they look at  
11 commitments. So they do get at that through the  
12 inspection process.

13 The other thing I wanted to note with  
14 regard to the capturing, tracking, and enforcement of  
15 commitments is that it's my understanding that the  
16 staff plans to have a license condition that would  
17 require that the commitments be put into the updated  
18 final safety analysis report. So they will be  
19 incorporated in that report and tracked. And can only  
20 be modified under the provisions by which you can  
21 change that report, which is 50 59.

22 JUDGE KENNEDY: Okay, thank you, sir.

23 Maybe I'll open it up to the staff and if  
24 they themselves have anything to add to this process  
25 since they're a part of it?

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1 DR. HISER: This is Dr. Hiser. Actually  
2 we have, the normal process that is followed is as Mr.  
3 Cox mentioned, applicants or license renewal holders  
4 at that point, would send us a letter that indicates  
5 they've completed their commitments prior to the plant  
6 entering the period of extended operation. We would  
7 implement an inspection by the region. It would  
8 verify that the completion of each of the commitments.

9 JUDGE KENNEDY: I guess I'm curious about  
10 this license condition and about commitments and when  
11 that take place. Is that once the renewed licenses  
12 are granted? When does that process kick off? Where  
13 the commitments are incorporated into something like  
14 the UFSAR?

15 DR. HISER: This is Dr. Hiser. Normally,  
16 well when the renewed license is issued is when the  
17 conditions apply to the plant. If we do not issue a  
18 license, there is no license condition because it's  
19 out of process at that point.

20 JUDGE KENNEDY: So maybe Dr. Hiser, in the  
21 interim between I guess in this case, the extreme  
22 interval of when the license application was submitted  
23 and all the evolutions of commitments up until today.  
24 What is the process for tracking, monitoring  
25 commitments before this license condition evolution?

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1 DR. HISER: The process would be that  
2 changes made to the application, and commitments are  
3 considered a part of the application, would be  
4 submitted to the NRC as an amendment to the  
5 application.

6 JUDGE KENNEDY: Okay. Mr. Cox, how does  
7 that tie into your regulatory commitments? Are we  
8 talking about the same thing here? Or is there a  
9 subtlety here that may be missing, or I may be  
10 missing?

11 MR. COX: This is Alan Cox for Entergy.  
12 There is a, I guess you could make a commitment to  
13 the, I'm trying to describe the difference between the  
14 normal process and license renewal. There's really  
15 not a lot of difference.

16 The license renewal application, the fact  
17 that that's under review adds another layer if you  
18 will, of review. Those commitments as Dr. Hiser  
19 indicated are submitted with the application as an  
20 amendment to the application. They're also still  
21 tracked internally in the database that I described  
22 earlier. It's the regulatory commitments, so you  
23 really kind of have a twofold process.

24 The one thing I didn't mention earlier, is  
25 the internal regulatory commitment management process

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1 is based on an industry guidance that was developed by  
2 the Nuclear Energy Institute. I believe it's NEI  
3 9904, which is an industry guideline on how to manage  
4 regulatory commitments. And that guideline, I believe  
5 is endorsed by the NRC staff.

6 CHAIRMAN McDADE: If I could just to  
7 clarify in my own mind here, to make sure I understand  
8 it correctly. Dr. Hiser, what is the FSAR?

9 DR. HISER: It's the Final Safety Analysis  
10 Report.

11 CHAIRMAN McDADE: Okay, and how are the  
12 commitments incorporated into the FSAR?

13 DR. HISER: They're incorporated as one of  
14 the appendices to the FSAR.

15 CHAIRMAN McDADE: Okay, and how does that  
16 FSAR then relate to the ongoing current licensing  
17 basis?

18 DR. HISER: That is one part of the  
19 current licensing basis.

20 CHAIRMAN McDADE: So these commitments are  
21 captured in the FSAR, which then in turn is captured  
22 in the CLB, which is the overarching document for the  
23 continued operation of the plant. Is that correct?

24 DR. HISER: That is an overarching  
25 classification of documents for the plant.

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1 CHAIRMAN McDADE: Okay, thank you. Judge  
2 Kennedy.

3 JUDGE KENNEDY: Thank you. I think I'm,  
4 I don't know where to direct this. Let's talk a  
5 little bit about Appendix A and Appendix B of the  
6 application. If I remember correctly, Appendix A  
7 contains aging management program descriptions. And  
8 there's some discussion -- this is going to get long.  
9 Let's see if I can make a question out of this.

10 All this discussion about commitments and  
11 stuff made me think about Appendix A and Appendix B.  
12 Appendix B, let me ask the question to Mr. Cox.  
13 Appendix B contains the descriptions of the Indian  
14 Point aging management programs. Is that true?

15 MR. COX: That's correct.

16 JUDGE KENNEDY: And Appendix A to the  
17 license renewal application contains?

18 MR. COX: Appendix A also contains  
19 descriptions of the programs. In some cases they're  
20 not as much detail as in Appendix B. It's a summary  
21 level of the program. It's intended to include all  
22 the key elements that are necessary to ensure that we  
23 have an effective program.

24 In addition, Appendix A also has a  
25 discussion of the evaluation that was performed of the

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1 time limited aging analysis for license renewal. And  
2 that becomes, that's the Appendix to the FSAR that Dr.  
3 Hiser referred to.

4 That will be incorporated into the FSAR.  
5 Essentially for Indian Point it was done prior to the  
6 entry into the period of extended operation.  
7 Typically it's done the next, it's updated, the FSAR,  
8 after you receive the renewed license.

9 JUDGE KENNEDY: So the, do I take that to  
10 mean the material that's placed in Appendix A is where  
11 the long lasting descriptions of the aging management  
12 programs are contained?

13 MR. COX: Yes. That would be correct.

14 JUDGE KENNEDY: And that's the material  
15 that, is that the material that is under some level of  
16 control then? What's the level of control over those  
17 descriptions if it makes it to the final safety  
18 analysis report?

19 MR. COX: Well the final safety analysis  
20 report is indicated as a current licensing basis  
21 document. Changes to that can be made under 10 CFR  
22 50.59. If it meets those criteria in that part of the  
23 regulations.

24 JUDGE KENNEDY: So the 10 CFR 50.59  
25 process would be the controls over changes to the

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1 descriptive material of the aging management program?

2 MR. COX: Yes, sir. That's correct.

3 JUDGE KENNEDY: This is a question that I  
4 struggle with all the time. It's unclear to me, and  
5 I guess I'll start with the NRC staff. Why there's a  
6 difference between, there appears to be in reading in  
7 particular the Indian Point license renewal  
8 application, a difference between what's in Appendix  
9 A and what's in Appendix B. And I've always wondered  
10 why they weren't just a mirror of each other.

11 I guess could you help enlighten the Board  
12 as to why that would be the case? Or what's the  
13 rationale and how does the staff determine that what's  
14 in Appendix A is acceptable?

15 DR. HISER: This is Dr. Hiser. Appendix  
16 A is the UFSAR supplement that the applicant proposes  
17 to describe the aging management programs and TLAA  
18 resolutions. So that becomes a part of the current  
19 licensing basis.

20 Appendix B provides a description of the  
21 AMPs, which for AMPs consistent with GALL tends to be  
22 a very short summary. If there are exceptions, if  
23 there are enhancements, then those are described in  
24 Appendix B.

25 Appendix B is more the information that

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1 the staff reviews as a part of its assessment of the  
2 adequacy of the AMP.

3 Appendix A, the UFSAR supplement, is what  
4 will go into the UFSAR and provides the licensing  
5 basis description of the AMP that then is controlled  
6 through the 50.59 process.

7 JUDGE KENNEDY: And I think that's the  
8 nexus of my problem. Is how do you determine what  
9 goes in the Appendix A documentation, which appears at  
10 least to me, to be under a level of control that's  
11 regulatory driven? And there's a lot of precedence on  
12 how it is to be handled, and it's transparent best as  
13 anything can be.

14 So I struggle with how the staff  
15 determines what goes where. And if you could help  
16 enlighten us it would help me a bunch.

17 DR. HISER: What goes into Appendix A, and  
18 into the UFSAR is what staff believes sufficient  
19 information to provide adequate control of the AMP.  
20 So we look for sufficient description of the program  
21 and the essential elements of the program such that  
22 50.59 would be an effective way to control changes to  
23 that.

24 JUDGE KENNEDY: Does that have any  
25 synergism with the GALL description? I'm trying to

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1 see you know a pathway from GALL which from one  
2 argument, if you did verbatim compliance with GALL,  
3 you'd have reasonable assurance. And then there's the  
4 Appendix B description which could capture that.

5 And then Appendix A which puts that, some  
6 subset of that information, or all of it, under a  
7 level of control. I'm trying to really get  
8 comfortable with how that, determinations are made.  
9 And we end up with Appendix A that has a measure of,  
10 I perceive to be a good strong measure of controls on  
11 the information?

12 DR. HISER: As I said, Appendix B is what  
13 we review within the application. And the Commission  
14 determined that for AMPs, that applicant AMPs that are  
15 consistent with GALL, that the applicant could provide  
16 a very short description of what is in the AMP.

17 The staff then performs an audit to verify  
18 that AMPs identified as consistent with GALL, we  
19 verify that they are in fact consistent, or identify  
20 discrepancies.

21 Appendix A is just intended to provide  
22 enough information that the applicant, or at that  
23 point, license renewal holder, could not make  
24 significant changes to the program that could affect  
25 the effectiveness of the program. So it's to provide

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1 a measure of controls over that.

2 So they really are different purposes I  
3 guess is what I'm trying to say.

4 JUDGE KENNEDY: I don't want to put words  
5 in your mouth, but I heard you use the word  
6 effectiveness of the aging management program. Is  
7 that a level of the criteria that's being used to  
8 determine the sufficiency of material in Appendix A?

9 DR. HISER: Well, when I said  
10 effectiveness, I guess I did not mean in a, sort of in  
11 detail by detail way. But more in an overall sense  
12 that the effectiveness of the program would not be  
13 compromised by changes.

14 JUDGE KENNEDY: You can see what I'm, well  
15 maybe you can't. What I'm trying to get at is, I want  
16 to get to the answer of the question, is there  
17 sufficient, how do I convince myself there's  
18 sufficient material in Appendix A that all the right  
19 stuff is under a measure of control? That I at least  
20 perceive to be adequate? And I'm trying to figure out  
21 how the staff determines that?

22 DR. HISER: Well, in part we do that by  
23 looking at prior applications, the level of detail  
24 that's provided in Appendix A. We also just make an  
25 engineering assessment of what is sufficient level of

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1 detail. The applicant could put the entire ten  
2 element program into their FSAR. But we don't believe  
3 that that's necessary to do. We believe that would be  
4 excessive.

5 JUDGE KENNEDY: Would I expect to find all  
6 the critically characteristics that have been  
7 displayed in Appendix B carried forward into Appendix  
8 A?

9 DR. HISER: I believe that our intent is  
10 to capture the things that we believe are critical in  
11 Appendix A.

12 JUDGE KENNEDY: From the material that's  
13 in Appendix B?

14 DR. HISER: Correct. Or in general about  
15 the program. Because again, Appendix B may not, it  
16 may be very, some overarching summary description. So  
17 we may actually have more detail in Appendix A in some  
18 cases.

19 JUDGE KENNEDY: Okay.

20 MR. COX: Judge Kennedy. This is Alan  
21 Cox. I might add just a little bit to that. It might  
22 be helpful to look at the specifics for this  
23 particular program. If you look at Appendix A, it  
24 refers you to the MRP-227-A. There's not a lot of  
25 discussion in there but it does tie you to that

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1 program.

2 If you go to the GALL report description  
3 in Appendix B, you would have, you go to the GALL  
4 report, or the ISG program that's referenced from  
5 Appendix B, you would find a lot of MRP information  
6 that's broken out into the individual ten elements of  
7 the program.

8 So I guess the differences there, it's all  
9 incorporated in Appendix A as a reference to MRP-227-  
10 A. You go to Appendix B, that's broken out and  
11 spelled out in more detail. But there's nothing new,  
12 there's nothing in Appendix B that's not covered under  
13 MRP-227-A, which is what Appendix A ties the Indian  
14 Point program to.

15 MR. STROSNIDER: This is Jack Strosnider  
16 for Entergy. I'd like to add a little bit to this  
17 too. And maybe if I can describe the overall  
18 framework for you.

19 I think you need to recognize first the  
20 hierarchy of documents. So you have the updated final  
21 safety analysis report which is as Dr. Hiser  
22 indicated, includes that information that the NRC  
23 staff concludes is appropriate to show, demonstrate  
24 reasonable assurance.

25 But you can imagine to implement that,

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1 there's a whole lot of lower tier documents all the  
2 way down to plant operating procedures. And it's not  
3 practical or necessary to put all of those in the  
4 updated FSAR.

5 That said, part of your question if I  
6 understood it was related to control of, what controls  
7 is over all these documents then. And one of the  
8 things I wanted to point out when we mentioned 50.59  
9 earlier, is that the nuclear plant, when they go to  
10 make a change in a procedure, even some of these lower  
11 tier documents, they can't just unilaterally make that  
12 change without first looking at it to see if it needs  
13 to be evaluated under 50.59.

14 So if it could potentially, if a change in  
15 a low level procedure, an implementation procedure,  
16 could change something that's as described in the  
17 updated final safety analysis report, then they need  
18 to put it through 50.59 evaluation.

19 So all the way down to those implemented  
20 procedures, there is a strong level of control in  
21 terms of how they can be changed, and how they're  
22 managed.

23 JUDGE KENNEDY: And I think that's what I  
24 was concerned about. Depending on what level of  
25 detail you put in Appendix A, governs how broad the

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1 50.59 process could be in terms of level of control.  
2 Now if what Mr. Cox is saying is something like MRP-  
3 227-A is incorporated by reference, that adds a lot of  
4 detail to Appendix A. And I guess I'm going to ask  
5 Mr. Cox if that's what he intended to say?

6 MR. COX: Yes, that's exactly what I was  
7 intending to say.

8 JUDGE KENNEDY: Okay, that helps a bunch.  
9 I mean I think that clears some of my concern up.  
10 Because sometimes you look at, if I look at these  
11 Appendix A write-ups, they seem somewhat devoid of  
12 detail. But if the intent is to incorporate by  
13 reference, or if the actual practice is incorporation  
14 by reference, I see this as a much broader set of  
15 controls.

16 And I'm trying to look at it more say from  
17 New York State's perspective, who has concerns about  
18 how transparent this is to the public. And that to me  
19 goes right to the heart of what's in Appendix A.  
20 That's where it all starts. At least from my  
21 perspective.

22 MR. STROSNIDER: This is Jack Strosnider  
23 for Entergy. So I'm looking at Appendix A and it  
24 starts off saying, this program relies on  
25 implementation of MRP-227-A. It's called out

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1 specifically here that that's what the program is  
2 based on.

3 JUDGE KENNEDY: That helps. Thank you.  
4 And with that, I don't have any additional questions  
5 on GALL. So I'll either turn it over to my colleagues  
6 if they have any follow-up questions.

7 CHAIRMAN McDADE: I don't, not on this  
8 overarching issue.

9 JUDGE KENNEDY: And then on behalf of all  
10 assembled, I'm wondering if it's time for a break? I  
11 have no idea what time it is, so.

12 CHAIRMAN McDADE: It's about 1:30. Would  
13 a ten minute break be adequate? Does anyone require  
14 more than ten minutes?

15 JUDGE KENNEDY: I think a ten minute break  
16 would be great.

17 CHAIRMAN McDADE: Okay, why don't we break  
18 now? We'll be back in ten minutes at 1:40.

19 (Whereupon, the above-entitled matter went  
20 off the record at 1:29 p.m. and resumed at 1:43 p.m.)

21 CHAIRMAN MCDADADE: Okay, we're back on the  
22 record. Okay, first of all, let me ask do any counsel  
23 have any matters to take up before we get back to  
24 taking testimony?

25 MR. HARRIS: This is Brian Harris for the

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1 staff. No, Your Honor.

2 MR. KUYLER: Ray Kuyler for Entergy. No,  
3 Your Honor.

4 CHAIRMAN MCDADE: Mr. Sipos?

5 MR. SIPOS: John Sipos, State of New York.  
6 Not at this time.

7 MS. BRANCATO: And Deborah Brancato for  
8 Riverkeeper. No, Your Honor. Thank you.

9 JUDGE KENNEDY: Okay. Dr. Hiser, you have  
10 some clarification?

11 DR. HISER: I have clarifications. One of  
12 them may make it more difficult to understand but it's  
13 more consistent with the record I guess.

14 Initially the AMP that was submitted by  
15 the Applicant was submitted July 2010 as a plant-  
16 specific AMP.

17 JUDGE WARDWELL: Now, is this all AMPs or  
18 you're referring to the reactor vessels?

19 DR. HISER: Only reactor vessel internals,  
20 and what I will say for the next little bit is only  
21 for the reactor vessel internals program. So that  
22 program was submitted as a plant-specific program.  
23 Had ten elements. At that point GALL Revision 2 had  
24 not been issued, so that's why it was a plant-specific  
25 program.

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1 JUDGE WARDWELL: And that's because GALL  
2 1 didn't contain any AMP in it for reactor vessel  
3 internals. Is that correct?

4 DR. HISER: That is correct.

5 JUDGE WARDWELL: Thank you.

6 DR. HISER: Yes. Let's see. Subsequent  
7 to that, we issued our Revision 2. Then through a  
8 letter, let's see, the Exhibit Number is NYS 496,  
9 which is Entergy Letter NL-12-037, they revised that  
10 plant-specific AMP, and although they did not say it  
11 was consistent with the LR-ISG, the staff realized  
12 that it, in effect, was consistent.

13 MR. POEHLER: Jeffrey Poehler of the  
14 staff. Yes, well, in February 2012 the LR-ISG had not  
15 even been issued yet, but GALL Rev. 2 had been issued  
16 but the Applicant did not cite GALL Rev. 2 because it  
17 still referred to it as a plant-specific program but  
18 one that was, that they did claim consistency with the  
19 guidance in MRP-227-A.

20 JUDGE WARDWELL: Again, you said this  
21 letter was NL-12-037?

22 MR. POEHLER: Correct.

23 JUDGE WARDWELL: Thank you.

24 DR. HISER: This is Allen Hiser again.  
25 Earlier I answered a question about how we evaluate

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1       AMPs that are consistent with GALL and cited an audit  
2       and then an audit report that summarizes the results  
3       of the audit.

4                Because of the sequencing, the timely  
5       sequencing of the AMP for reactor vessel internals for  
6       Indian Point, there is no AMP consistency audit  
7       report. Instead, the staff's evaluation is provided  
8       in SER, Supplement 2.

9                There is an audit report that describes  
10       the staff's evaluation of some of the applicant action  
11       items and that is summarized in an audit report, so  
12       there is a report for that. I do not have the exhibit  
13       number for that right now but we could find that.

14               MR. POEHLER: It was NRC Exhibit 216, 2-1-  
15       6.

16               JUDGE WARDWELL: And that's for this  
17       modified audit report, is that correct?

18               MR. POEHLER: Right, and that audit  
19       report, it was limited in scope to some calculations  
20       that supported some of the plant-specific action items  
21       so it wasn't an overall, was not an overall audit of  
22       the program compliance, just limited, narrow aspects.

23               JUDGE WARDWELL: And, Dr. Hiser, could you  
24       get me the locations, the citing within the various  
25       sections in case there's more than one in the SER

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1 where this is described for the reactor vessels  
2 internals? You don't have to do it now but get it for  
3 us later.

4 DR. HISER: We'll do that. I guess the  
5 other thing that I wanted to clarify was regarding the  
6 Appendix A descriptions of AMPs.

7 We have in the SRP-LR document, NUREG-  
8 1800, Rev. 2, we have descriptions of the AMPs that  
9 the staff uses as examples for what should be in  
10 Appendix A of the applications. So those are examples  
11 of what the staff considers to be sufficient  
12 information to assure adequate controls over the AMP.

13 When the staff reviews the application, we  
14 compare what is in SRP-LR with Appendix A from the  
15 application to ascertain that the application is  
16 sufficient.

17 JUDGE KENNEDY: Dr. Hiser, that makes me  
18 think of a question. So that's the standard review  
19 plan for license renewal that you're referencing?

20 DR. HISER: That's correct.

21 JUDGE KENNEDY: For these descriptive  
22 summaries?

23 DR. HISER: That's correct. And in the  
24 case of this program, that SRP-LR discussion would be  
25 in the LR-ISG for the reactor vessel internals

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1 program.

2 JUDGE KENNEDY: Okay. I guess what comes  
3 to mind is as GALL has evolved from Rev. 0 to Rev. 1  
4 to Rev. 2, has the standard review plan document  
5 changed accordingly and, if not, how do I interpret  
6 the value of that summary material for AMPs that have  
7 undergone significant change over time?

8 DR. HISER: I have not done a comparison  
9 from Rev. 0, Rev. 1, Rev. 2. I know for the reactor  
10 vessel internals program, the FSAR supplement in Rev.  
11 1 was a description of the commitment in effect, that  
12 the plant would participate in industry programs and  
13 then would implement the program that came out of  
14 those industry activities. Clearly then the LR-ISG  
15 provided a more robust description of the program.

16 JUDGE KENNEDY: All right, thank you.

17 CHAIRMAN MCDADADE: Okay, and let me just to  
18 make sure, as time sequence goes here, you're  
19 referring to the aging management audit report. That  
20 report is dated August of 2015, or is that, it says a  
21 submission date on it. Your index indicates October  
22 of 2014 but the report itself has a date of August  
23 2015. I'm just trying to figure out for time sequence  
24 of where it fits in. Is it from October 2014 or  
25 August of 2015?

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1 MR. POEHLER: This is Jeffrey Poehler from  
2 the staff. Are you referring to the Exhibit 216, NRC  
3 216 for the audit report?

4 CHAIRMAN MCDADE: Yes.

5 MR. POEHLER: Yes, the audit itself was  
6 actually performed in 2013 I believe and --

7 CHAIRMAN MCDADE: Okay, it's indicated  
8 April of 2013 for the dates of the audit.

9 MR. POEHLER: Right, and I think the  
10 actual audit report was possibly not issued until  
11 sometime in 2014 but I can't remember the exact dates  
12 but it was prior to the supplemental safety evaluation  
13 report being published.

14 CHAIRMAN MCDADE: Okay. Okay, and that  
15 would have been October of 2014, approximately?

16 MR. POEHLER: Correct.

17 CHAIRMAN MCDADE: Okay, thank you.

18 JUDGE KENNEDY: R2 of the overarching  
19 questions. This is Judge Kennedy. Again, I drew the  
20 short straw.

21 We'd like to entertain some discussion  
22 over time-limited aging analyses. Again, the  
23 testimony and the exhibits for a couple of these  
24 contentions, time-limited aging analyses seem to play  
25 a role and it occurred to us that it would be useful

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1 to have some general discussion before we start the  
2 contention-specific questions.

3 Again, I'll try to address it, hopefully  
4 to a person this time but, if not, we'll try starting  
5 with organizational affiliations and work our way to  
6 specifics.

7 Time-limited aging analysis, as I  
8 mentioned, play a role in the testimony for this Track  
9 2 hearing and, for that reason, since it goes across  
10 a couple of contentions, we thought we'd start with  
11 it.

12 Let's start at the highest level and maybe  
13 start with Entergy. Could you describe for us what a  
14 time-limited aging analysis is in regard to the  
15 license renewal process?

16 MR. COX: This is Alan Cox for Entergy.  
17 I could describe that. In general terms, there are  
18 some places in the testimony, I'm looking at the NRC  
19 staff testimony here, where they give a detailed  
20 discussion of it out of the --

21 JUDGE KENNEDY: Are you looking at the  
22 response to Question 16?

23 MR. COX: I am.

24 JUDGE KENNEDY: If possible, Mr. Welkie,  
25 could you put up Page 23 from NRC 197, and hopefully

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1 it's not all redacted because it should be regulation.  
2 I was going to use that later, Mr. Cox, so we might as  
3 well put it up. Sorry, did I give you the wrong page  
4 number?

5 MR. COX: Question 16.

6 JUDGE KENNEDY: Yes.

7 MR. POEHLER: Your Honor, Page 23?

8 JUDGE KENNEDY: Yes, that's correct.  
9 That's it right there.

10 MR. POEHLER: That's it. Would you like  
11 to use this in answering the TLA question, Mr. Cox?

12 MR. COX: Sure. This is Alan Cox with  
13 Entergy. As it says here on the screen, a TLAA is an  
14 analysis that meets these six criteria that are listed  
15 here.

16 The first is it has to involve system  
17 structures or components that are within the scope of  
18 license renewal. The second considers the effects of  
19 aging. The third, it involves time-limited  
20 assumptions defined by the current operating term, for  
21 example, 40 years. The fourth is the analysis was  
22 determined to be relevant by the licensee in making a  
23 safety determination.

24 Criteria five involves conclusions or  
25 provides the basis for conclusions related to the

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1 capability of the SSC, system, structure, or  
2 component, to perform its intended function as  
3 identified in 10 CFR 54.4 bravo. And lastly, it has  
4 to be contained or incorporated by reference in the  
5 plant's current licensing basis.

6 JUDGE KENNEDY: Now let's look at a couple  
7 of these. Can we leave that up there, Mr. Welkie?

8 Looking at Number 3 in this list here of  
9 characteristics of a time-limited aging, "involved  
10 time-limited assumptions." Mr. Cox, what is that  
11 referring to and if you would have an example it would  
12 be useful.

13 MR. COX: Most of the TLAAs are involved  
14 in these contentions and the Track 2 contentions are  
15 involving fatigue analyses.

16 Fatigue analyses are based on a number of  
17 cycles. The numbers of cycles that are used in those  
18 analyses are estimates or assumptions that are  
19 considered to be based on what numbers would be  
20 anticipated to be incurred by the plant during a 40-  
21 year period of operation. That becomes the tie.  
22 That's the assumption. It assumes a certain number of  
23 cycles that is based on a 40-year operating period.

24 JUDGE KENNEDY: And the Bullet Number 6,  
25 "are contained or incorporated by reference in the

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1 current licensing basis." If I turn that around, if  
2 it isn't currently in the current licensing basis,  
3 that makes it not a TLAA? Are there none?

4 MR. COX: Yes, that's correct. That's the  
5 way I would read that sixth criteria.

6 JUDGE KENNEDY: So do I take that further?  
7 Does that mean that TLAA's are not performed as part of  
8 license renewal? They're contained somewhere else?

9 MR. COX: Let me try to clarify that a  
10 little bit. The TLAA is an existing analysis so it  
11 would not be performed for a license renewal. The  
12 license renewal rule requires an evaluation of the  
13 TLAA's, which is what's discussed in the next paragraph  
14 here of this page.

15 So the TLAA itself is an existing  
16 analysis. The evaluation is required for license  
17 renewal, which may involve a revision of that analysis  
18 to extend the time period for which it's applicable.

19 JUDGE KENNEDY: Let's go through these  
20 little I, little two I, little, I, ii, and iii. So a  
21 TLAA fits in one of those bins, I, ii, or iii? Is  
22 that the way I should think of this?

23 MR. COX: The evaluation of TLAA's has to  
24 be, has to demonstrate that you meet one of those  
25 three options.

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1 JUDGE KENNEDY: And you only meet one of  
2 them? Are they mutually exclusive? So if a TLAA fits  
3 in Bucket 1, you're done?

4 MR. COX: I think in general that's true.  
5 There is, you know, some variations. For example, we  
6 could say that if we do a fatigue analysis that says  
7 a component was good for 40 years or for 60 years,  
8 maybe looked at the additional 20 years of operation  
9 in that same analysis, maybe based on the number of  
10 transients that we're experiencing, we are not going  
11 to exceed that assumed number in 60 years.

12 We could look at that and say, well, that  
13 TLAA is valid for the period of extended operation in  
14 accordance with the single I there.

15 What we do, we actually take it a little  
16 bit further than that. Because those are estimates,  
17 projections are not actionable. I mean, it's not  
18 truly based on a calendar. When you get to the end of  
19 60 years, you don't know that you've met those  
20 assumptions. It depends on how fast, you know, it  
21 depends on the rate of accrual of the transient.

22 So we have credited, for the fatigue  
23 TLAAs, we also credit, or in lieu of single I, we  
24 credit triple I. We credit the fatigue monitoring  
25 program, primarily as a way to monitor the number of

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1 transients that are occurring as you operate the plant  
2 to make sure that we don't exceed those numbers that  
3 were assumed at the end of the, for the end of the  
4 period of extended operation.

5 JUDGE KENNEDY: So using that example, I  
6 guess when I first looked at this I came away with the  
7 sense that if it fell into the first bucket, that  
8 aging management wouldn't be part of the process.

9 MR. COX: I think, in general, in the  
10 purest sense of the word, that would be true but, like  
11 I said, this case, it's not, you know, the number of  
12 transients is not strictly a function of how long you  
13 operate the plant. It's an estimate based on what's  
14 expected during a typical operating cycle.

15 And because there are variations from  
16 plant to plant as far as how well the plant is  
17 operated and how many transients you incur, we've  
18 credited the program to monitor those occurrences to  
19 make sure the assumptions remain valid for the 60-year  
20 period.

21 JUDGE KENNEDY: And you use the example of  
22 metal fatigue I guess, and so this is the cumulative  
23 usage factor calculation. Is that what falls into  
24 this?

25 MR. COX: Yes, that's correct.

1 JUDGE KENNEDY: And so I thought I heard  
2 you say that even though it maybe would be valid for  
3 the period of extended operation, you really, the  
4 application considers it more of a third bullet?

5 MR. COX: That's correct.

6 JUDGE KENNEDY: So it's actually, even  
7 though it's projected to remain valid for the period  
8 of extended operation, it is within an aging  
9 management program. Is that the way I should take  
10 that?

11 MR. COX: That's correct. For the fatigue  
12 analyses, that is true. It's a little bit of a hybrid  
13 because it is, it's not purely based on the number of  
14 years but it is based on the number of transients that  
15 are experienced.

16 JUDGE KENNEDY: What does it mean to be  
17 projected to the end of the period of extended  
18 operation and what's a good example of that type of  
19 TLAA, or time-limited aging analysis?

20 MR. COX: I guess if we used fatigue  
21 analysis as an example, if we had an analysis that  
22 said you're going to -- Let's just pick a number.  
23 Let's say you could have 100 heat-ups and cool-downs  
24 in the analysis and your TLAA or your CUF would still  
25 be valid at the end of the period of extended

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1 operation.

2 If you determined that 100 was a valid  
3 number that you would not expect to exceed after 60  
4 years of operation, you could say that was a single I.

5 If you saw, based on your operating  
6 history, that you're probably going to go up to 120  
7 heat-ups and cool-downs at the end of 60 years, then  
8 you would redo that analysis to use 120 cycles instead  
9 of 100 and you could say that you have projected the  
10 analysis to the end of the period of extended  
11 operation.

12 JUDGE WARDWELL: That doesn't make much  
13 sense to me. It sounds like both were projections.  
14 I don't see how you get a single I. Aren't you still  
15 projecting? You just made a different assumption in  
16 your projection.

17 DR. HISER: This is Dr. Hiser. I guess  
18 the difference is in the first one your projection  
19 validates the current analysis of record, so it  
20 validates the adequacy of the COB analysis.

21 If the projection, as Mr. Cox mentioned,  
22 indicates that the value will go higher, so your  
23 assumptions are no longer valid, then double I  
24 indicates that you would have to reevaluate that  
25 analysis to demonstrate that it still is accurate.

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1 JUDGE WARDWELL: Explain to me again how  
2 with fatigue a TLAA could possibly fall within I  
3 because it seemed to me we'll be always projecting, as  
4 Mr. Cox said, the number of transients, not the time  
5 of years.

6 It's not important, the time of years.  
7 It's the number of transients. So it's a rate of  
8 transients really and it's always a projection.  
9 You'll never know truth until you experience it.

10 MR. COX: Judge Wardwell, let me try that.  
11 I mean, you're right. They both involve projections  
12 but in the first case, the single I, you're not  
13 revising the analysis to incorporate a different  
14 projection. You've done the work outside of the  
15 analysis to project the number of transients and,  
16 based on that projection, that analysis remains valid  
17 without revision.

18 But if you read the words, it says "the  
19 analysis is projected." That's not to say, you know,  
20 on single I analysis remains valid based on your  
21 projection of the transients but you're not changing  
22 the analysis.

23 In the second one, you're actually doing  
24 a projection of the analysis to use a different number  
25 based on projection of the number of cycles.

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1 JUDGE WARDWELL: So the analysis you're  
2 referring to is not the calculation that was done in  
3 the TLAA but the analysis of the TLAA? Is that what  
4 you were saying?

5 MR. COX: The analysis that's done in the  
6 TLAA is looking at, in my first example it would say  
7 100 heat-ups and cool-downs. That's in the analysis.

8 JUDGE WARDWELL: Okay, where did this 100  
9 come from? We're going to have to jump me right back  
10 down because as soon as you start saying that I got to  
11 know where did -- Okay, here we are. You're preparing  
12 your license renewal application --

13 MR. COX: The 100 is a --

14 JUDGE WARDWELL: -- and you've done TLAA's,  
15 okay, for fatigue all along, correct?

16 CHAIRMAN MCDADE: Okay, if I could  
17 interrupt here because I'm getting more confused  
18 rather than, you know, more clear on this.

19 JUDGE WARDWELL: So you interrupting is  
20 going to help us?

21 CHAIRMAN MCDADE: No.

22 JUDGE WARDWELL: We need help.

23 CHAIRMAN MCDADE: For Mr. Cox, as you  
24 answer the question -- Correct my misinformation and  
25 my misconception here. I had viewed I as the

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1 situation where you anticipated there'd be 100  
2 transients.

3 ii is a situation where you look at it and  
4 you determine in the period of extended operation  
5 there won't be 100 transients but there'll be 200  
6 transients. So you now have to project given the  
7 increased number of transients in the period of  
8 extended operation. Have I just --

9 MR. COX: Yes, let me start that.

10 CHAIRMAN MCDADE: Explain how I got so far  
11 off the path.

12 MR. COX: The TLAAs that we're talking  
13 about, if we talked about the first one on the -- You  
14 know, and the 100 number, Judge Wardwell, is a  
15 hypothetical number. That's what I just made up.

16 So assuming that the analysis evaluated  
17 100 transient, that analysis was done probably during  
18 the initial plant design, so that was done 35 years  
19 ago and it's an assumption.

20 So we look at the projection of cycles  
21 based on operating history and we say at the end of 60  
22 years I'm still going to be less than 100. That  
23 original analysis does not change. It's still valid  
24 for the period of extended operation.

25 JUDGE WARDWELL: Hold right here. So what

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1 you said is at this point your analysis that you  
2 conducted during the design or even subsequently  
3 during operations up to this point, up to the original  
4 licensing date, that's the end of your license,  
5 current license, you had always used 100.

6 And at this point in time, if you look  
7 forward to license renewal and determine that it was  
8 still going to be less than 100, then it would be an  
9 I.

10 MR. COX: That's correct.

11 JUDGE WARDWELL: Okay, great. Now, I'll  
12 move ahead. Yes, good.

13 So now, under ii, all you did is now at  
14 that same point in time while you're preparing your  
15 license application, you now say, oh, gee, it's going  
16 to go up to 160. That would be a double I.

17 MR. COX: Right, that would require a  
18 revision or a projection of that analysis. That  
19 original analysis is no longer going to remain valid  
20 for the 60-year period. It's going to have to be  
21 revised. We're going to have to calculate a new  
22 cumulative usage factor and we're going to have to  
23 show that it still remains less than one.

24 JUDGE WARDWELL: And if it does, if this  
25 wasn't a fatigue example, you would be off the hook

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1 from doing aging management, right? Either I or  
2 double I took place.

3 MR. COX: Right, you would essentially  
4 have an analysis that says for this 60-year period  
5 this particular aging effect is not an aging effect  
6 requiring management.

7 JUDGE WARDWELL: But with fatigue that's  
8 a special case where you actually are doing it because  
9 you just don't know how many transients. It's always  
10 going to be an unknown. It's not based on years.  
11 It's just based on how many of these you happen to  
12 have and it could be a wrong projection.

13 MR. COX: That's correct.

14 MR. STROSNIDER: This is Jack Strosnider  
15 for Entergy. I'd just like to suggest that this  
16 conversation, to me, demonstrates exactly why it makes  
17 sense to manage fatigue through an aging management  
18 program, which is what Entergy is doing, meaning that  
19 they will be looking at the number of cycles and  
20 making sure that it meets their analysis.

21 So they have chosen Option 3 and it makes  
22 sense for the reasons that you're talking about. The  
23 simple example, if I could --

24 JUDGE WARDWELL: So let me interject  
25 because we're interested in questioning and, as your

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1 colleague just spoke, Mr. Cox, why have these i's and  
2 double i's and triple i's, why don't we just jump to  
3 aging management for everything we do?

4 MR. STROSNIDER: This is Jack Strosnider  
5 for Entergy. If I could just finish my comment there.  
6 The example I was going to give, which is not related  
7 to these contentions, but consider, if you will, a  
8 piece of equipment that's qualified for a 20-year life  
9 and then it has to be replaced.

10 That doesn't fall in the, I guess in the  
11 scope of license renewal perhaps, but if you have  
12 something like that, you can't look at it and say this  
13 is going to be good for 60 years. I know that I have  
14 to do something earlier, but.

15 JUDGE WARDWELL: Mr. Cox, would you have  
16 a comment on why would we bother with i and double i?

17 MR. COX: Well, again, I think in this  
18 case, in the case of fatigue analyses, it's important  
19 to recognize that it's not strictly based on the  
20 calendar.

21 If you had another kind of analysis --  
22 Let's say you had a corrosion rate that you knew was  
23 going to be a constant every year for 60 years and in  
24 that case you could say if I apply that corrosion rate  
25 for 60 years I still meet the acceptance criteria. I

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1 projected the analysis. It still shows I have  
2 adequate minimum wall thickness. So in that case, the  
3 single i or the double i would be applicable.

4 JUDGE WARDWELL: Have any of the pieces of  
5 equipment or system structures or components that do  
6 qualify for license renewal been screened out based on  
7 TLAA's, i.e., as falling under i or double i knowledge?

8 MR. COX: Yes, that's not quite the same  
9 as screened out. In screened out, we would consider  
10 that to be where you apply the criteria of whether  
11 it's active or passive or long-lived or short-lived.

12 But as far as TLAA's go, there are TLAA's  
13 described in the license renewal application that have  
14 been demonstrated acceptable in accordance with the  
15 single i or the double i.

16 JUDGE WARDWELL: That's a better way to  
17 word it than the screening. Thank you.

18 MR. COX: Embrittlement TLAA's on the  
19 reactor vessel is a good example. Those are typically  
20 projected. You reevaluate, recalculate the fluence  
21 expected at the end of 60 years and you show that the  
22 associated embrittlement analyses are going to be  
23 valid at 60 years in accordance with the double i.

24 JUDGE WARDWELL: Thank you.

25 CHAIRMAN MCDADE: And those are items such

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1 as, like, the upper support plate assembly, the upper  
2 core plate, the core barrel. Is that what you're  
3 talking about?

4 MR. COX: No, what I was talking about in  
5 that last example is the actual reactor vessel itself,  
6 not the internals but the reactor vessel that's  
7 subject to the upper-shelf energy requirements in 10  
8 CFR, what is it, 50.60?

9 CHAIRMAN MCDADE: Okay, but what about the  
10 reactor vessel internals? There are reactor vessel  
11 internals that have been --

12 JUDGE WARDWELL: Get to that.

13 CHAIRMAN MCDADE: Going to get to that?  
14 Okay.

15 MR. COX: Yes. Those --

16 CHAIRMAN MCDADE: Judge Wardwell is going  
17 to get to that, so let me defer.

18 JUDGE WARDWELL: In excruciating detail  
19 I'm afraid, though I am looking forward to it. The  
20 audience, I think, is even more excited than me.

21 JUDGE KENNEDY: So going back to i and ii,  
22 did I understand, using the example of embrittlement  
23 or the reactor vessel itself, if that fell in either  
24 i or ii, would that mean it's not subject to aging  
25 management?

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1 MR. COX: It would mean that that  
2 particular aging effect does not require an aging  
3 management program.

4 JUDGE KENNEDY: Okay. And that's why, at  
5 least it sounded to me like that's why this has these  
6 categories, so that you could bin them. It sounds  
7 like what you just testified, that -- Under metal  
8 fatigue, even though i or ii may be a calculation that  
9 has either been done before or redone, it would still  
10 be managed for aging or at least monitored for cycles.

11 MR. COX: That's correct and it's not, I  
12 mean, it's not actually managing the aging effect  
13 directly as much as it is monitoring the numbers of  
14 transients that are assumptions in the analyses to  
15 make sure that those assumptions remain valid and,  
16 therefore, the analysis remains valid.

17 JUDGE KENNEDY: One more question, Mr.  
18 Cox, before we turn to the staff because, these re-  
19 analyses or calculations that are done under Item ii,  
20 are those done as part of license renewal or is that  
21 done somewhere else? The little i.

22 MR. COX: Those calculations or those  
23 projections would be done as part of the evaluation of  
24 TLAA's for license renewal.

25 JUDGE KENNEDY: For license renewal.

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1 Okay.

2 Going back to cumulative usage factors, is  
3 every cumulative usage factor a TLAA?

4 MR. COX: I would say the analysis that  
5 calculated the cumulative usage factor would be a  
6 TLAA.

7 JUDGE KENNEDY: And I think that's, I have  
8 my own internal confusion over that terminology and it  
9 shows up when I read the testimony. Maybe you could  
10 amplify that a little bit so we can get some clarity  
11 to what a CUF, which sounds like a calculation, and a  
12 TLAA, which is a calculation, and what's the  
13 relationship between those two?

14 MR. COX: Okay. The CUF is the result of  
15 the fatigue calculation. Fatigue calculation, which  
16 is the TLAA, calculates the cumulative usage factor,  
17 compares that to the acceptance criteria, which is  
18 1.0, and that's how you would determine whether that  
19 calculation is valid. So the CUF is a product of a  
20 TLAA or a fatigue analysis, which is a TLAA.

21 JUDGE KENNEDY: Is that saying I wasn't  
22 confused, that they are the same thing?

23 MR. COX: I mean, it's a subtle  
24 difference. It's the analysis in one case and it's  
25 the result of the analysis. The CUF is a result of

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1 the TLAA.

2 JUDGE KENNEDY: I think the reason I'm  
3 spending a little bit of time on it, maybe more than  
4 I should, but in some of the responses to the  
5 testimony under the contentions it seems like there's  
6 an attempt to put some of this out of reach as being  
7 within the current licensing basis and not being done  
8 as part of license renewal and I'm trying to find  
9 where that line is.

10 It would seem to me in metal fatigue that  
11 they're all in. I guess that's what it looked to me  
12 like. They were all calculations that were needed for  
13 license renewal and part of the license renewal  
14 process.

15 MR. COX: Yes, this is Alan Cox again with  
16 Entergy. Let's take the single i example or case for  
17 an example. You have an analysis that's based on an  
18 example I used, 100 heat-ups and cool-downs. Okay,  
19 that's a current licensing basis analysis. That was  
20 done as part of the plant design.

21 So we're not changing any of the  
22 assumptions. We're not changing anything about that  
23 analysis. All we're doing is evaluating that analysis  
24 to see if it remains valid for the period of extended  
25 operation by looking at the operating history of the

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1 plant and projecting the number of cycles.

2 So that's what we intended by any  
3 references to saying that's part of the current  
4 licensing basis, is that those assumptions and the way  
5 you calculated fatigue is all defined in the current  
6 licensing basis. We're not changing that for that  
7 particular calculation.

8 You know, so that's why we're saying it's  
9 CLB. It's not part of license renewal. It's not  
10 changed due to license renewal.

11 JUDGE KENNEDY: So the single i items  
12 would be viewed as current licensing basis and not  
13 challengeable within a license renewal proceeding?

14 MR. COX: Yes and, again, it's a little  
15 bit of a hybrid here because we're saying that even  
16 for the single i we're using the program to manage the  
17 number of cycles but we're still not touching the  
18 original analysis or changing, you know, even on a  
19 double ii we're not changing necessarily the methods  
20 that are used to calculate fatigue from what's defined  
21 in the current licensing basis by references to the  
22 applicable parts of the ASME Code, for example.

23 JUDGE KENNEDY: Would the double ii CUFs  
24 be challengeable as part of or subject to challenge as  
25 part of the license renewal proceeding? I mean, is

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1 that the line? Is it little i versus double ii or  
2 single i versus double ii as being the boundary even  
3 though they're -- I think Dr. Hiser seems to want to  
4 say something here. We'll get to you. We'll see if  
5 they got a --

6 MR. COX: In my opinion on this, even if  
7 you changed the calculation, if you still followed  
8 procedures and processes that were established as part  
9 of the CLB, those processes and procedures would not  
10 be subject to challenge as part of license renewal.

11 JUDGE KENNEDY: Is that the same as saying  
12 the CUF values would not be challengeable, whether  
13 they're single i or double i?

14 MR. COX: I think the result of the  
15 calculation would be the CUF values that you're  
16 referring to and I think that would be the conclusion  
17 that I would reach, is that those are not subject to  
18 challenge because they are done using the same methods  
19 that were established as part of the CLB.

20 JUDGE KENNEDY: All right. Thank you, Mr.  
21 Cox. Dr. Hiser, would you like to add to this  
22 discussion? I know it's not your application but --

23 DR. HISER: This is Dr. Hiser. Actually  
24 I would say the NRC would consider any TLAA to be  
25 challengeable, whether it's single i, double i, or

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1 triple i, because the applicant must make certain  
2 assumptions and evaluations as a part of that  
3 determination and clearly those would be, you know, we  
4 challenge them as we review the application and so  
5 from that perspective I think they certainly would be  
6 subject to challenge.

7 Now, I mean, just to be clear, the  
8 methodology used to do the calculation, to do the  
9 analysis, would not be subject to challenge.

10 The input value of, in using Mr. Cox's  
11 examples of heat-up and cool-down cycles, that would  
12 be where the challenge really would be because the  
13 methodology is current licensing basis and that is not  
14 challenged.

15 The time-limited aspect of the analysis,  
16 which would be the input heat-up and cool-down number  
17 of cycles, that would be the part that would be  
18 subject to challenge in this case.

19 CHAIRMAN MCDADE: Okay, Dr. Hiser, and,  
20 again, I just want to make sure I'm hearing what  
21 you're saying.

22 Under i, the method isn't challengeable  
23 but if they're saying initially it's good for 100  
24 cycles, they have to demonstrate that it's not going  
25 to exceed 100 cycles during the period of original and

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1 extended operation.

2 On the other hand, if it is going to  
3 exceed 100 cycles during the period of extended  
4 operation, then you go to double i and make a  
5 determination as to whether or not the analysis  
6 demonstrates that with the additional cycles it will  
7 remain, you know, valid, using this CUF that it'll  
8 still be below one as an example. Am I correctly  
9 understanding what you're saying?

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

11 CHAIRMAN MCDADE: Okay, thank you.

12 JUDGE KENNEDY: With that, I have no  
13 further questions on TLAAs. My board mates may have  
14 some.

15 JUDGE WARDWELL: I'm not sure I heard,  
16 I'll ask Dr. Hiser again just to make sure I heard  
17 this last bit correctly. Would the initial 100  
18 transient cycles be challengeable also? You may have  
19 answered that but, if not, I want to make sure that is  
20 answered.

21 DR. HISER: The original 100 in the  
22 original analysis would not be. The demonstration  
23 under single i that the number of expected transients  
24 will remain below 100, that would be challengeable.

25 JUDGE WARDWELL: That's what I meant to

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1 ask. Thank you.

2 MR. COX: And this is Alan Cox with  
3 Entergy. I might add to that, for the case of fatigue  
4 analyses, that's the reason why we credit the triple  
5 i. We credit the fatigue monitoring program because  
6 that's what we're going to use to make sure that that  
7 100 number does remain valid and is a good projection.

8 DR. HISER: This is Allen Hiser. Just to  
9 clarify one thing as well, the fatigue monitoring  
10 program is required in the tech specs by the  
11 applicant, so that program is there regardless of  
12 license renewal or regardless of TLAAs. The plant is  
13 required to monitor transients and compare with  
14 assumptions that are listed in the tech specs as well.

15 So this is one situation, as Mr. Cox  
16 mentioned, that they can demonstrate, using single i  
17 or double i, that the analysis is acceptable, but they  
18 still are required by tech specs to continue to verify  
19 that those assumptions are still met.

20 JUDGE WARDWELL: And is it fair to say  
21 they're more than assumptions too? I mean, they are  
22 estimates based on some operating experience or  
23 evaluation or --

24 DR. HISER: You know, they really are  
25 projections. In the case of fatigue cycles,

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1 applicants will determine the number of cycles up to  
2 some point in time.

3 Normally around the date that they submit  
4 the application, they will evaluate the trends from  
5 that and then project forward what they expect to be  
6 the case at 60 years, so it is a projection.

7 I guess assumption I took in the manner of  
8 an analysis has certain assumptions. Maybe input  
9 value is what I should have used, that that input  
10 value is what is used in the analysis.

11 MR. COX: This is Alan Cox with Entergy.  
12 I guess one more point of clarification on that, at  
13 the time these analyses were first performed back in  
14 the early '70s they were estimates. There wasn't a  
15 lot of operating history you could use to project what  
16 you're going to have after 40 years. Nobody had been  
17 operating for that long. There was very little  
18 operating experience to go by so, in essence, they  
19 were --

20 JUDGE WARDWELL: True --

21 MR. COX: -- educated guesses about or  
22 estimates about what cycles would be necessary to  
23 qualify that component.

24 JUDGE WARDWELL: Good point.

25 JUDGE KENNEDY: I ceded the floor, sir.

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1 JUDGE WARDWELL: So I think now we're  
2 going to move on to our first contention that we're  
3 going to address. That's Contention 25.

4 Couple little introductory comments I  
5 might make before we get started here. We've read all  
6 the testimony so we're familiar with what you've  
7 offered.

8 Generated some questions to help clarify  
9 some of what we read. Many times I'll be asking, and  
10 other judges will too I'm sure, yes/no questions.  
11 We're not trying to trick you.

12 Oh first of all, the entire panel for 25  
13 ceded? Is that correct? We're all set with that,  
14 right? This is the 25 panel, all right.

15 We're not trying to trick you with yes/no  
16 questions. More often than not, it is just a question  
17 to help confirm what we understood you were saying or  
18 advocating within the, usually, in my case, on  
19 something I'm going to quote out of your testimony.

20 Don't think you need to elaborate on those  
21 yes/no's. Just answer them as yes and no and, as part  
22 of that, I'll let you know the topics I'm planning to  
23 cover so that you can be comforted that, yes, you  
24 don't have to cover everything right now with these  
25 yes/no questions. There will be times to elaborate

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1 more on any position you have.

2 But, again, I'm just trying to fix a point  
3 mostly with some of those and, just for time  
4 constraints, try to stay with yes or no because  
5 usually it's just trying to fix an obvious point more  
6 often than not.

7 Sometimes I may interrupt you in your  
8 response. Don't be crushed. Don't take it  
9 personally. More often than not it's because I wasn't  
10 clear with my question.

11 And if I find that you're wandering off,  
12 I can see that obviously I haven't made myself clear  
13 so I want to interrupt you and try to ask it another  
14 way to bring you back to where I'm trying to go with  
15 this to help complete the record, which is what I'm  
16 trying to do with these questions that I have on 25.

17 Also, I'd like to hold down any offers to  
18 provide additional testimony from other witnesses  
19 besides the ones that I am questioning. You know, if,  
20 in fact, we're confused, we certainly will ask for  
21 that.

22 If you have a burning desire -- And,  
23 again, this is for time constraints because otherwise  
24 we'd be here for a long time and some of the times I  
25 think with Track 1 we did get too much off course with

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1 some discussion that was more than that was needed.

2 If you do have a burning desire that you  
3 just, and this is I just have too much to offer here  
4 that I cannot sit still, well, jot it down and get it  
5 to your counsel and they'll be able to offer it as  
6 questions at the end of each of these sessions to  
7 offer those up and then we can look at them and say,  
8 oh, yes, gee, we should have asked that so that we  
9 will seek that information through those questions.

10 And if nothing else, they can, you know,  
11 add it to the findings of facts or conclusions of law,  
12 so there is a way to get something in that you might  
13 have a burning desire to offer, but we will generally  
14 ask the additional questions we need if we're confused  
15 as we go along here and that will allow us to do it  
16 the most efficiently.

17 Under 25, I'll just read a synopsis, one  
18 of the synopses that I saw offered and get everyone  
19 familiar again with what we're covering here. Twenty-  
20 five says that "Entergy's license renewal application  
21 does not include an adequate plan to monitor and  
22 manage the effects of aging due to embrittlement of  
23 the reactor pressure vessels and the associated  
24 internals."

25 New York State submitted a declaration in

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1 support of the additional bases identifying concerns  
2 with, among other things, that declaration discussing  
3 the synergistic effects of embrittlement and fatigue  
4 and efficiencies in the visual and remote examination  
5 techniques that Entergy and industry had proposed to  
6 employ as part of the aging management program for the  
7 embrittlement of reactor internals.

8 As part of this, I will be asking  
9 questions and discussing just the general adequacy of  
10 these AMPs, you know, related to the reactor pressure  
11 vessel and the internals. Talk then about synergistic  
12 degradation. Follow that up with talking about the  
13 full range of transient shock loads that may or may  
14 not influence that degradation. Discuss the  
15 adequacies of inspections, and then finish it up with  
16 preventive actions, corrective actions and acceptance  
17 criteria, so that's where we're going with this.

18 And with that, I think I'll start off with  
19 talking about the general adequacy of the AMP and  
20 reference to start with Entergy's Exhibit 616.

21 Oh and by the way, all my references are  
22 to non-public documents. I don't believe I've asked  
23 any questions, relayed anything that had been redacted  
24 by the various parties within those testimonies.

25 So if we do pull up an exhibit, it will be

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1 the redacted exhibit and it'll show up in the process  
2 as we pull up any testimony that we may want to ask a  
3 question about and then we'll proceed from there on  
4 how to address that, but hopefully it hasn't happened.

5 But I just wanted to notify you now that,  
6 yes, I have referenced as far as page numbers and  
7 various answers from your testimony the public version  
8 of it, the non-public version of it, I'm sorry, in  
9 regards to, although I don't think the page numbers  
10 change but I just wanted to reference that anyhow.

11 So Entergy's Exhibit 616, testimony for  
12 Question and Answer 51 on Page 27, the question and  
13 answer on Page 55 for 29, and the question and answer  
14 for 64 on Page 33 where within those sections --

15 And you don't have to look them up. I'm  
16 going to read to you what I'm interested in and that's  
17 the case here in all of these. I'll be reading what  
18 I'm interested in and then ask questions about that.  
19 So it's better just listen for now, and then if you  
20 need to see it, we can call it up.

21 But within those groups of areas, Entergy  
22 notes that while State's initial pleadings in 2007 on  
23 this contention focused primarily on the reactor  
24 pressure vessel rather than the reactor vessel  
25 internals, following the admission of Contention New

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1 York State 25, Entergy submitted several reactor  
2 vessel-related amendments to clarify its license  
3 renewal application, revise the description of how  
4 Entergy would address the then proposed alternative  
5 pressurized thermal shock, or the PTS rule, and noted  
6 the closure of certain reactor pressure vessel-related  
7 commitments.

8 The State, however, has never amended New  
9 York State 25 to address or challenge these updates.  
10 This is, again, Entergy's statement, not mine.

11 Going on with Entergy's statement, they  
12 say that, instead, the State has shifted its focus to  
13 reactor vessel internals.

14 Specifically, in Entergy's opinion, in Dr.  
15 Lahey's pre-file testimony and the State's statements  
16 of position on this contention, Dr. Lahey and the  
17 State do not allege any specific deficiencies in  
18 Entergy's license renewal application regarding  
19 reactor pressure vessels.

20 And I'll start off with Entergy and ask  
21 are the AMPs for the reactor vessel internals and the  
22 reactor pressure vessels one and the same or are they  
23 covered by different AMPs?

24 MR. KUYLER: Your Honor, if I may, this is  
25 Ray Kuyler for Entergy. I believe Your Honor has been

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1 reading from the Statement of Position, the legal  
2 brief that Entergy submitted, rather than our witness  
3 testimony.

4 JUDGE WARDWELL: I think the question and  
5 answers on Page 51 of 27 and 55 of 29 and 64 of 33  
6 cover those same topics. This wasn't a quote. This  
7 was just a statement that I gathered from those but,  
8 so anyone from Entergy who would like to answer that.

9 MR. COX: Could you repeat your question  
10 one more time, Your Honor?

11 JUDGE WARDWELL: Yes, I'm interested in  
12 are the, is the reactor pressure vessel covered by the  
13 same AMP as the reactor vessel internals?

14 MR. COX: No, it's not.

15 JUDGE WARDWELL: Okay, thank you. NRC  
16 statement, Testimony 197, Answer 10 to Page 20 states,  
17 quote, this is the NRC speaking, "The reactor vessel  
18 internals also do not include any pressure or boundary  
19 component such as reactor pressure vessels. These  
20 components are addressed in other programs," which  
21 seem to support Entergy's answer that we just  
22 received.

23 Entergy's Testimony Exhibit 616, Answer  
24 64, Pages 33 to 34, and this I will quote, says that  
25 "with regard to the reactor pressure vessels, Dr.

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1 Lahey briefly alludes to some of his prior claims  
2 regarding the reactor pressure vessel when he refers  
3 to the, quote, 'variance' that was, quote, 'endorsed'  
4 by the ACRS to permit continued operation with reactor  
5 pressure vessels end-of-life Charpy upper-shelf USE,  
6 and I believe that's the capital U, capital S, capital  
7 E, values that are less than 50 foot pounds.

8 In his 2015 testimony, Dr. Lahey also  
9 refers to certain documents discussing branch  
10 technical position regarding the initial fracture  
11 toughness of reactor pressure vessel materials,  
12 suggesting that certain reactor pressure vessel  
13 embrittlement analyses may be non-conservative.

14 The staff then goes on to say that "but  
15 Dr. Lahey and the state stop short of asserting," I  
16 mean, sorry, that's Entergy, and 616 goes on to say  
17 "but Dr. Lahey and the state stop short of asserting  
18 any specific deficiencies in Entergy's license renewal  
19 application regarding the reactor pressure vessels."

20 And I'll direct this to Dr. Lahey. Are  
21 there any other locations, besides what I just said,  
22 that Entergy said that you were referred to reactor  
23 pressure vessels where you feel you have challenged  
24 the AMP for reactor pressure vessels within your  
25 testimony?

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1 DR. LAHEY: Thank you, Your Honor. This  
2 is Richard Lahey, a witness for New York State. We  
3 did, in fact, starting in 2007 I believe, raise the  
4 issue of certain plates in the pressure vessel which  
5 were either going to violate the upper-shelf criteria  
6 --

7 JUDGE WARDWELL: Yes. Excuse me, I'm  
8 interested in your testimony that you submitted now  
9 for the current issue --

10 DR. LAHEY: Yes.

11 JUDGE WARDWELL: -- not what you did  
12 before.

13 DR. LAHEY: Interestingly my testimony has  
14 been pretty consistent for the last eight years, but  
15 the answer is there are a few plates in the pressure  
16 vessel which have some problems with pressurized  
17 thermal shock.

18 JUDGE WARDWELL: And where did you cite  
19 those in your testimony?

20 DR. LAHEY: Which testimony?

21 JUDGE WARDWELL: Yes, where did you cite  
22 that in any of your testimony that you've provided  
23 here?

24 DR. LAHEY: Well, in fact, I think in the  
25 2007 I cited it first and then in others I've said,

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1 but if you just let me finish --

2 JUDGE WARDWELL: Okay.

3 DR. LAHEY: -- I can tell you why it was  
4 not a big deal for me, because this is an area that  
5 has been of great importance to the U.S. NRC since day  
6 one, pressure vessel integrity, and I felt very  
7 comfortable that they had their arms around this  
8 problem and there was not too much I could add to it,  
9 other than bring it to the attention of the board.

10 And the fact is there have been some BTP  
11 53 issues in terms of how you determine the  
12 embrittlement of these things that are related. But  
13 I feel really comfortable the NRC is on top of this,  
14 so compared to my other issues, this has not been  
15 highlighted in my testimony.

16 CHAIRMAN MCDADE: The focus of your  
17 testimony is on the reactor vessel internals and the  
18 adequacy of the aging management for those reactor  
19 vessel internals, correct, doctor?

20 DR. LAHEY: That's certainly true because  
21 of how that impacts the possibility of core cooling,  
22 adequacy of core cooling, because my overall concern  
23 is safety. That's what I've been doing all my life.  
24 And so anything related to that is what I'm concerned  
25 with and what I've focused on in my testimony.

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1 JUDGE WARDWELL: So you would agree that  
2 then the heart of your contention for 25 now deals  
3 with the reactor vessel internals, and specifically  
4 I'm going to pull out from your testimony 482 on Page  
5 78, Lines 14 through 21, where you summarize that and  
6 just want to confirm if there's anything else extra  
7 you'd like to add to this list.

8 DR. LAHEY: Do you want me to look that  
9 up?

10 JUDGE WARDWELL: No, I'm going to read it  
11 for you right here now so that you don't have to do.

12 One, the synergistic effect on degradation  
13 and integrity of reactor pressure vessel internals of  
14 radiation-induced embrittlement, corrosion, and  
15 fatigue was one of your issues.

16 The second issue was the potential for  
17 unanticipated failure of reactor vessel internals due  
18 to a severe seismic event or accident-induced thermal  
19 and/or pressure shock loads.

20 Three, the implications of the failure of  
21 the reactor pressure vessel internal structure  
22 components and fittings on post-accident core  
23 coolability.

24 And then citing another area was your same  
25 testimony, Exhibit 482 on Page 40, Lines 1 through 4,

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1 that, quote, "Highly embrittled and fatigued reactor  
2 vessel internal components may not have signs of  
3 degradation that can be detected by an inspection but  
4 such weakened components could, nonetheless, fail as  
5 a result of severe seismic event or thermal pressure  
6 shock loads." Is that a fair assessment of your main  
7 points of your contention?

8 DR. LAHEY: Yes, Your Honor.

9 JUDGE WARDWELL: Thank you. And without  
10 getting into any inadequacies associated with the  
11 RVIs, is it fair to say then that we can move forward  
12 with only looking at the reactor vessel internals and  
13 that the pressure vessel itself is no longer an issue  
14 with this contention?

15 DR. LAHEY: I would leave that up to New  
16 York State. I told you how I feel about the issue.

17 JUDGE WARDWELL: But as I heard --

18 DR. LAHEY: I mean, my primary concern is  
19 with the impact of failed reactor pressure vessel  
20 internals on core coolability.

21 JUDGE WARDWELL: Okay, and there's no  
22 longer a need to address anything else with you as far  
23 as testimony you'd like to provide in addition in  
24 regards to the pressure vessel itself?

25 DR. LAHEY: Well, I've told you the issue

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1 is the plates which are, in fact, the wall of the  
2 pressure vessel. And at some point in time, they are  
3 going to exceed the pressurized thermal shock criteria  
4 and the implications of that are not good, but it's  
5 well-known and I think the NRC is totally on top of  
6 that issue as far as I'm concerned.

7 JUDGE WARDWELL: Thank you very much.

8 DR. LAHEY: Maybe they could say they're  
9 not, but I doubt it.

10 JUDGE WARDWELL: Dr. Hiser, are you on top  
11 of those plates for the pressure vessel itself?

12 DR. HISER: I am technically on top of  
13 them, yes.

14 JUDGE WARDWELL: Right. Thank you.

15 CHAIRMAN MCDADE: Not physically on top of  
16 them.

17 DR. HISER: I'm in Tarrytown, New York  
18 right now.

19 JUDGE WARDWELL: Top of the world. It  
20 doesn't get any better than this, does it?

21 DR. HISER: No, sir.

22 JUDGE WARDWELL: Thank you.

23 CHAIRMAN MCDADE: You were under oath when  
24 you said it doesn't get any better than this.

25 (Laughter.)

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1 JUDGE WARDWELL: Let's turn to these AMPs  
2 again and a little bit of this may be a repeat from  
3 what we've managed to cover already but we'll see  
4 where we are with that.

5 NRC's testimony, Exhibit 197, Answer 114  
6 on Page 72, states that "The IP2 and IP3 RVI," that's  
7 for reactor vessel internals, "AMP consists of a  
8 program description describing the ten elements of the  
9 AMP. A program description was initially submitted on  
10 July 14th, 2010, and was revised in a letter dated  
11 February 17th, 2012." And here you're citing New York  
12 State's Exhibit 496, which is the letter NL-12-037 and  
13 Attachment 1.

14 Entergy, do you agree that the program  
15 description of Entergy's AMP for reactor vessels  
16 internals is attached to Entergy's letter NL-12-037 in  
17 New York State's Exhibit 496?

18 MR. DOLANSKY: This is Bob Dolansky with  
19 Entergy. Yes.

20 JUDGE WARDWELL: Thank you. And, Dr.  
21 Lahey, do you agree that that is their AMP for reactor  
22 vessel internals?

23 DR. LAHEY: As I understand it, yes.

24 JUDGE WARDWELL: Thank you. For anyone  
25 with NRC, where have -- I think you've already been

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1       tasked to answer this but I'll answer it again. Where  
2       have you addressed the ten elements of GALL for the  
3       RVI AMP in your SER? Is that one of those ones that  
4       I asked you earlier to get for me at some time?

5               MR. POEHLER: This is Jeffrey Poehler for  
6       the staff. The ten elements are addressed in the  
7       supplement to the SER. It's NUREG-1930, Supplement 2.

8               JUDGE WARDWELL: And if you have the  
9       section numbers and can get that for us later, that's  
10      fine. It just --

11              MR. POEHLER: I don't have the exact  
12      section number at the moment. I can get it for you.

13              JUDGE WARDWELL: The only reason I ask you  
14      is not because I'm lazy. Well, that is part of the  
15      reason, but oftentimes there are sections we're not  
16      aware that really apply to that when you look at  
17      something like the table of contents and that's why I  
18      just want to make sure that you're telling me where I  
19      should be looking for the SER for things like that.

20              And when I ask this question in other  
21      areas, that's why I do it, whether it's for New York  
22      or any expert. I may ask you where is that actually  
23      stated and that's because I don't want to assume I  
24      know every place that it might be stated within a  
25      given document.

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1 MR. POEHLER: Yes, Dr. Hiser just pulled  
2 up the citation. It's Section 3.0.3.3.9 of NUREG-  
3 1930, Supplement 2.

4 JUDGE WARDWELL: Thank you very much.

5 MR. HARRIS: Your Honor, this is Brian  
6 Harris for the staff. Can we just let that reflect  
7 that it's NYS 507, I believe is the Exhibit number for  
8 the supplemental safety evaluation report.

9 JUDGE WARDWELL: Better yet. That's  
10 great. Thanks. Yes, I really appreciate any of those  
11 cites that you provide. It always helps the record as  
12 we go through the transcript. That's welcomed  
13 interruption by the way.

14 MR. HARRIS: Thank you, Your Honor.

15 CHAIRMAN MCDADE: If I could clarify for  
16 myself, that was Section 3.0.3.0.9. Is that --

17 DR. HISER: This is Allen Hiser.  
18 3.0.3.3.9, Page 3-13 of Supplement 2.

19 CHAIRMAN MCDADE: Thank you. Thank you.

20 JUDGE WARDWELL: Staying with the staff,  
21 we kind of skirted this but I think I'm going to ask  
22 it anyhow because it says it a little more directly  
23 too.

24 From a technical standpoint, is  
25 consistency with GALL, containing the ten program

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1 elements, in and of itself enough or is more depth  
2 analysis of the adequacy of the described program in  
3 the AMP needed for you to reach the conclusion that  
4 the intended functions of the passive reactor vessel  
5 internals within the scope of license renewal will be  
6 maintained?

7 DR. HISER: This is Dr. Hiser, the staff.  
8 In and of itself, consistency with the ten elements is  
9 not sufficient. The applicant must demonstrate that  
10 the components at the applicant site that are covered  
11 by the AMP are consistent and they also must  
12 demonstrate that operating experience is consistent.  
13 So they have to provide a context that shows that the  
14 AMP really is responsive to the aging management needs  
15 at the facility.

16 JUDGE WARDWELL: And is that response  
17 documented in the SER also in at least some summary  
18 form or so someone can understand what you went  
19 through in your interactions with the staff to provide  
20 this demonstration that the ten elements are being  
21 addressed?

22 DR. HISER: I'm not sure that we can point  
23 to a specific place within the SER because I think it  
24 really is embedded within the evaluation in the SER of  
25 each of the elements and in the applicant action

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1 items.

2 JUDGE WARDWELL: That was my question. I  
3 didn't mean to ask you to point me to a page number.  
4 I just asked you as a standard practice that you  
5 incorporate those interactions within your narratives.  
6 Thank you.

7 I'll ask Dr. Lahey, have you looked over  
8 the ten elements of the GALL in the submittal that was  
9 provided in Attachment 1 of that letter, and do you  
10 see any area where you feel there is inconsistencies  
11 associated with what's required by law?

12 DR. LAHEY: Your Honor, this is Richard  
13 Lahey again. I have looked it over. I have concerns  
14 about synergisms, and to understand how I feel, at  
15 some point I need to give you some overview of why I'm  
16 saying what I'm saying but I don't know it's the right  
17 time. If you just want --

18 JUDGE WARDWELL: Well, I think you have.  
19 You provided your testimony in 482. Isn't that your  
20 overview?

21 DR. LAHEY: Well, it's part of it but I  
22 think --

23 JUDGE WARDWELL: Well, that should be.  
24 That's what we're interrogating here. That should be  
25 all of it if, I mean, that's what you've submitted for

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1 your testimony and now we're getting elaborations on  
2 that overview that you provided.

3 DR. LAHEY: Your Honor, if you understood  
4 everything I said, that's fine.

5 JUDGE WARDWELL: Oh, no, don't get me --  
6 I've got a lot of questions for you. Don't worry  
7 about that. I just want to make sure you're aware  
8 that your testimony has been submitted as pre-filed  
9 testimony and we're not here to create more testimony.  
10 We're here to explore the details of your testimony,  
11 and so that testimony is the overview of your position  
12 and we're just exploring the details of that.

13 DR. LAHEY: Yes, Your Honor.

14 JUDGE WARDWELL: And along those lines,  
15 those items I just read in regards to the heart of  
16 your contentions where I went through each one of  
17 those issues that you've summarized from your  
18 testimony, if you ever want to refer to those again in  
19 a general sense to caveat a response to my question,  
20 just go ahead and call them synergism et al. or  
21 something like that, so you don't have to worry.  
22 We'll know you're referring to all of those that we  
23 just covered previously.

24 So if I ask you a question about was this  
25 suitable or something like that, you can say with the

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1 exception of the synergism, et al., we see no other  
2 differences or I see no other differences or something  
3 like that. Do you get what I'm driving at? So you  
4 don't have to repeat the caveat.

5 I understand what your concerns are and so  
6 you can express those again just by that symbolic  
7 representation if you feel the need to whenever I ask  
8 you a question.

9 DR. LAHEY: Okay. Thank you, sir.

10 JUDGE WARDWELL: Sure. Entergy's Exhibit  
11 616 again, Answer 133, Page 82, says that the IPEC RVI  
12 AMP, as updated, relies upon the extensive industry  
13 research document in MRP-227-A and MRP-228 and in the  
14 many reports supporting these documents where you're  
15 citing to New York State, again 496, NL-12-037,  
16 Attachment 1.

17 Entergy's testimony Answer 119, Page 74,  
18 talks more about this EPRI materials reliability  
19 programs. That's the MRP, of MRP-227-A which is  
20 entitled "Pressurized Water Reactor Internal  
21 Inspection and Evaluation Guidelines," and states that  
22 it is the NRC-approved version of EPRI's guidance on  
23 the aging management for reactor vessel internals.

24 Entergy's Testimony 116 Exhibit again,  
25 Answer 133, Page 83, goes on, and I quote, that "the

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1 RVI AMP has three principal components. One,  
2 examinations and other inspections along with a  
3 comparison of data to examination acceptance criteria  
4 as defined in MRP-227-A and MRP-228, two, a resolution  
5 of indications that exceed examination acceptance  
6 criteria by entering them into the applicant's  
7 corrective action program, and, three, monitoring and  
8 control of reactor primary coolant water chemistry  
9 based on industry guidelines."

10 And I guess I'd ask staff if you agree  
11 with Entergy's statement that the MRP-227-A is the  
12 NRC-approved version of EPRI's guidance and what  
13 you're approving it for. What does that approval  
14 mean? What's the significance of it?

15 MR. POEHLER: This is Jeffrey Poehler, the  
16 staff. Yes, we agree that MRP-227-A is the approved  
17 version of the MRP-227 topical report.

18 JUDGE WARDWELL: And that's all it is, is  
19 the approved version of that report? It doesn't  
20 approve that report for anything else?

21 MR. POEHLER: No, it approves basically  
22 our safety evaluation, approved that report to be used  
23 as the basis for plant-specific reactor vessel  
24 internals aging management program or I should, aging  
25 management programs and inspection programs.

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1 JUDGE WARDWELL: A plant specific or a  
2 generic plant? I would think it would be the  
3 opposite.

4 MR. POEHLER: Yes, plant specific because  
5 any individual plant that needs to develop a reactor  
6 vessel internals aging management program can now use  
7 the framework of MRP-227-A to develop that program.

8 But what this does is it makes the plant-  
9 specific programs consistent with the generic  
10 guidance, so it's generic guidance for individual  
11 plants to use.

12 DR. HISER: This is Dr. Hiser. And I  
13 think the main thing, it is a generic program. Plant-  
14 specific applicability is demonstrated, in part,  
15 through the action items, A/LAI, that are --

16 JUDGE WARDWELL: A/LAI.

17 DR. HISER: Yes, licensee --

18 JUDGE WARDWELL: Is that correct?

19 DR. HISER: Yes, applicant/licensee action  
20 items, yes.

21 JUDGE WARDWELL: Is there a way to  
22 pronounce that acronym? I'm going to call it "a lay,"  
23 is that all right with you?

24 DR. HISER: Yes.

25 JUDGE WARDWELL: Does anyone else use

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1 anything else different, because I can't go A/LAI  
2 anymore.

3 DR. HISER: We can just call them action  
4 items. How about that?

5 JUDGE WARDWELL: That would work.

6 DR. HISER: Okay.

7 CHAIRMAN MCDADE: But before we move on,  
8 if you could explain to me, the MRP-227-A was  
9 developed by industry for a particular purpose. What  
10 is the nature of the NRC staff's review of that  
11 document and how then is it used by the NRC staff in  
12 determining the adequacy of aging management?

13 DR. HISER: This is Dr. Hiser. The  
14 purpose of the AMP is to demonstrate adequacy of aging  
15 management for reactor vessel internals. The NRC  
16 approved that report, approved the methodology in its  
17 safety evaluation for the report. That safety  
18 evaluation was then incorporated in the -A version,  
19 MRP-227-A, as a topical report that is acceptable to  
20 the NRC staff.

21 When we then implemented that report into  
22 the LR-ISG to modify the AMP for reactor vessel  
23 internals, that is where the NRC determined that that  
24 methodology was acceptable for license renewal  
25 applicants.

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1 CHAIRMAN MCDADE: Yes, but how does the  
2 NRC go about doing that? What is the nature of your  
3 review? I mean, is it simply a read through and  
4 subjecting that to the technical expertise of your  
5 staff? Is there a period of, you know, the equivalent  
6 of the RAI situation that you have on a license  
7 renewal?

8 I'm just trying to understand what is it  
9 the ARC ExpressScribe staff does with MRP-227-A to  
10 effectively put its imprimatur on it as a guide for  
11 AMP compliance?

12 DR. HISER: Okay. Yes, this is Dr. Hiser.  
13 What we did was a detailed technical review, and items  
14 that we believed were not appropriately addressed in  
15 the report or that we had questions about we asked  
16 RAIs and went through a question and answer sequence  
17 to get to the point that we had no more questions on  
18 the adequacy of the report.

19 This was part of the topical report review  
20 which is a standard process that we use to review  
21 industry reports that try to address generic issues,  
22 such as adequacy of aging management for vessel  
23 internals.

24 CHAIRMAN MCDADE: And is that process part  
25 of what caused the metamorphosis from 227 to 227-A?

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1 DR. HISER: That's correct, yes.

2 JUDGE KENNEDY: Dr. Hiser, this is Judge  
3 Kennedy. Is there a staff safety evaluation document  
4 that's issued for an approved topical report?

5 DR. HISER: Yes there is. In general,  
6 there is and for this one there was a safety  
7 evaluation. In addition, we had, I believe it was a  
8 revision to the SE for MRP-227.

9 JUDGE KENNEDY: Would that be the ultimate  
10 culmination of the staff's review of that industry  
11 document?

12 MR. POEHLER: Almost. I just wanted to  
13 clarify that. So when the industry, so we issued our  
14 safety evaluation. Then EPRI takes that and includes  
15 it in the approved version of the topical report.

16 They also had to make some changes to the  
17 topical report, that the staff had included conditions  
18 in our final safety evaluation that related to changes  
19 that we wanted to see made in the final version of  
20 MRP-227.

21 EPRI made those changes. Then they  
22 submitted to us the final -A version. And at that  
23 point, the staff still had to verify that those  
24 promised changes had been made.

25 And then at that point, I believe we

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1 issued a letter that said it's good to, you know, we  
2 agree that you made all the changes so, and at that  
3 point they were able to publish the -A version.

4 JUDGE KENNEDY: Okay, thank you.

5 JUDGE WARDWELL: And are the lists of the  
6 RAIs that were generated documented anywhere, either  
7 in the SE or the industry document in the MRP?

8 MR. POEHLER: Jeffrey Poehler from the  
9 staff. Yes, the RAIs are included as an appendix to  
10 the -A version.

11 JUDGE WARDWELL: Well, the whole RAI is,  
12 not just the --

13 MR. POEHLER: The RAI letters and the  
14 responses. There were four rounds of RAIs so those  
15 are all included as appendices, although they're not  
16 all, every RAI is not explicitly discussed in the  
17 staff's safety evaluation.

18 JUDGE WARDWELL: But they're physically  
19 attached to the MRP-A?

20 MR. POEHLER: Correct.

21 JUDGE WARDWELL: MRP-227-A?

22 MR. POEHLER: Correct.

23 JUDGE WARDWELL: Thank you.

24 CHAIRMAN MCDADE: Okay, Mr. Poehler, just  
25 to, for my point to clarify for the record, when you

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1 mention EPRI, that's the Electric Power Research  
2 Institute, which is what?

3 MR. POEHLER: The Electric Power Research  
4 Institute is the organization that developed the MRP-  
5 227-A or Rev. 0 and -A report, specifically the  
6 materials reliability program, which is, you know, a  
7 sub-program of EPRI that specifically deals with  
8 pressurized water reactor vessel materials integrity  
9 issues.

10 CHAIRMAN MCDADE: Okay, and it's a non-  
11 governmental entity that is supported by the electric  
12 power industry.

13 MR. POEHLER: Correct.

14 CHAIRMAN MCDADE: And in preparing this  
15 document, it works in conjunction with the NRC to  
16 determine appropriate guidelines for AMPs here, for  
17 reactor vessel internals.

18 MR. POEHLER: In preparing the document,  
19 it was, you know --

20 CHAIRMAN MCDADE: Their goal was to come  
21 up with a proposal and the proposal is then reviewed  
22 by the NRC, the goal being to have the NRC put its  
23 imprimatur on it after a technical review that  
24 requires them to answer questions and modify their  
25 proposals. Is that correct?

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1 MR. POEHLER: That's correct.

2 CHAIRMAN MCDADE: Okay, thank you. Thank  
3 you, Mr. Poehler.

4 DR. HISER: This is Dr. Hiser. Just to  
5 add one thing to what Jeff said, the RAI, RAIs  
6 themselves and the MRP responses are in, I'm not sure  
7 if it's Enclosure or Appendix B to MRP-227-A, so the  
8 full record is provided there in the report.

9 CHAIRMAN MCDADE: Thank you.

10 JUDGE WARDWELL: Which does bring to mind  
11 another general comment I was going to make early on.  
12 We sometimes focus more time on one group of witnesses  
13 than the other. Don't also take that personally, that  
14 you're feeling slighted or that you're feeling you're  
15 getting beat up on. It's strictly how, where the  
16 questions come up from.

17 And usually, it's been my experience at  
18 least, that we do spend more time on staff and  
19 Entergy, the applicant, staff and the applicant,  
20 because they are the ones defending from the  
21 allegations that have been made.

22 And so that's why we end up challenging  
23 you more than we seem to with, oftentimes, witnesses  
24 for the intervenors, and if that ends up to be the  
25 case here, that's not necessarily unusual. It just is

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1 what it is based on the questions that we come up  
2 with, so that was a comment I forgot to mention  
3 earlier, general comment.

4 And back to that, I wanted to ask Dr.  
5 Lahey whether he disagreed with any of those principal  
6 components of Entergy's RVI AMP, and I think it's been  
7 long enough that I'm going to have to repeat them  
8 again for you unless you remember them. I'd like to  
9 repeat them again to make sure you know what I'm  
10 asking.

11 All I'm asking about is do you have any  
12 disagreement with Entergy's statement that the RVI AMP  
13 has three principal components and that is, one, the  
14 examinations and other inspections along with a  
15 comparison of data to examination acceptance criteria  
16 as defined in MRP-227-A and MRP-228 and then, two,  
17 resolution of indications that exceed examination  
18 acceptance criteria by entering them into the  
19 applicant's corrective action program, and, three,  
20 monitoring and control of reactor primary coolant  
21 water chemistry based on industry guidelines. Do you  
22 agree those are three principal components of  
23 Entergy's RVI?

24 DR. LAHEY: This is Richard Lahey again.  
25 I certainly agree but I have problems with the MRP-

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1 227-A, which it is based on.

2 JUDGE WARDWELL: And I assume you'll be  
3 able to refer back to that when we cover each of those  
4 other topic areas where that differs from that, rather  
5 than just open up a general discussion.

6 DR. LAHEY: Fine. Great, thanks.

7 JUDGE WARDWELL: NRC's Exhibit 197, Answer  
8 114, Page 72, in addition to the program description,  
9 quote, "The IP2 and IP3 RVI AMP consists of an  
10 inspection plan initially submitted on September 28th,  
11 2011, and a revised version consistent with MRP-227-A  
12 was submitted on February 17th, 2012."

13 And now for this inspection plan, citing  
14 New York State's Exhibit 496-NL-12-037, Attachment 2,  
15 Entergy's Exhibit 616, Answer 134, Page 83, and I  
16 quote, states that, "The reactor vessel," excuse me,  
17 "The RVI inspection plan provides additional details  
18 on inspections to be covered under the RVI AMP," and,  
19 again, citing that Attachment 2.

20 And I guess I'll ask Dr. Lahey, did you  
21 have a chance to look over that inspection plan and  
22 were those basic contents provided in Attachment 2 of  
23 12-037 for their inspection plan?

24 DR. LAHEY: The inspection, excuse me,  
25 this is Richard Lahey again. The inspection plan

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1 that's associated with MRP-227-A? Is that what you're  
2 asking about?

3 JUDGE WARDWELL: Yes.

4 DR. LAHEY: I have read that in detail,  
5 yes.

6 JUDGE WARDWELL: Okay well, yes, and that,  
7 do you agree, has -- No, I'm sorry. I'm getting into  
8 the next question relating to the contents of that.

9 Entergy's testimony, Exhibit 616, Answer  
10 134, Page 83, states that the reactor vessel  
11 inspection plan provides additional details on the  
12 inspections to be conducted under the RVI AMP,  
13 including, one, the type of examinations; two, the  
14 level of examination qualification; three, the  
15 schedule of initial inspection and frequency of  
16 subsequent inspections; four, the criteria for  
17 sampling and coverage; five, the criteria for  
18 expansion of scope if unanticipated indications are  
19 found; six, the acceptance criteria; seven, the  
20 methods for evaluation of examination results that do  
21 not meet the acceptable criteria; seven, provisions to  
22 update the program based on industry-wide results;  
23 and, eight, contingency measures to repair, replace,  
24 or mitigate beyond the information set forth in the  
25 RVI AMP.

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1           And, again, without getting into the  
2           adequacies with which they addressed those particular  
3           items, Dr. Lahey, do you agree that those components  
4           were in the inspection plan?

5           DR. LAHEY: This is Richard Lahey again.  
6           I heard you say reactor vessel rather than reactor  
7           vessel internals, is that correct?

8           JUDGE WARDWELL: You probably heard  
9           correct. I probably misspoke, so it's reactor vessel  
10          internals. If I ever say reactor vessels, it's  
11          probably reactor vessel internals from now on but,  
12          yes, I meant reactor vessel internals. I'm sorry.

13          DR. LAHEY: Yes, sir, I agree that that's  
14          what they're doing.

15          JUDGE WARDWELL: Thank you.

16          CHAIRMAN MCDADE: Okay and, Dr. Lahey,  
17          it's your contention not that these aren't addressed  
18          but they're not adequately addressed in a number of  
19          instances. Is that correct?

20          DR. LAHEY: I think this document that  
21          they use is a very well-done document. It's  
22          inspection based and that's only part of it, so it's  
23          necessary but it's certainly not sufficient in my  
24          view. Thank you.

25          CHAIRMAN MCDADE: Thank you, Dr. Lahey.

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1 JUDGE WARDWELL: Back to staff, there are  
2 various Westinghouse reports that came up in the  
3 testimony and I jotted down WCAP 13587, 14577, 15030,  
4 15270, 16156, 16211, 17096, 17894, 17901. Could you  
5 briefly summarize what's in all -- No.

6 (Laughter.)

7 JUDGE WARDWELL: What I'm interested in is  
8 --

9 CHAIRMAN MCDADE: Ten words or less.

10 JUDGE WARDWELL: Yes. How do these  
11 reports fit into your assessment of the adequacy of  
12 Entergy's RVI AMP? What role do they play and of what  
13 significance are they?

14 MR. POEHLER: This is Jeffrey Poehler.  
15 Just to clarify the question, were those referenced in  
16 MRP-227-A or in the staff's testimony on New York  
17 State 25?

18 JUDGE WARDWELL: We ask the questions.  
19 You can't ask us questions.

20 (Laughter.)

21 JUDGE WARDWELL: I'm not sure where I got  
22 these from. I just know they've cropped up and I had  
23 any reference to Westinghouse report. I was  
24 interested and they seemed to have a significant  
25 influence on something that you've done. And I was

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1 just wondering how do they fit in? What role do they  
2 play? How should we consider them?

3 I believe all of those are, well, I'm not  
4 sure whether they're exhibits or not. I didn't go to  
5 look for an exhibit number but I know they've come up,  
6 and is this new to you? Have you never heard of any  
7 of these reports, or would you like me to ask Entergy  
8 and --

9 MR. POEHLER: Well I can answer for --  
10 This is Jeffrey Poehler of the staff. So one of the  
11 ones that you mentioned was WCAP 17096. Is that  
12 correct?

13 JUDGE WARDWELL: Yes, that was one. WCAP  
14 just call it.

15 MR. POEHLER: Just using that as an  
16 example, that's another topical report that was under  
17 review by the NRC staff. It was kind of related to  
18 MRP-27-A and, you know, that's a document that  
19 provides methodologies for performing engineering  
20 evaluations when you find, if you were to find  
21 degradation in reactor vessel internals that exceeds  
22 the acceptance criteria of MRP-227-A.

23 So the staff was concurrently reviewing  
24 that at the time period that they were reviewing  
25 Entergy's reactor vessel internals aging management

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1 program, but those WCAP reports are not, they're not  
2 directly relied upon in our review of 227-A.

3 Another one that I think I heard you  
4 mention was WCAP 14577.

5 JUDGE WARDWELL: Yes.

6 MR. POEHLER: And that one was a  
7 Westinghouse report that addressed some of the same  
8 issues as MRP-227-A, aging management, for aging  
9 management of reactor internals and --

10 CHAIRMAN MCDADE: Okay, Mr. Poehler, let  
11 me interrupt here for a second just by way of  
12 background for my edification. Can you explain to me  
13 what a WCAP report is, what the genesis is, how  
14 they're developed, and then how they're used by the  
15 NRC in their evaluation of MRP-227?

16 JUDGE WARDWELL: That's just what I asked  
17 earlier --

18 MR. POEHLER: And so, yes.

19 CHAIRMAN MCDADE: I didn't follow --

20 JUDGE WARDWELL: -- in a terrible way.

21 MR. POEHLER: Those reports were not  
22 direct components. They're not components of MRP-227-  
23 A. There were some supporting EPRI reports.

24 CHAIRMAN MCDADE: Okay, first, how are  
25 they generated? Who --

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1 MR. POEHLER: They're generated by  
2 Westinghouse Electric Company as technical reports and  
3 sometimes those are submitted to NRC for review and  
4 approval as topical reports and sometimes they're not.

5 CHAIRMAN MCDADE: Are they submitted to  
6 EPRI as part of the development of MRP-227 or are they  
7 submitted to the NRC after MRP-227 has been  
8 circulated?

9 MR. POEHLER: I don't know if they're  
10 submitted to EPRI. But to the NRC they're not, we did  
11 not have any WCAPs that were submitted to directly  
12 support the MRP-227 review.

13 The one that I mentioned, the 17096, was  
14 submitted subsequently to MRP-227, Rev. 0. So it's a  
15 completely independent topical report that the NRC was  
16 reviewing separately.

17 CHAIRMAN MCDADE: Okay, submitted to the  
18 NRC by who, by Westinghouse?

19 MR. POEHLER: The WCAP 17096 was, I  
20 believe, submitted by EPRI and on behalf of the PWR  
21 Owners Group and Westinghouse, but I believe EPRI was  
22 the entity that actually submitted it, so.

23 CHAIRMAN MCDADE: Okay. So, again, I'm  
24 just trying to get on the record here how these  
25 reports are developed and used and correct me if I

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1 have a misinterpretation.

2 You've got a MRP-227. It is out there.  
3 It's submitted, not the A. This is not the final,  
4 that it is prepared by an industry group. Various  
5 entities in the industry, such as Westinghouse, have  
6 an interest in getting this right.

7 They prepare a document such as this WCAP  
8 17096 which is then used to provide technical support,  
9 technical accreditation, as you were, for the  
10 underlying EPRI document which can be then evaluated  
11 by the NRC for whatever value you view it might have.  
12 You may view it very helpful. You may view it not be  
13 helpful. Is that correct?

14 MR. POEHLER: Well, this is Jeffrey  
15 Poehler of the staff.

16 CHAIRMAN MCDADE: And I realize I went on  
17 there. Some of what I said may have been right and  
18 some of it may have been wrong. Don't just say yes if  
19 a lot of it is wrong.

20 MR. POEHLER: For the specific example of  
21 WCAP 17096, that was not a supporting document that  
22 was necessary for the staff's review of MRP-227. It  
23 would be something that would be used by licensees in  
24 conjunction or with their MRP-227-A inspection program  
25 if they needed to do engineering evaluations of

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1 conditions that they found. But we didn't rely, we  
2 certainly didn't rely upon that for approval of 227-A.

3 DR. HISER: This is Dr. Hiser. The  
4 sequence is MRP-227-A. Plants go to implement it.  
5 They find some indication. Maybe it exceeds  
6 acceptance criteria. Put that in the corrective  
7 actions program.

8 MRP 17096 is one method they can use under  
9 corrective actions to determine whether it's  
10 acceptable or what other corrective actions they may  
11 need to take. So it's independent time-wise and  
12 process-wise really of MRP-227-A.

13 JUDGE WARDWELL: Did you provide any of  
14 these WCAPs as testimony as an exhibit to the best of  
15 your knowledge?

16 DR. HISER: Yes, I believe we did. NRC  
17 200 is WCAP 17096.

18 JUDGE WARDWELL: Okay. And how about the  
19 14577?

20 DR. HISER: I do not remember other than  
21 doing a --

22 MR. HARRIS: Your Honor, this is Brian  
23 Harris for the staff. WCAP 14577, I think it's Rev.  
24 1-A, is Exhibit NYS 341.

25 CHAIRMAN MCDADE: Thank you very much, Mr.

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1 Harris. Maybe we can turn to Entergy who's --

2 CHAIRMAN MCDADE: I'm sorry. Could you  
3 repeat that?

4 MR. HARRIS: It's New York State 341.

5 CHAIRMAN MCDADE: 341. Thank you.

6 JUDGE WARDWELL: Would someone from  
7 Entergy like to shed some light on what are these  
8 Westinghouse reports and answer the question Judge  
9 McDade provided so eloquently?

10 MR. AZEVEDO: Yes, Your Honor. This is  
11 Nelson Azevedo for Entergy. The MRP 227 was written  
12 by EPRI in MRP specifically which is a subgroup of  
13 EPRI but a lot of analysis in the additional  
14 evaluations were required to develop MRP-227 and also  
15 for the implementation details.

16 And there's another industry group called  
17 the PWR Owners Group. I actually sit on both of these  
18 groups, and the PWR Owners Group develops a lot of  
19 these WCAPs that you're talking about, both for  
20 implementing the requirements in MRP-227 and  
21 performing evaluations that supports MRP-227. So  
22 that's a separate organization, PWR Owners Group, that  
23 supports the development of these guidelines.

24 JUDGE WARDWELL: And have you provided any  
25 of these WCAPs as exhibits to this proceeding?

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1 MR. AZEVEDO: Yes we have, Your Honor.

2 JUDGE WARDWELL: Thank you. Anything more  
3 on that? You comfortable?

4 NRC Exhibit 197, Answer 114, Page 72,  
5 quote, "The inspection plan contains tables specifying  
6 the inspections for primary expansion and existing  
7 program components and tables containing the  
8 acceptance and expansion criteria for these  
9 components.

10 "The inspection plan also contains  
11 Entergy's proposed resolution of the Applicant/license  
12 action items" these are these A/LAIs or A lays or just  
13 action items as we'll call them from here on in, "from  
14 the staff's final safety evaluation of MRP-227, Rev.  
15 0."

16 And I guess I'll start with the staff.  
17 What makes a component a primary component, an  
18 expansion component, or existing component and how  
19 does it fit into the inspection program?

20 MR. POEHLER: This is Jeffrey Poehler of  
21 the staff. So a primary component is a component that  
22 was judged either most likely to experience some form  
23 of degradation such as tracking, for example, and/or  
24 also, you know, a higher safety risk component.

25 So those primary components are those

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1 components that will be inspected as part of the  
2 initial and subsequent inspections under MRP-227-A or,  
3 you know, any inspection program that is based on 227-  
4 A.

5 You inspect the primary components within  
6 two refueling outages at the beginning of the period  
7 of extended operation and every ten years thereafter  
8 for the majority of the primary components.

9 Expansion components are those that are  
10 the next tier of components. They're somewhat less  
11 susceptible to degradation and/or lower risk, and  
12 expansion components would only be inspected if a  
13 primary component that is linked to it, in other words  
14 one that has the similar degradation mechanisms,  
15 materials, et cetera, experiences degradation.

16 So the expansion component may never be  
17 inspected unless its associated primary component  
18 first experiences degradation. So the primary  
19 components are considered the lead components for  
20 degradation.

21 CHAIRMAN MCDADE: I'm sorry. They're  
22 considered what?

23 MR. POEHLER: The lead.

24 CHAIRMAN MCDADE: Lead?

25 MR. POEHLER: Leading indicators basically

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1 of degradation as compared to the expansion  
2 components.

3 And then existing program components are  
4 components that were determined to be adequately  
5 managed by existing programs.

6 Generally the most common existing program  
7 is the American Society of Mechanical Engineers Boiler  
8 and Pressure Vessel Code, Section 11, in-service  
9 inspection program. We'll just call that the in-  
10 service inspection program from now on.

11 But that's something that is required by  
12 the ASME Code, which is incorporated by reference into  
13 NRC regulations, and the plants do that every ten  
14 years and they have been doing that since day one.

15 But basically what that program does is  
16 visual inspections of the internals, but there were  
17 certain components where the type of visual inspection  
18 that's done was considered adequate to manage aging so  
19 MRP-227 took credit for those inspections for certain  
20 components, so those will be inspected as well,  
21 basically on the same timing as the primary.

22 JUDGE WARDWELL: You said the same  
23 sequence, the ten-year sequencing.

24 MR. POEHLER: The ten-year interval,  
25 depending on when the plant's Section 11 inspections

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1 are scheduled, which typically they would, plants will  
2 try to have those coincide with the augmented  
3 inspections that are done under MRP-227-A.

4 DR. HISER: This is Dr. Hiser. I just  
5 want to clarify one thing. The expansion components  
6 are inspected if the inspections of the primary  
7 components, if the results exceed the expansion  
8 criteria that are in MRP-227-A and also in the  
9 Applicant's AMP.

10 JUDGE WARDWELL: You said expansion  
11 criteria. You mean acceptance criteria or --

12 DR. HISER: No, expansion criteria.

13 JUDGE WARDWELL: Say your sentence over  
14 again. I'm sorry.

15 DR. HISER: Okay. The expansion  
16 components are examined if the primary component  
17 inspections, if the results exceed the expansion  
18 criteria that are in the Applicant's inspection plan.

19 So you do the primary inspection. If you  
20 have no findings, you're finished until the next  
21 inspection. If you find degradation, you go to the  
22 expansion criteria. If it exceeds the expansion  
23 criteria, then you do the expansion inspections.

24 CHAIRMAN MCDADE: Okay, and we've been  
25 going for about, almost two hours now since our last

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1 break and it may be appropriate to take another ten-  
2 minute break. Does anyone believe they need more than  
3 ten minutes?

4 (No audible response.)

5 CHAIRMAN MCDADE: Okay, apparently not.  
6 And before we break, just one thing while it's still  
7 on my mind and before I lose it here.

8 You've got a list, Table 5-2, where the  
9 primary 5-3 would be expansion components, 5-4 would  
10 be existing program components. Can you explain  
11 briefly how you determine whether something should be  
12 in the primary as opposed to the expansion components?  
13 Just what's the process on --

14 DR. HISER: This is Dr. Hiser. I guess we  
15 didn't determine whether they should be in one or the  
16 other. I mean, the industry program did that. We  
17 reviewed it and determined that we agreed with the  
18 binning that was done of the components just to  
19 clarify that.

20 CHAIRMAN MCDADE: Okay, and what's the  
21 nature of that vetting?

22 MR. POEHLER: The nature of the binning  
23 that was done -- This is Jeffrey Poehler of the staff.  
24 So the binning that was done by EPRI in developing  
25 these recommendations was basically, they used a

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1 process -- Well, initially they did screening of the  
2 components to determine which aging mechanisms were  
3 applicable.

4 Then they took those results and they did  
5 a process called failure modes, effects, and  
6 criticality analysis, or FMECA, and basically that  
7 process looks at all the different ways a component  
8 can fail and what the consequences would be if a  
9 individual component is to fail as far as the  
10 functions of the reactor vessel internals, the various  
11 safety functions.

12 And based on that process, the components  
13 were given an initial ranking and that was basically  
14 the, they were given a ranking like A, B, C with C  
15 being the, you know, most likely to, most critical  
16 components I guess.

17 And then there was, some additional  
18 analyses were done by EPRI to refine the initial  
19 binning so there were some initial, more detailed  
20 engineering analyses done on certain components. And  
21 after that, they came up with the final rankings or  
22 the final binning of primary expansion existing  
23 programs and --

24 CHAIRMAN MCDADE: And then did the NRC  
25 conduct a de novo review of those conclusions or did

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1 you rely on EPRI's conclusions unless they were  
2 demonstrably faulty?

3 MR. POEHLER: We did review that process  
4 and EPRI submitted, the MRP, EPRI MRP submitted  
5 several supporting reports that contained some of the,  
6 you know, the detailed analysis that went into this.

7 So there were a series of technical  
8 reports that were submitted to the staff for  
9 information to support our review of MRP-227. So we  
10 did review those reports to some degree and so, no,  
11 yes, we didn't just accept the industry's or EPRI's  
12 determination. In fact --

13 CHAIRMAN MCDADE: Okay, you kind of had a  
14 throwaway phrase there. You said "to some degree."  
15 Before that, it sounded like the review was rather  
16 extensive and then you described it as "to some  
17 degree," which suggests less than. Which is it or did  
18 I read more into it than was intended?

19 MR. POEHLER: Yes, perhaps but, you know,  
20 did we, yes, did we review every component in detail?  
21 I cannot answer that question.

22 CHAIRMAN MCDADE: Would it be accurate to  
23 say that some of them were obvious, that it's only the  
24 stuff on the fringes that could be, you know, could go  
25 to Table 2 as opposed to Table 3?

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1 MR. POEHLER: And, you know, we --

2 CHAIRMAN MCDADE: Is that correct, that  
3 those are the ones that got the in-depth review and  
4 the others that were obvious got less of a review,  
5 received less of an in-depth review?

6 MR. POEHLER: Some of them were obvious  
7 and, yes, in some cases the staff challenged some of  
8 the binning, the final binning for some of these  
9 components.

10 And we included conditions. We included  
11 conditions for certain components, saying you need to  
12 elevate this component from expansion to primary, for  
13 example, because we did have concerns about the safety  
14 significance of certain components. So, yes, we  
15 didn't just accept without question what EPRI had  
16 done.

17 CHAIRMAN MCDADE: Okay, thank you. Do you  
18 have anything before we break?

19 JUDGE WARDWELL: No.

20 CHAIRMAN MCDADE: It's 3:35. Why don't we  
21 break until 3:45.

22 (Whereupon, the above-entitled matter went  
23 off the record at 3:35 p.m. and resumed at 3:46 p.m.)

24 CHAIRMAN MCDADE: Okay, the hearing will  
25 come to order. Judge Wardwell.

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1 JUDGE WARDWELL: Getting back to where we  
2 left off, we were talking about the primary expansion  
3 in existing components. And in addition to getting  
4 various components into one of those sitements, the  
5 inspection plan contains Entergy's proposed resolution  
6 of the Applicant's license action items.

7 And I've asked the Staff if they could  
8 explain a little bit more about what these ALIs are  
9 and how they are used in either your evaluation of  
10 MRP-227 or in your review of the Aging Management Plan  
11 for vessel internals?

12 MR. POEHLER: This is Jeff Poehler of the  
13 Staff.

14 So there were eight Applicant licensee  
15 action items. And so those were included in the  
16 staff's safety evaluation of MRP-227-A, or MRP-227.  
17 They were included generally for things where for a  
18 licensee or Applicant that wanted to reference  
19 MRP-227-A, that there would be some plant-specific  
20 technical evaluation that was needed to be done that,  
21 in addition to just following the recommendations of  
22 MRP-227-A.

23 So these were things that weren't  
24 addressed in sufficient detail or have a  
25 plant-specific aspect that couldn't be addressed

1 generically in -- by the topical report 227-A.

2 And an example of that is Action Item 1  
3 where it's -- it requests the Applicants or licensees  
4 to confirm the plant-specific applicability of  
5 MRP-227-A.

6 JUDGE WARDWELL: Is it your position that  
7 if a plan addresses these action items that then by  
8 definition they're AMP will be site-specific enough to  
9 provide a demonstration that the -- of aging  
10 management for these items?

11 MR. POEHLER: Yes, that's one important  
12 component. The other is just verifying that they are,  
13 they're -- the inspections that they have -- the  
14 inspections that they're doing under their plan are  
15 consistent with the inspections that are specified in  
16 MRP-227-A for their particular design.

17 JUDGE WARDWELL: So are most of these  
18 related to the inspections more than the other part of  
19 the plan or is it evenly distributed?

20 MR. POEHLER: Yeah, some of them are  
21 related to the inspections. I would say, I would say  
22 most of them are, but.

23 DR. HISER: Just sort of -- this is Dr.  
24 Hiser -- just sort of skipping through 1 and 2, 1  
25 relates to the applicability of the MRP-227-A to the

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1 plant. So is the plant within the parameters that  
2 were considered in development for the report?

3 JUDGE WARDWELL: And what are those  
4 approximate parameters that would make a plant  
5 eligible or not eligible?

6 DR. HISER: One of them relates to core  
7 power density.

8 One relates to the top of the -- distance  
9 from the top of the active fuel to the bottom of the  
10 upper core plate.

11 The third one relates to heat generation  
12 within the core.

13 JUDGE WARDWELL: And if a plant didn't  
14 meet those, then in fact 227 is inapplicable or?

15 DR. HISER: Well, then we would expect the  
16 plant to propose additional actions. For example,  
17 maybe they would include more components under primary  
18 category or something along those lines. But they  
19 would then need to take some additional actions beyond  
20 what is in the base program in MRP-227-A.

21 JUDGE WARDWELL: All right. You were  
22 stepping us through the ALIs. Do you still want to go  
23 over it or did you -- you were hoping I wouldn't  
24 remember something you can't remember all of? That's  
25 fine if you don't.

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1 DR. HISER: Well, those are two in  
2 particular that really don't relate directly to change  
3 -- well, they both I guess in reality could relate to  
4 changes in the inspection activities.

5 Action Item 2 then is components not  
6 covered in the generic evaluation of MRP-227-A, or  
7 potentially different materials that were used from  
8 within 227-A.

9 JUDGE WARDWELL: Thank you.

10 Commitment 30: could you talk a little  
11 bit about that? What did the Applicant agree to and  
12 has that been fulfilled and now moot?

13 MR. POEHLER: This is Jeffrey Poehler of  
14 the Staff.

15 So commitment 30 was the commitment  
16 originally made in the license general application for  
17 Indian Point where they committed to follow the  
18 industry program when it was issued, basically  
19 implement the industry program within a certain time  
20 frame of that program being issued.

21 And that, we do consider it to have been  
22 fulfilled by their submission of their Aging  
23 Management Program and inspection, inspection plan;  
24 and as modified, you know, as approved by the Staff  
25 through our review process which, you know, basically

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1 as documented in the Supplemental Safety Evaluation  
2 Report NUREG 1930, Supplement 2.

3 JUDGE WARDWELL: So if I went to 1930,  
4 Supplement 2, would I be able to see a statement that  
5 commitment 2 has been fulfilled or something along  
6 those lines?

7 MR. POEHLER: Yes, I believe so. I think  
8 I would have to check the conclusions but I believe  
9 there is a statement to that effect.

10 JUDGE WARDWELL: Thank you.

11 CHAIRMAN MCDADE: You were talking about  
12 commitment 30?

13 JUDGE WARDWELL: Yes.

14 CHAIRMAN MCDADE: I thought you said so.

15 JUDGE WARDWELL: I may have said something  
16 different but I started off that way this last time I  
17 said it. I don't know. We'll check the transcript.

18 Let's talk a little bit about the  
19 adequacies of the RVI.

20 New York's Exhibit 482, their testimony on  
21 page 51, lines 7 through 10, and I quote, "A  
22 systematic safety evaluation of the degraded pressure  
23 vessel internals is needed to identify the limiting  
24 structures, components and fittings that need to be  
25 repaired or replaced before the onset of extended

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1 operations."

2 And in response to that, Entergy's Exhibit  
3 616 on page -- Answer 128, page 79, says that "The  
4 guidelines in MRP-227 are based on a systematic  
5 evaluation of degradation of mechanisms, including  
6 multiple concurrent mechanisms, the resulting aging  
7 effects, including combination of effects, and  
8 consequences that identify the limiting RVI  
9 structures, components and fittings."

10 They go on in Answer 129 to say, "Based on  
11 a considerable body of research and operating  
12 experience, MRP-227-A provides Aging Management  
13 guidelines, defines inspections to detect the effects  
14 of aging, and recommends methods to evaluate aging  
15 effects. As described..." And then it goes on and  
16 describes it further in Answers 121 to 129, pages 75  
17 to 80.

18 Entergy also then in their Answer 201,  
19 page 135, states that "The guidelines in MRP-227-A  
20 were developed through a systematic evaluation of all  
21 RVIs and all potential aging effects on those RVIs,  
22 including combined effects caused by multiple aging  
23 mechanisms."

24 And I guess my question for you, Dr.  
25 Lahey, is do your criticisms mostly relate to what

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1 Entergy omitted or missed in its RVI AMP rather than  
2 proffering any evidence that challenges specific  
3 aspects of the engineering work that was expanded --  
4 expended to develop MRP-227?

5 DR. LAHEY: So can I talk about synergisms  
6 now or? Richard Lahey. I'm aching to talk about  
7 synergy.

8 JUDGE WARDWELL: I know it. Hold off for  
9 just about another half hour and then I think we'll be  
10 able to rock and roll with details.

11 DR. LAHEY: Okay.

12 JUDGE WARDWELL: But I need time --

13 DR. LAHEY: I think they missed the boat,  
14 to your specific question, they did not, when they  
15 evaluated the degradation they do not take into  
16 account all the effects.

17 JUDGE WARDWELL: And as the synergism et  
18 al. statement that's there?

19 DR. LAHEY: Right.

20 JUDGE WARDWELL: And exclusive of that  
21 though, looking at -- I guess my heart of my question  
22 is, what they did do, do you have challenges in  
23 regards to what they did do, not what they did not do?  
24 Not the inadequacies or what's missing out of that but  
25 the fact of do you have any specific criticisms in

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1 your testimony in regards to the specific actions that  
2 they did take in this systematic evaluation that they  
3 claimed has been performed as part of MRP-227?

4 DR. LAHEY: I certainly do, Your Honor.  
5 But I have to talk about synergisms to tell you what  
6 those are.

7 JUDGE WARDWELL: It's related to that  
8 then?

9 DR. LAHEY: Yes, sir.

10 JUDGE WARDWELL: That's fine. That's  
11 fine.

12 CHAIRMAN MCDADE: Well, Doctor, if you  
13 could, I mean there's a couple of aspects to this.

14 One, as I understand it, your -- you focus  
15 on the fact that this is an inspection program and  
16 that inspection alone is inadequate?

17 DR. LAHEY: Yes.

18 CHAIRMAN MCDADE: They need something more  
19 than inspection. Okay.

20 Focusing just on the inspection aspect of  
21 the program, are there specific areas that you view as  
22 inherently deficient in the method of inspection?

23 DR. LAHEY: It's Richard Lahey again.

24 Yes, sir. There are some very specific  
25 things where it appears that just the visualization

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1 techniques they're using would not be sufficient. But  
2 quite frankly, my real concern is the things that are  
3 the biggest problem you don't see until they happen.  
4 All right. They occur. They're happening right along  
5 but you're not able to determine the level of  
6 degradation based on the techniques that they're  
7 using.

8 That's the real concern. That's the  
9 synergism concern.

10 CHAIRMAN MCDADE: Okay. Are there  
11 inspection techniques that they could use that they're  
12 not using that would solve that problem?

13 DR. LAHEY: They're aware of the issue and  
14 they claim they can't, for example, determine the  
15 level of embrittlement. They don't know how to do  
16 that in situ. So --

17 CHAIRMAN MCDADE: You don't disagree with  
18 them on that, do you?

19 DR. LAHEY: No, I don't. But I, I think  
20 the other thing they're missing is it's not just  
21 sufficient to do inspection, there needs to be  
22 complementary analysis, particularly when you look at  
23 such things as earthquake events or shock load events  
24 which can really disrupt and relocate some of these  
25 key structures.

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1           And if you then wind up with an uncoolable  
2 geometry, I can tell you you're in deep trouble.  
3 That's what I've been doing all my life. And, and  
4 this is what I am concerned about.

5           CHAIRMAN MCDADE:     Winding up in deep  
6 trouble?

7           DR. LAHEY:     You're in deep trouble if you  
8 don't, if you don't maintain an intact geometry  
9 because you really don't know where things are going  
10 and what of blockages may occur and what it means in  
11 coolability.

12          CHAIRMAN MCDADE:   And from my standpoint,  
13 and I'm sure Judge Wardwell is going to get into this  
14 later, is, is to bifurcate things for the moment. And  
15 accepting your premise that no inspection program  
16 standing alone would be sufficient, but just looking  
17 at the inspection program that is there, to focus on  
18 what you view as the defects in the existing  
19 inspection program by way of what they inspect, how  
20 they inspect, how often they inspect, baseline those  
21 kinds of issues with regard to the -- your view of  
22 deficiencies in the existing inspection program  
23 without accepting that standing alone inspection is  
24 sufficient?

25          DR. LAHEY:     Well, for most of them I think

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1 they're, they're good. It's very well thought through  
2 and screened.

3           However, for instance for some of the  
4 bolts which they don't have the ability to determine  
5 the degradation until it's to a certain percentage,  
6 and in fact, on the interval where they inspect there  
7 can be bolts missing. And the concern is if you then  
8 have an event which pops out, which unzips a lot of  
9 the other bolts, you have a vary distorted geometry.  
10 You have no idea what's going to be happening to the  
11 materials and what it will do for core coolability.

12           So for the bolting, I have serious  
13 concerns.

14           CHAIRMAN MCDADE: But on a couple of  
15 those, Doctor, for example the baffle former bolts.

16           DR. LAHEY: Yes, sir.

17           CHAIRMAN MCDADE: They indicate that, one,  
18 there will be cracking that is observable before you  
19 get anywhere close to failure.

20           Secondly, that even if there were a  
21 failure, there is so much redundancy built in that you  
22 could have 50 percent of the bolts crack and fail and  
23 it wouldn't adversely affect the operation of the  
24 facility. And on others, like the Clovis bolts, they  
25 indicate that even -- that once the facility is

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1 operational that they never serve a function, so if  
2 they would fail it wouldn't have an adverse impact.

3 So with regard to those that you address,  
4 why is that a safety issue?

5 DR. LAHEY: Well, I read the same thing  
6 you did but I don't come to the same conclusion that  
7 they did.

8 CHAIRMAN MCDADE: I haven't come to a  
9 conclusion yet.

10 DR. LAHEY: Right.

11 CHAIRMAN MCDADE: I'm just asking you to  
12 criticize their conclusion.

13 DR. LAHEY: My, my concern is, number 1,  
14 they can have up to 30 percent cleavage of a bolt  
15 before they can detect it with ultrasound. That's  
16 what they found.

17 They also have found in other reactors,  
18 bolts that have failed. It's not a hypothetical  
19 event; it happens. And it's because their highly  
20 irradiated, and irradiated-assisted stress cores, and  
21 cracking and other events, fatigue, cause these  
22 failures to occur.

23 If you look at the analysis, it's really  
24 a steady state analysis for why you have enough  
25 redundancy to keep operating. If you then look at a

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1 accident which puts significant loads and pops the  
2 other bolts, you no longer have an intact geometry.  
3 And once your baffles are going anywhere, it's bad  
4 news.

5 That's, that's where I'm at. I'm not, I'm  
6 not in the steady state mode, I'm in an actuative  
7 mode. That's what I'm looking at.

8 CHAIRMAN MCDADE: Okay. But you're  
9 talking still about design-basis accidents?

10 DR. LAHEY: Not just. Earthquake events  
11 can do the same thing if they're severe enough.

12 CHAIRMAN MCDADE: Okay. But as your  
13 testimony is right now that with regard to inspection  
14 techniques, for example, the VT-3, you don't have  
15 specific suggestions to change that or criticisms of  
16 why that doesn't serve the purpose proffered by  
17 Entergy?

18 DR. LAHEY: Are you only talking about the  
19 inspection part of it? Because --

20 CHAIRMAN MCDADE: Right now.

21 DR. LAHEY: -- my concern is the lack of  
22 analysis, the complementary analysis part.

23 CHAIRMAN MCDADE: Okay. Well, Dr.  
24 Wardwell is going to get into that in great detail  
25 later. But right now just on the inspection.

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1 DR. LAHEY: Well, the inspection program.

2 CHAIRMAN MCDADE: Yes.

3 DR. LAHEY: Yeah, I have, I have concerns  
4 about the inspection technique being adequate for the  
5 bolting. And there's some other components where the  
6 visualization technique they're using is not, in my  
7 view, sufficient. But more or less I think what  
8 they're doing, other than those specific things, is a  
9 good thing, it's a usable thing, but not sufficient.

10 CHAIRMAN MCDADE: Okay. Essential but not  
11 sufficient?

12 DR. LAHEY: Right. Necessary. As the  
13 mathematicians say, necessary but not sufficient.

14 CHAIRMAN MCDADE: Okay. Judge Wardwell.

15 JUDGE WARDWELL: NRC in your Exhibit 197  
16 testimony, Answer 122 to page 74 says that the  
17 "MRP-227-A relies on PWR water chemistry control to  
18 prevent or mitigate aging effects that can be induced  
19 by corrosion aging mechanisms. For instance, loss of  
20 material induced by general corrosion, pitting  
21 corrosion, crevice corrosion, or stress corrosion  
22 cracking of any of its forms." Some of the acronyms  
23 that are used are SCC, PWSCC and IASCC. And probably  
24 there's a way to pronounce those, but we'll find out  
25 as we move through here.

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1           Anyhow, section Roman Numeral XI.1M16A of  
2           the Interim Staff Guidance, which we talked about  
3           earlier, 2011/04, further states that the "reactor  
4           coolant water chemistry is monitored and maintained in  
5           accordance with the water chemistry program as  
6           described in GALL AMP Section XI.M2, 'Water  
7           Chemistry.'

8           My question for Entergy: have you  
9           implemented a water chemistry water control program at  
10          IP-2 and 3?

11          MR. AZEVEDO: Yes, Your Honor. I'm sorry,  
12          this is Nelson Azevedo for Entergy.

13          The Indian Point water chemistry program  
14          does follow the AMP requirements.

15          JUDGE WARDWELL: And how long ago did you  
16          implement that? And could you describe the program  
17          generally, what its function is and how, what benefit  
18          you gain out of that program?

19          MR. AZEVEDO: I can describe some  
20          portions. I'm not a chemist so I cannot go into the  
21          details.

22          But I can tell you from the '70s and the  
23          '80s Indian Point has been following the  
24          recommendations of the EPRI for water chemistry. That  
25          program, as I understand, has evolved over the years.

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1           As far as getting details, I'm not sure if  
2 anybody in the Entergy panel can add to that.

3           MR. COX: This is Alan Cox for Entergy.

4           I will add that there's been several  
5 revisions of the EPRI water chemistry guidelines. The  
6 EPRI guidelines are the industry guidelines and  
7 recommendations for a chemistry program for a nuclear  
8 reactor. And those have been revised several times  
9 over the years.

10           And typically a plant will upgrade their  
11 program to align with the latest version.

12           JUDGE WARDWELL: I think you may be too  
13 worried that we want to know too much technical  
14 detail.

15           What's the basic goal of the program?  
16 What water are you chemistrizing? What's the purpose  
17 of any chemistry controls that you're putting on and  
18 how does that help your operations?

19           MR. GORDON: This is Barry Gordon from  
20 Entergy.

21           JUDGE WARDWELL: Where are you?

22           MR. GORDON: I'm right here.

23           JUDGE WARDWELL: I'm kidding. I'm  
24 kidding.

25           MR. GORDON: I don't even have a sign.

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1 You know?

2 JUDGE WARDWELL: Yes.

3 MR. GORDON: Respect I guess.

4 Anyway, the water chemistry is to min --  
5 basically to minimize all forms of corrosion,  
6 including stress corrosion cracking. And what's  
7 unique about or more favorable for Indian Point is  
8 that they're doing an excellent job on controlling  
9 their water chemistry, and exceeding even the  
10 guidelines that are required by, by the water  
11 chemistry guidelines.

12 For example, they have the recommended  
13 level -- we'll just talk about one technical factor  
14 here -- of dissolved hydrogen in the plant, is between  
15 25 and 50 --

16 JUDGE WARDWELL: Of hydrogen or oxygen?

17 MR. GORDON: Hydrogen. Hydrogen.

18 JUDGE WARDWELL: Okay.

19 MR. GORDON: We don't want oxygen in  
20 there.

21 It's between 25 and 50 cc's per kilogram.  
22 It's an unusual unit but that's what they use.

23 And at Indian Point they're up -- the  
24 higher level the more benefit you have, minimizing  
25 corrosion. And Indian Point is actually running at

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1 the higher level. They're running at 42.5 cc's per  
2 kilogram. So that's beneficial.

3 Also, in IP, Indian Point Unit 2 they are  
4 adding zinc to their water, which is also beneficial  
5 to minimizing corrosion. And otherwise they just have  
6 general things like lithium hydroxide, things like  
7 that, which are just to minimize general corrosion of  
8 the material.

9 JUDGE WARDWELL: You say you don't want  
10 oxygen. What do they do to not have oxygen?

11 MR. GORDON: They have excess hydrogen  
12 present. And also during start-up they put hydrozine  
13 in there which consumes, it consumes oxygen. It's a  
14 de-aerated environment, unlike the BWR.

15 JUDGE WARDWELL: I'll ask anyone from  
16 Entergy, and we can stay with you if you are the best  
17 that can answer it, what types of data do you see, do  
18 you have any quantification of your reduction in your  
19 corrosion issues at the plant? Do you have any  
20 parameter that helps guide you in quantifying how  
21 helpful this really is.

22 MR. GORDON: This is Barry Gordon from  
23 Entergy again.

24 They do keep track of the dissolved  
25 hydrogen. They keep track of how much zinc is in the

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1 water. And all the chemical controls that are  
2 required by the PWR water chemistry guidelines.

3 But the performance of the plant has been  
4 exceptional. If you look at their alloy 600 thermally  
5 treated steam generator tubing it's, they've hardly  
6 plugged anything and most of it was conservatively  
7 plugged. They've had very good results.

8 JUDGE WARDWELL: Most of it was  
9 conservatively plugged when? And at this plant or is  
10 this --

11 MR. GORDON: At this plant.

12 JUDGE WARDWELL: Okay.

13 MR. GORDON: You know, you're allowed 10  
14 percent. And they've done a very small percentage of  
15 it. And usually it's because they found something  
16 going on and said, well, we'll be conservative and  
17 we'll do all the tubes around it, even though it's  
18 really they're just being very conservative how they  
19 deal with it.

20 The performance has been outstanding at  
21 this facility relative to stress corrosion cracking.  
22 And that's a good measure that the water chemistry  
23 control is doing its job.

24 JUDGE WARDWELL: Dr. Lahey, did you review  
25 anything in regards to the water chemistry program

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1 and/or have any comments in regards to its  
2 effectiveness in helping to control one of the aspects  
3 that you were concerned about, that is corrosion?

4 DR. LAHEY: I didn't specifically review  
5 the water chemistry program. It's my opinion based on  
6 other input that I have had over the years that Indian  
7 Point is run very well in that regard. And overall  
8 it's a tight plant, what we call a tight plant.

9 JUDGE WARDWELL: And wouldn't that go a  
10 long ways to controlling some of those aspects of that  
11 particular failure effect, if you will, of any  
12 component for aging?

13 DR. LAHEY: Are you going back to the  
14 bolts now?

15 JUDGE WARDWELL: Well, of anyone, just the  
16 fact that the water chem -- isn't there some benefits  
17 gained on though from the water chemistry program in  
18 regards to aging effects on this location?

19 DR. LAHEY: Yeah, there's definitely  
20 benefits gained. And, you know, when we talked about  
21 the bolts which were failing, they're failing by  
22 irradiation-induced stress corrosion and cracking,  
23 just because of their location. But it's not a show  
24 stopper. I mean those are things you can easily  
25 replace.

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1                   So it's a very doable thing to fix that  
2                   problem.

3                   JUDGE WARDWELL: Thank you.

4                   CHAIRMAN MCDADE: Okay. Let me go back a  
5                   second just to make sure I understand.

6                   The water chemistry control program is  
7                   something separate and apart from the Aging Management  
8                   Program for the reactor vessels' internals; correct?

9                   MR. COX: This is Alan Cox with Entergy.

10                  It's treated and described as a separate  
11                  program. The reactor vessel internals program does  
12                  have a reference that refers to that program and says  
13                  that it is an effective preventive action. So it's,  
14                  I mean it's a matter of semantics. It's not described  
15                  as part of the reactor vessel internals program but  
16                  it's applicable to all the reactor vessel internals.

17                  CHAIRMAN MCDADE: When you use the term  
18                  "preventive action" is it more accurate to say it  
19                  ameliorates the condition rather than prevents, you  
20                  still have the potential for stress corrosion cracking  
21                  regardless of the water chemistry; isn't that correct?

22                  MR. COX: This is Alan Cox with Entergy.

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25                  have a reference that refers to that program and says

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1 that it is an effective preventive action. So it's,  
2 I mean it's a matter of semantics. It's not described  
3 as part of the reactor vessel internals program but  
4 it's applicable to all the reactor vessel internals.

5 CHAIRMAN MCDADE: When you use the term  
6 "preventive action" is it more accurate to say it  
7 ameliorates the condition rather than prevents? You  
8 still have the potential for stress corrosion cracking  
9 regardless of the water chemistry; isn't that correct?

10 MR. COX: Yes, that's correct.

11 CHAIRMAN MCDADE: Okay. But if you don't  
12 have a well-controlled water chemistry, then that  
13 potential for stress corrosion cracking is greater?

14 MR. COX: That's correct.

15 CHAIRMAN MCDADE: Okay. And, Dr. Lahey,  
16 is it your position that given this potential for  
17 stress corrosion cracking along with other aging  
18 mechanisms that there is a risk that is not adequately  
19 identified by the inspection program that exists? Is  
20 that your view?

21 DR. LAHEY: Could you rephrase the  
22 question, Your Honor?

23 CHAIRMAN MCDADE: I don't know if I could  
24 rephrase it but I could repeat it.

25 DR. LAHEY: Yes, please do. Are you

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1 asking do I think the water chemistry program is  
2 beneficial to mitigate stress corrosion cracking?

3 CHAIRMAN MCDADE: And I believe your  
4 answer to that is yes?

5 DR. LAHEY: Yes, I do.

6 CHAIRMAN MCDADE: Okay. But that even  
7 though they do have a effective water control program  
8 that it doesn't eliminate the potential for stress  
9 corrosion cracking; is that correct?

10 DR. LAHEY: Yeah, there's different types  
11 of stress corrosion cracking. And it doesn't  
12 eliminate all of them.

13 CHAIRMAN MCDADE: Regardless of the water  
14 chemistry?

15 DR. LAHEY: Yes, sir.

16 CHAIRMAN MCDADE: Okay. And you're not  
17 saying that the stress corrosion cracking standing  
18 alone is the basis for your opinion with regard to the  
19 adequacy of the AMP? You're saying that it's "a"  
20 factor?

21 DR. LAHEY: It's a factor and perhaps not  
22 even the primary factor.

23 CHAIRMAN MCDADE: Okay. And Judge  
24 Wardwell will get to it in a second, but before we  
25 move on, just very quickly could you tell me in your

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1 view what in sequence are the most significant  
2 factors? You said this is water -- stress corrosion  
3 cracking is not one of the more significant.

4 What is the most significant and sort of  
5 working your way down through various of these aging  
6 mechanisms?

7 DR. LAHEY: Can I have a few minutes to do  
8 that?

9 CHAIRMAN MCDADE: I don't know. Let's  
10 start --

11 JUDGE WARDWELL: Not now.

12 CHAIRMAN MCDADE: Okay. Judge Wardwell  
13 will get to that later, so.

14 DR. LAHEY: Okay. We need to talk about  
15 silos to answer your question.

16 JUDGE WARDWELL: Because I want to finish  
17 on this topic area before we move into the next one.

18 CHAIRMAN MCDADE: No, that's fine. It's  
19 just, you know, there are big silos and there are  
20 little silos, and I just want to find out which silos  
21 contain the largest problem.

22 JUDGE WARDWELL: NRC's testimony 197,  
23 Exhibit 197, Answer 85, page 61, in industry review of  
24 the MRP-227, Revision 0, "The NRC staff identified  
25 eight action items that must be addressed by the

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1 Applicants or licensees --" And these are these  
2 action items we talked about earlier. "-- in order to  
3 apply the methodology of the topical report Aging  
4 Management of the Reactor Vessel Internals at a  
5 particular plant."

6 And I guess I just want to confirm that --  
7 two things from Staff -- I want to confirm that those  
8 ALIs have been incorporated into the most recent  
9 version of MRP-227-A, Revision 1, issued on December  
10 16th, 2011?

11 MR. POEHLER: This is Jeffrey Poehler from  
12 the Staff.

13 Yes, the action items have been  
14 incorporated in -- well, they're incorporated in the  
15 Staff's safety evaluation which is included in the  
16 MRP-227-A.

17 JUDGE WARDWELL: Okay. So where they're  
18 really documented and incorporated is in your SE  
19 rather than in the MRP-227 text of the body, if you  
20 will?

21 MR. POEHLER: That's correct.

22 JUDGE WARDWELL: And included as an  
23 appendix in the SE?

24 MR. POEHLER: That's correct.

25 JUDGE WARDWELL: Thank you.

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1 For Dr. Lahey. In regards to these action  
2 items, exclusive of 7 which I believe deals with the  
3 specific analysis of cast austenitic stainless steel,  
4 which we will talk about later, so exclusive of that  
5 do you have any -- well, let me ask you, have you had  
6 a chance to review those Action Items 1 through 8, are  
7 familiar with them and have any comment on them?

8 DR. LAHEY: I don't remember them by  
9 heart, Your Honor. If we can --

10 JUDGE WARDWELL: No, but I just want to  
11 make sure that exclusive of 7, are there any others  
12 that jumped out at you as something that related to  
13 your issues associated with their Aging Management  
14 Plan?

15 DR. LAHEY: I'd have to look at them to  
16 know. I just don't remember them that well.

17 JUDGE WARDWELL: Nothing jumped out at you  
18 though with regards to that?

19 DR. LAHEY: Honestly, I'd have to look at  
20 them to give you a good answer.

21 JUDGE WARDWELL: Entergy's testimony  
22 Exhibit 616, Answer 169, page 109, and I quote,  
23 "During the development of MRP-227-A, EPRI  
24 appropriately considered combination of aging effects,  
25 including potential synergistic effects that could

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1 affect the reactor vessel internals. As the NRC Staff  
2 concluded in its safety evaluation of MRP-227-A, EPRI  
3 considered 'individual or synergistic effects of  
4 thermal aging or neutron irradiation embrittlement'  
5 and 'loss of pre-load due to either individual or  
6 synergistic contributions from thermal and  
7 irradiation-enhanced stress relaxation.'"

8 Dr. Lahey, do you agree that EPRI  
9 considered combination of aging effects and that Staff  
10 reviewed these and concluded that potential  
11 synergistic effects were considered?

12 DR. LAHEY: To the extent that you have  
13 described it there they did. But they did not look at  
14 the effect of an accident type load on a weakened  
15 structure, both fatigue-weakened or embrittled with  
16 the various embrittlement mechanisms. As far as I  
17 could tell, that was not at all considered.

18 JUDGE WARDWELL: So if I heard you  
19 correctly, you believe that the synergistic effects  
20 had been looked at with the exception of the loading  
21 associated with what you called seismic and shock  
22 loads; is that a fair assessment of your position?

23 DR. LAHEY: Well, you talked about, for  
24 example, the relaxation of spring loads. And they  
25 definitely did look at that and the effect of some of

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1 these synergistic effects. But what I am concerned  
2 with hasn't been looked at.

3 JUDGE WARDWELL: So the synergistic  
4 effects they looked at aren't the synergistic effects  
5 that you believe should be looked at?

6 DR. LAHEY: They're somewhat the same but  
7 for a whole different application.

8 JUDGE WARDWELL: Okay. And how do yours  
9 differ and how do they -- how would you apply them as  
10 opposed to how they apply them?

11 DR. LAHEY: Well, for example, if we're  
12 talking about reactor vessel internals.

13 JUDGE WARDWELL: That's where we are.

14 DR. LAHEY: Okay. One of the problems  
15 that I see is that when they look at fatigue they do  
16 not --

17 JUDGE WARDWELL: At the what? I'm sorry.

18 DR. LAHEY: When they look at fatigue --

19 JUDGE WARDWELL: Okay, fatigue.

20 DR. LAHEY: -- fatigue in their  
21 structures, they do not take into account any  
22 embrittlement, what the effect of embrittlement is on  
23 the fatigue. They assume that once the fatigue will  
24 go just like it goes for ductile material, until the  
25 crack, until the crack occurs, is one. And then the

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1 crack will propagate more rapidly if it's embrittled.

2           Actually, if you have a shock load, a  
3 highly fatigued structure will fail well before that,  
4 well before they see surface cracks. And that's  
5 exactly what the light water reactor sustainability  
6 program is doing right now. I mean they're working on  
7 the report right now with Argonne.

8           JUDGE WARDWELL: You just stated that a  
9 highly fatigued component will?

10           DR. LAHEY: If you hit it, if you hit it  
11 with a shock load. Do you know what I mean by a shock  
12 load?

13           JUDGE WARDWELL: Well, no. Tell me what  
14 you mean by a shock load.

15           DR. LAHEY: All right. I mean I can show  
16 you a picture but try this.

17           JUDGE WARDWELL: Just tell me.

18           DR. LAHEY: You've seen people that do  
19 karate that put bricks across. And you can stand on  
20 them, you can sit on them. And then you get back and  
21 if you hit it with an impulsive load, real snap, it  
22 will break a dozen bricks, not just one, which would  
23 support the weight of the intensity.

24           So it's a impulsive load. And if you want  
25 to see a picture I can do that.

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1 JUDGE WARDWELL: No, I think I've got a  
2 clear view.

3 DR. LAHEY: Okay.

4 JUDGE WARDWELL: Unless one of the other  
5 Board members has a question.

6 DR. LAHEY: It's a lot more than the  
7 static load. So when, when I've asked about this in  
8 the past the response that has come back, this is no  
9 problem because we have shown that the loads are, you  
10 know, the static loads can be withstand -- withstood  
11 by the structure, even if it's embrittled. But it's  
12 a lot different when you hit it with a shock load.

13 And that's what I'm worried about because  
14 of the location.

15 JUDGE WARDWELL: Sorry. Sorry to  
16 interrupt. You just used the word "embrittled"  
17 though. That's different than fatigue, isn't it?

18 DR. LAHEY: Yeah. But what I said is if  
19 you embrittle a structure, a reactor vessel internal,  
20 and then do the fatigue analysis, right now they do  
21 them quite separately, all right. They're in two  
22 different silos and they don't interact. And then the  
23 third silo is the shock loads.

24 So when they do the safety analysis it's  
25 implicitly assumed that the geometry is intact. And

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1 I can tell you I spent lots of decades working on the  
2 coolability of light water reactors for intact  
3 geometries. I was involved in the Loft Program and  
4 all the programs for the NRC and whoever. And as long  
5 as you maintain the cool geometry the engineered  
6 safety systems work. That's what they're designed  
7 for.

8           Once you lose the intact geometry, all  
9 bets are off. That's, that's what I'm concerned with.  
10 They're not looking at, they're not looking at just a  
11 fatigue-weakened structure, and you hit it, it can  
12 snap before you have any cracks.

13           They're not looking at an embrittled  
14 structure, and it can, it can snap well before you  
15 reach the fatigue limit. And they're all synergistic,  
16 and it's not taken into account right now. That's the  
17 concern.

18           So I, you know, I really like the  
19 structure that we're doing now. It's a compliant  
20 structure and I think it has a lot of advantages  
21 because it makes people do things in a consistent way  
22 and you eliminate falling through the cracks with  
23 important things. But it only works with everything  
24 that's on the list. If you have things that aren't on  
25 the list, they're not going to get done. They're not

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1 required to be done and they're not done.

2 And so what I'm concerned about are things  
3 that aren't on the list. That's what I've been trying  
4 to bring.

5 JUDGE WARDWELL: Okay. Let me just make  
6 sure I understand you correctly.

7 You believe, it's your position, is it  
8 not, that a fatigued structure component or the SSC,  
9 a fatigued internal if we're talking about reactor  
10 vessel internals, so we can eliminate -- we can focus  
11 on those, that as it fatigues it may very well have  
12 values that show that it's, for instance if we're  
13 using the CUF as a parameter, which we'll get into in  
14 26 in more depth, below 1, that's still adequate. But  
15 you believe, it's your position that if a shock load  
16 hits it, that could still fail at CUF values below 1;  
17 is that correct? Without any embrittlement.

18 DR. LAHEY: That's correct.

19 JUDGE WARDWELL: Okay.

20 DR. LAHEY: Because there's lots of  
21 micro-cracks in there. It is being weakened. And if  
22 you hit it hard enough it will break. And that's, as  
23 I said, they're doing those systematic fatigue  
24 structure tests for light water reactor sustainability  
25 right now. And they will, they will show this.

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1           And so my concern is somehow we're not  
2 taking this into account in our safety analyses right  
3 now.

4           JUDGE WARDWELL:       Okay.       And then,  
5 likewise, you believe that as the material embrittles,  
6 likewise it will be more susceptible, it will be fine  
7 until a shock load comes in and then that also will  
8 have a -- lose its intended function?

9           DR. LAHEY:   Exactly, Your Honor.

10          JUDGE WARDWELL:   Okay.   And --

11          CHAIRMAN MCDADE:   So if I can before you  
12 move on, I just want to make sure I understand.   When  
13 you talk about neutron embrittlement, in 10 words or  
14 less can you explain exactly what you mean?

15          DR. LAHEY:   Well, it's not just neutron,  
16 it can also be, depending on the material, it can have  
17 a different embrittlement mechanism.   But let's say  
18 you have high energy neutrons that are hitting the  
19 atoms, they're knocking them out of their lattice  
20 position.   And if you go to the end of life for the  
21 period of extended operations, you're talking 75 to  
22 several 100 displacements per atom.   That is, every  
23 atom in the lattice has been knocked out of the  
24 lattice 100 times.

25          So it's a very beat up material.   It

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1 doesn't have the properties of a ductile material  
2 anymore.

3 CHAIRMAN MCDADE: And perhaps I'm not  
4 using the appropriate technical term, but does this  
5 necessarily affect the toughness of the metal?

6 DR. LAHEY: It affects the ductility, the  
7 fracture toughness, you know, the propagation of the  
8 metal; it will propagate cracks easier. It also -- do  
9 you know what the stress-strain curve looks like?

10 CHAIRMAN MCDADE: Yes.

11 DR. LAHEY: Okay. The normal stress  
12 versus strain curve is, you know, goes up to the yield  
13 stress, the element stress. When you irradiate it, it  
14 hardens it. And so it goes into a higher peak but it  
15 can't take much strain. So if you go to a large  
16 enough strain, you're gone.

17 CHAIRMAN MCDADE: Okay.

18 DR. LAHEY: That's the concern.

19 CHAIRMAN MCDADE: Now, when you're talking  
20 about these shock loads, are you talking about shock  
21 loads within the design basis to have this effect or  
22 only shock loads that are beyond the design basis?

23 DR. LAHEY: No, the shock loads can be,  
24 for example, a very severe thermal shock load is a  
25 steam line break, coupled with the scram so you're

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1 really sucking energy out of the system and you're  
2 putting a lot of cold water shock into the core and  
3 hitting those internals hard.

4 Or you could have --

5 CHAIRMAN MCDADE: So you're saying within  
6 design basis?

7 DR. LAHEY: Oh yes. The various accidents  
8 are sufficient to do it, depending on how weakened it  
9 is. I mean as you, as you go on in time it gets more  
10 and more susceptible to these types of failures.

11 CHAIRMAN MCDADE: If I can, just two more  
12 quick questions before I turn it back over to Judge  
13 Wardwell.

14 Can you explain to me, to make sure I  
15 understand, what is irradiation enhanced stress  
16 relaxation?

17 DR. LAHEY: Irradiation enhanced stress  
18 relaxation is if you have a -- as I understand it, if  
19 you have a residual stress in a material and it's  
20 irradiated, that this can relax the stress.

21 CHAIRMAN MCDADE: Okay. And how do you  
22 evaluate the level of embrittlement?

23 DR. LAHEY: How do you evaluate it?

24 CHAIRMAN MCDADE: Yes.

25 DR. LAHEY: Well, you calculate the

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1 fluence. The fluence is the neutron flux, the high  
2 energy neutrons times the time. So you integrate that  
3 for how long you've been running. And then you use  
4 cross-sections, what we call cross-sections to look at  
5 the interaction of the neutrons with the material.  
6 And then from that you can determine the damage and,  
7 therefore, the embrittlement.

8 JUDGE WARDWELL: So we've got the fatigue  
9 that may, may be influenced by thermal. And let me  
10 ask you one question about the shocks.

11 What about normal transience? Do those  
12 provide enough shock to hurt either the -- to fail  
13 either a fatigued member or an embrittled member?

14 DR. LAHEY: Probably you want to wait  
15 until we talk about 26, because I've got a lot of nice  
16 figures to show and talk about all of that. But the  
17 answer is yes, --

18 JUDGE WARDWELL: And this is in your  
19 testimony?

20 DR. LAHEY: -- they can have an effect.

21 JUDGE WARDWELL: And that's in your  
22 testimony on 26?

23 DR. LAHEY: Yes. And I have some nice  
24 visual aids I think will help.

25 JUDGE WARDWELL: And where was I with that

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1 now? Yes, we have the fatigued and we've got the  
2 embrittled. What about the embrittled under a  
3 transient, would that -- is that considered a shock  
4 for embrittled materials, sufficient enough shock?

5 DR. LAHEY: Take two benches and you put  
6 a copper pipe across it and hit it; it will break.

7 Take the same two benches, put a candy  
8 cane across it; it's gone.

9 So, well, I don't know if that translates  
10 into that, into the recording. But if it's brittle it  
11 can't take shock loads because of the way the stress  
12 strains are --

13 JUDGE WARDWELL: So you're concerned about  
14 these vessel internals under normal transience?

15 DR. LAHEY: Yes.

16 JUDGE WARDWELL: I mean operational  
17 transience I should say.

18 DR. LAHEY: Yes. Not every one, but yes.  
19 Some important ones that can lead to loss of a  
20 coolable geometry. See, bottom line for me is, is the  
21 plant safe? That's, that's why I'm involved in all  
22 this; right? And when I look at things --

23 JUDGE WARDWELL: I think we're all here  
24 for that.

25 DR. LAHEY: -- which say it's not for sure

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1 it's safe, I worry about it. And I'd like to see it  
2 on the list. I'd like to see the NRC with on top of  
3 that --

4 JUDGE WARDWELL: What would be "it"? You  
5 said you'd like to see "it" on the list; what is "it"  
6 you want to see on the list? And what list is this?

7 DR. LAHEY: I'd like to break the silos  
8 and have things instead of issue 25, 26 and 38, it's  
9 issue. And the issue is they're all going on  
10 together.

11 JUDGE WARDWELL: Okay. And that's where  
12 your synergism comes in --

13 DR. LAHEY: Exactly.

14 JUDGE WARDWELL: -- is in between fatigue  
15 and embrittlement. Is there anything else in regards  
16 to it?

17 DR. LAHEY: Well, and safety, the safety  
18 analysis.

19 JUDGE WARDWELL: It's the safety analysis  
20 for under fatigue and embrittlement.

21 DR. LAHEY: Right.

22 JUDGE WARDWELL: And you said how it would  
23 affect fatigue and how it would affect embrittlement.  
24 Where does a synergism come in?

25 DR. LAHEY: The synergism has to do with,

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1 for example, if you have an embrittled material --  
2 we're talking about embrittlement now -- and you do a  
3 analysis of fatigue, they don't take it into account  
4 at all until right at the end when it already fails.

5 JUDGE WARDWELL: So you believe it will be  
6 less resistant to fatigue as it embrittles?

7 DR. LAHEY: All the data shows that if you  
8 have low amplitude -- I mean high amplitude/low cycle  
9 fatigue you reduce the cycles for failure and it can  
10 be significant, yes.

11 JUDGE WARDWELL: And what data are you  
12 citing for this?

13 DR. LAHEY: Well, I've cited three or four  
14 references in the, in my testimony. And I've also  
15 cited some of the work that they're doing at Argonne  
16 where the people at Argonne are saying the same thing  
17 really.

18 JUDGE WARDWELL: But could you, you know,  
19 tomorrow focus me towards those specific ones that  
20 you're thinking of --

21 DR. LAHEY: Sure.

22 JUDGE WARDWELL: -- and so to refresh your  
23 memory in regards to where you cite them in your  
24 testimony and --

25 DR. LAHEY: I have them. I could look

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1       them up for you and tell you, yes.

2               JUDGE WARDWELL: Right. I just don't want  
3       to take the time now to do it.

4               DR. LAHEY: Right.

5               JUDGE WARDWELL: And so the synergism  
6       comes in that you think it's worse with a combination  
7       of the two than just the additive of the two effects  
8       in regards to the potential problem?

9               DR. LAHEY: Absolutely. And it's three,  
10       because now once you have that going on, you hit it  
11       with the shock load and that's the concern.

12              JUDGE WARDWELL: Considering you've been  
13       dealing with this for all your career -- and I assume  
14       your career was probably about as long as mine was, so  
15       we can say it might be a fairly long career --

16              DR. LAHEY: Yeah.

17              JUDGE WARDWELL: -- that have you noticed  
18       this effect actually occurring in existing plants?

19              DR. LAHEY: Have I noticed?

20              JUDGE WARDWELL: Of the same age.

21              DR. LAHEY: I think the reason -- well,  
22       that's a very good question, Your Honor. This is  
23       Richard Lahey, so I'm sorry to not identify myself.

24              JUDGE WARDWELL: Well, no, once you get on  
25       you don't have to worry. They've got you.

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1 DR. LAHEY: It's an interesting question  
2 because there have been remarkably few fatigue  
3 failures in nuclear reactors. But it's not accident.  
4 They -- when we designed, I used to be in charge of  
5 safety in thermohydraulics, R&D and reactor physics,  
6 all that at GE. All right. And when we designed  
7 these nuclear reactors we designed them for a certain  
8 life. And we put margin in. And they profited by  
9 that design.

10 So there's no, you know, there's not a lot  
11 of those kind of failures.

12 But if you now start looking at going  
13 beyond what the design life is and start fiddling away  
14 at the margins until you get into really safety  
15 margins, that concerns me a lot. And we'll talk about  
16 that tomorrow I guess.

17 JUDGE WARDWELL: I guess I want to fix  
18 once more, and do you believe that MRP-227 doesn't  
19 look at the systematic effects, the synergistic  
20 effects associated with fatigue and embrittlement? Is  
21 that your position, that the synergistic effects  
22 they're talking about are different than the ones that  
23 you are concerned with?

24 DR. LAHEY: They have certain components  
25 that they're applying that logic to. But it's not

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1 carried over to others because the analyses that are  
2 of concern don't take that into account. They just  
3 don't consider it. That's, that's what I'm worried  
4 about. And they're not considering it. It's a well  
5 done study focused on inspection, so it's sort of like  
6 you detect things after the fact.

7 I'm worried about you don't see anything  
8 and then you have some sort of load that you don't  
9 expect, and all hell breaks loose. That's what I'm  
10 worried about.

11 CHAIRMAN MCDADE: Okay, Dr. Lahey, one  
12 thing. And again, Dr. Wardwell has given you certain  
13 homework to do that he wants to discuss tomorrow. One  
14 of the things I'd like to have you look at overnight:  
15 in the safety evaluation for MRP-227, and that's the  
16 NRC document 115A at page 4, they talk about the  
17 impact of the synergistic contributions from various  
18 factors.

19 And what I'd like to do is have you review  
20 that specifically. And perhaps tomorrow we can talk  
21 about it as of what you think they're missing there.

22 DR. LAHEY: Can I ask, do we have it with  
23 us?

24 MR. SIPOS: Yes, I believe we do.

25 CHAIRMAN MCDADE: Yes, it's NRC-114.

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1 DR. LAHEY: Yeah. I just, I mean I have  
2 mountains of stuff. We've been working on this for  
3 eight years back at the ranch.

4 CHAIRMAN MCDADE: We all have mounds. I'm  
5 sure Mr. Sipos has it. And if not, we can provide it.

6 DR. LAHEY: Okay. Be happy to.

7 MR. SIPOS: More mountains, Your Honor?

8 CHAIRMAN MCDADE: No. Just the 114A.

9 MR. SIPOS: Very good.

10 CHAIRMAN MCDADE: But if you'd like a  
11 mountain, we can give you a mountain.

12 MR. SIPOS: I believe we have it.

13 CHAIRMAN MCDADE: Okay, thank you.

14 JUDGE WARDWELL: I guess I'll turn to  
15 Entergy because that was the testimony I was quoting.

16 Answer 169, page 109, where you state that  
17 "EPRI considered individual or synergistic effects of  
18 thermal aging or neutron irradiation embrittlement and  
19 loss of pre-load due to either individual or  
20 synergistic contributions from thermal and  
21 irradiation-enhanced stress relaxation."

22 Does -- how does that apply to the types  
23 of synergism that Dr. Lahey is bringing up, that being  
24 a synergistic effect between fatigue and  
25 embrittlement?

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1 DR. LOTT: Well, I --

2 JUDGE WARDWELL: Now you can introduce  
3 yourself.

4 DR. LOTT: Yes, I'm sorry. My name is  
5 Randy Lott. I'm here on behalf of Entergy.

6 I don't think that that particular  
7 statement did relate to fatigue --

8 JUDGE WARDWELL: I'm sorry, I can't --  
9 Could you get close to it and try to talk a little  
10 slower because I can't, I can't hear you very well.

11 DR. LOTT: I don't believe that statement  
12 that you read refers particularly to fatigue and  
13 irradiation embrittlement, it related to stress  
14 relaxation, the loss is corroding both.

15 JUDGE WARDWELL: Okay.

16 DR. LOTT: And its impact on the  
17 assumption of the component.

18 In the particular case, and just even  
19 within the screening criteria that was used, whenever  
20 you identified, for instance, a bolt that would be --

21 JUDGE WARDWELL: A what?

22 DR. LOTT: A bolt.

23 JUDGE WARDWELL: Okay.

24 DR. LOTT: A threaded fastener. That is  
25 potentially subject to irradiation such that the load,

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1 the pre-load on the bolt, which is critical to its  
2 function might relax. We took that same component and  
3 we screened it in for concerns about fatigue and  
4 concerns about wear because we felt that with the loss  
5 of pre-load we'd have an impact on the ability of the  
6 component to survive those particular concerns.

7 JUDGE WARDWELL: But can you point me to  
8 where you believe MRP-227 does look at fatigue versus  
9 embrittlement synergistically? And what steps are you  
10 doing within the Aging Management Program to address  
11 the concerns that you just heard Dr. Lahey express?

12 DR. LOTT: First of all, the relationship  
13 that is within the structure of the document to look  
14 at fatigue and embrittlement is that the loss to  
15 fracture toughness limits the size of the crack that  
16 would be acceptable in the component. So when we look  
17 at acceptance criteria for fatigue cracking, it's  
18 based on the ability of the component to withstand the  
19 type of design basis loads that Dr. Lahey just  
20 discussed.

21 In other words, we have not changed our  
22 requirement to survive the design basis load, but if  
23 a component has a fatigue crack, that would degrade --  
24 or decrease the ability to withstand those loads.

25 JUDGE WARDWELL: But how do you address

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1 the potential fatigued member that may not be over its  
2 ultimate resistance just yet but is also embrittled  
3 and then receives such a transient shock that between  
4 the two effects --

5 DR. LOTT: Well, yeah, I'm --

6 JUDGE WARDWELL: -- it now doesn't perform  
7 its intended function?

8 DR. LOTT: Again, I don't know of any  
9 evidence of there being a significant loss in the  
10 ability of a component prior to the initiation or  
11 prior to its exceeding effectively it's CUF equals 1  
12 value of an decreasing ability to withstand loading.

13 So I don't, I don't think we did agree  
14 with the particular statement about fatigue weakening.  
15 We have looked at other things in those data in our  
16 testimony related to the effect of irradiation on  
17 fatigue life. And in general, I think for most of the  
18 irradiated internals you'll find that they operate in  
19 a region where fatigue life is not impacted  
20 significantly by irradiation.

21 JUDGE WARDWELL: And does this mean that  
22 you've had -- there's data in your testimony in  
23 regards to the change in fatigue durability as a  
24 material is brittled?

25 DR. LOTT: I think most of the data that

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1 they were talking about there is probably the same  
2 data that Dr. Lahey just referred to. And I think it  
3 would probably be good for us to discuss that tomorrow  
4 or whenever you want to discuss it. But I don't --  
5 we'd have to pull up the references at this point.

6 JUDGE WARDWELL: You'd have -- what was  
7 the end of that sentence?

8 DR. LOTT: I said I -- unless you want to  
9 pull out the references and begin that discussion now.

10 JUDGE WARDWELL: Between fatigue and the  
11 durability under embrittled materials in regards to  
12 their fatigue strength, are you saying that's part of  
13 26 rather than 25 or?

14 DR. LOTT: Well, I think you just had the  
15 discussion. You asked Dr. Lahey about the impact of  
16 fatigue and irradiation on the life of the component.  
17 And he discussed it with that there was released data  
18 about the fatigue life, the CUF, effective of  
19 allowable number of cycles and strain related to the  
20 irradiation of a component.

21 Again, it's really the fatigue data that's  
22 available that we're talking about.

23 DR. LAHEY: Your Honor, this is the data  
24 you asked me to bring tomorrow, those references.

25 CHAIRMAN MCDADE: And we may get to it

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1 tomorrow. We may get to it after tomorrow, but.

2 DR. LAHEY: Okay.

3 JUDGE WARDWELL: Let me allow Staff to  
4 chime in with any comments they might have just to  
5 complete the loop, I guess, in regards to hearing what  
6 he said in regards to the fatigue durability, if you  
7 will, as the material embrittles.

8 MR. STEVENS: This is Gary Stevens of the  
9 NRC Staff.

10 I'm a little confused by some of the  
11 conversation because I do hear crack initiation,  
12 propagation, embrittlement and Charpy specimens. And  
13 so my response is going to be related to crack  
14 initiation and the CUF types of analyses that are  
15 done. I'm assuming that's kind of where you're going  
16 with your questioning.

17 As Mr. Lott has pointed out, there is not  
18 much data with respect to crack initiation under  
19 irradiated conditions available. The Staff in our  
20 research has looked at a lot of that or what is  
21 available. And generally speaking, in general terms  
22 irradiation tends to increase the mechanical strength  
23 of materials, increases yield strength, ultimate  
24 strength. And those kind of changes tend to increase  
25 the fatigue life of materials.

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1 JUDGE WARDWELL: At all strains?

2 MR. STEVENS: Generally, yes. It's not  
3 always that way. You can see some data where that's  
4 not observed.

5 And one of the things you have to be  
6 careful about, for example, some of the data may be at  
7 high temperature, which is not applicable to the  
8 reactors we're talking about here. So the general  
9 lack of data is inconclusive completely as to what the  
10 effects might be. There's not enough data to evaluate  
11 specifically factors for irradiation.

12 Based on what we've seen, generally we see  
13 an improvement in life. And some of the exhibits  
14 demonstrate that. And we have concluded as of now  
15 there's not enough information for us to say that  
16 there's an effect that isn't covered by the standard  
17 fatigue calculations that are done in accordance with  
18 ASME code.

19 CHAIRMAN MCDADE: Mr. Stevens, as I  
20 understood what Dr. Lahey was saying -- and I may be  
21 wrong, so please correct me if that's the case -- that  
22 it's different with embrittlement reacts differently.  
23 That even if you have a increase in the metal strength  
24 with a constant load, when you have a shock load you  
25 have a lack of ductility -- and I mispronounced that

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1 -- that can cause it to break unexpectedly.

2 Dr. Lahey, is that -- am I correctly  
3 understanding what you were saying?

4 DR. LAHEY: Yeah. A shock load can do  
5 significantly more damage than a static load for a  
6 weakened material, either weakened by fatigue or  
7 embrittled, or a combination.

8 CHAIRMAN MCDADE: And what Mr. Stevens was  
9 saying is that the data indicates that in many  
10 circumstances it's not weakened by the exposure to  
11 neutrons but rather it's actually strengthened. Is  
12 that correct, Mr. Stevens?

13 MR. STEVENS: That's correct. With  
14 respect to crack initiation.

15 CHAIRMAN MCDADE: Okay. Now, does that  
16 matter whether or not the crack initiation is as a  
17 result of a constant pressure or opposed to a shock  
18 load?

19 MR. STEVENS: No, sir. I mean all cyclic  
20 -- constant load would not contribute to fatigue, it  
21 must be a cyclic load. But all cyclic loads in the  
22 design bay or current licensing basis for normal upset  
23 or test conditions must be evaluated for crack  
24 initiation. If the CLB includes, it would include any  
25 kind of shock loads, those would have to be included

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1 in the calculation.

2 CHAIRMAN MCDADE: So you're saying they  
3 are included in the calculation?

4 MR. STEVENS: That's correct.

5 CHAIRMAN MCDADE: It's not just the normal  
6 cycles but all within design basis?

7 MR. STEVENS: Well, okay, so if there are  
8 shock loads that are in the normal upset or test  
9 condition levels specified by ASME code, they would be  
10 included in the fatigue calculation.

11 Some of the events that you're describing  
12 -- and that would include, by the way, some form of  
13 seismic events which would, which would be considered  
14 an upset event, and they would be included in the  
15 calculation.

16 JUDGE WARDWELL: What are those events?  
17 I didn't understand the word you said.

18 MR. STEVENS: Earthquake.

19 JUDGE WARDWELL: Huh?

20 MR. STEVENS: Earthquake.

21 JUDGE WARDWELL: Okay, sorry.

22 MR. STEVENS: There are other events, for  
23 example, some of the local loads and more severe  
24 earthquakes that are considered accident. And the  
25 ASME code requires them to be evaluated but not for

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1 fatigue crack initiation.

2 JUDGE WARDWELL: Okay. Dr. Hiser's body  
3 language sort of suggested that I was wandering off  
4 the path in an erratic fashion. Do you want to --

5 DR. HISER: This is Allen Hiser. I  
6 apologize.

7 JUDGE WARDWELL: -- put me back in the  
8 right direction.

9 DR. HISER: I apologize for that because  
10 I was -- there's, I think there's about three  
11 different topics that are on the table. And it's  
12 untangling them I think is very difficult.

13 What Mr. Stevens was talking about was  
14 effects of irradiation on CUF. And he, I think what  
15 he was saying was that there is minimal effect on CUF.  
16 And in reality it may retard crack initiation as  
17 modeled by CUF. So neutron embrittlement improves the  
18 fatigue life of the component.

19 Now, the shock loads only come into effect  
20 not as a part of the evaluation of CUF, but in terms  
21 of you have a structure in its condition and you, you  
22 subject it to a certain load. From that perspective  
23 you need to consider the effects of the load level on  
24 the condition of the material that exists at that  
25 time.

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1           If it is -- has a CUF of less than 1, the  
2 Staff believes there are no cracks evident in the  
3 structure that could cause failure. If there was a  
4 crack that existed, then one would properly account  
5 for the reduced fracture toughness due to the neutron  
6 embrittlement of the structure.

7           So the shock loads would only come into  
8 play at a point in time. It's an impulse load at a  
9 certain point in time.

10           JUDGE WARDWELL: And does the Aging  
11 Management Plan require analysis of those shock loads  
12 on given vessel internals for materials that have been  
13 embrittled?

14           MR. POEHLER: This is Jeffrey Poehler of  
15 the Staff.

16           The Aging Management Program does not  
17 require that analysis to be performed of embrittled,  
18 basically a crack to an embrittled component. Because  
19 the Aging Management Program is an inspection-based  
20 program so it performs various inspections to provide  
21 reasonable assurance that there are no cracks in the  
22 components. And without a crack you're not going to  
23 get failure even of an embrittled material.

24           CHAIRMAN MCDADE: As a -- the Aging  
25 Management Program does require a demonstration,

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1 right, of functionality, that meets its intended  
2 function. And so is it your statement that the Aging  
3 Management Program doesn't require any calculations to  
4 do that but is relying solely on the inspections to  
5 detect a crack indicative of a potential effect  
6 associated with whatever mechanism caused it?

7 DR. HISER: This is Allen Hiser for the  
8 Staff.

9 The inspections are intended to preserve  
10 the geometry of the materials, in effect no cracks.  
11 The Staff believe that no cracks under design basis  
12 loading conditions that the structure will not fail.

13 If one were to find a crack in one of the  
14 components then one of the evaluation options would be  
15 to look to ensure that that structure with the crack,  
16 with accounting for crack growth during one or more  
17 future cycles, with the embrittled state of the  
18 material -- or actually I won't say embrittled but  
19 with the actual fracture toughness of the material, be  
20 it whatever level of embrittlement it might be, and  
21 you apply the loads and you have to be able to show  
22 that that crack will remain stable.

23 So from that perspective, if you have a  
24 crack you consider the worst case loads that are in  
25 the design basis, you consider the fracture toughness

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1 of the material that exists at that point in time  
2 projected forward -- maybe you project to 60 years  
3 because you want to demonstrate that it's good for the  
4 rest of the license renewal period. Once you can do  
5 that then you have an assessment of whether the crack  
6 is acceptable or not.

7 JUDGE WARDWELL: So if I hear you  
8 correctly, this all hinges on the fact that there has  
9 to be a crack before there's any failure?

10 DR. HISER: My belief is that that is  
11 true. I have not seen evidence of reactor internal  
12 components that has failed without a crack.

13 CHAIRMAN MCDADE: Dr. Lahey, if I could,  
14 as I understood your testimony, you hypothesized that  
15 in embrittled material that is then subject to a shock  
16 load, that you could have a failure even though there  
17 is no discernible cracking prior to that time, no  
18 cracking as far as crack initiation or propagation,  
19 that no visible cracking but highly embrittled  
20 material, that you could have a failure under a shock  
21 load. Is that your theory?

22 DR. LAHEY: Yes. That -- yes.

23 And I would -- can I answer just a few of  
24 these things? So I agree wholeheartedly that we need  
25 more data. All right? But the data set that I'll

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1 bring the reference on shows that for low  
2 amplitude/high frequency fatigue that embrittlement  
3 due to radiation, things are even better. Okay?

4 Because if you look at the stress-strain  
5 curve, you know, you are on the elastic part. But  
6 when you get high amplitude/low cycle fatigue you have  
7 a reduction. Many of the kind of transients we're  
8 talking about when we evaluate life are not high  
9 frequency. They're not flowing vibration, so they're  
10 transients. They're a lower frequency event.

11 Everybody thinks that more data is needed.  
12 So but the focus on surface cracks is what the big  
13 difference is. I --

14 CHAIRMAN MCDADE: Okay. But, Dr. Lahey,  
15 given the fact that these components are primarily  
16 high grade stainless steel --

17 DR. LAHEY: Yes.

18 CHAIRMAN MCDADE: -- is it realistic to  
19 think that you would, without any crack propagation  
20 but simply a shock load could cause failure?

21 DR. LAHEY: Well, let me tell you. Can I  
22 give you just a Gedankenexperiment and we can see if  
23 we agree or not? All right?

24 The Gedankenexperiment which is actually  
25 being done or has been done is you now fatigue the

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1 metal. Forget about irradiation, just fatigue it.  
2 And it gets to a CUFen of .1.

3 And then you do a Charpy test and it has  
4 a certain energy to crack it. And then you --

5 CHAIRMAN MCDADE: And then, excuse me,  
6 what type of test is it? Is that for embrittlement?

7 DR. LAHEY: Just a fatigue test.

8 CHAIRMAN MCDADE: No, but the Charpy test?

9 DR. LAHEY: The Charpy test is to test it,  
10 what's the strength of the material to fracture? All  
11 right? How much does it take to --

12 CHAIRMAN MCDADE: So under embrittlement  
13 then?

14 DR. LAHEY: Or damage. I mean I don't  
15 like to call it embrittlement but metal damage due to  
16 fatigue.

17 So now you go to .5, do the same thing.  
18 Doesn't change much.

19 Now you go to .5. Oh, it's different.

20 .9, a lot less energy needed.

21 .99, bang-o, you know, it's easy to break.

22 So that's the difference. I mean the way  
23 it's being looked at now, nothing happens until you  
24 get to the CUF of 1, until you start to see a surface  
25 crack. What I'm concerned with is well before 1.0 on

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1 CUF. If you hit it hard enough, it will break. And  
2 it doesn't have to have a surface crack.

3 CHAIRMAN MCDADE: Okay. Dr. Hiser, do you  
4 wish to respond?

5 DR. HISER: This is Allen Hiser. I'm not  
6 familiar with any experiment such as that with  
7 austenitic stainless steel, be it with fatigue at  
8 different levels of CUF, be it with neutron  
9 embrittlement or any combination thereof. My belief  
10 is CUF is 1.0 or less, it's very unlikely that you  
11 have a surface crack even in the material.

12 I think your likely incipient to have a  
13 surface crack. Without a surface crack I think you're  
14 unlikely to fail under a shock load or any other kind  
15 of a load that's representative of the kind of  
16 conditions that you'd see in vessel internals for a  
17 PWR plant.

18 DR. LAHEY: Okay, so --

19 JUDGE WARDWELL: I would like to get back  
20 to my question. My question to you was, doesn't your,  
21 doesn't the AMP rely on a surface crack in regards to  
22 any evaluation of embrittlement?

23 DR. HISER: This is Allen Hiser.

24 Yes. That would be when the AMP would  
25 bring into account the neutron embrittlement.

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1 Otherwise the way that neutron embrittlement, thermal  
2 embrittlement are managed in this AMP and in others is  
3 through the detection of cracks.

4 JUDGE WARDWELL: So without a crack those  
5 embrittlements aren't evaluated until a crack occurs?

6 DR. HISER: I think that's correct.

7 JUDGE WARDWELL: And they haven't been  
8 evaluated as part of the AMP that's been submitted and  
9 approved by you; correct?

10 DR. HISER: That's correct.

11 JUDGE WARDWELL: What is to say why -- I  
12 understand that you haven't seen any data to show the  
13 relationship between the Charpy test and fatigue for  
14 stainless steel, but likewise have you seen any tests  
15 that might indicate this potential where the material  
16 after the additional 20 years of the PEO, right before  
17 you're ready to shut down, is so embrittled that  
18 there's no cracks, but it is so embrittled that a  
19 transient could fail it catastrophically?

20 Similar to what I imagine I've experienced  
21 myself with rubber bands holding together a bunch of  
22 envelopes. And after digging up a shoe box 30 years  
23 later I look at it and I go, Oh, that's neat. And I  
24 grab them and the whole rubber band disintegrates.

25 Why couldn't that happen -- and that's the

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1 way I picture what Dr. Lahey is talking about -- what  
2 data do you have that shows that can't happen?

3 DR. HISER: My experience is the same as  
4 yours. I find stuff that's been left away for a  
5 period of time and the rubber band is broken.

6 Stainless is not rubber bands.

7 JUDGE WARDWELL: What data do you have on  
8 the stainless steel? Because, likewise, my rubber  
9 band isn't in the middle of a nuclear reactor. What  
10 evidence do you have that that same type of thing  
11 could not be happening over this period of extended  
12 operation that no one's been through yet that would  
13 make for catastrophic failure without the presence of  
14 a crack initially?

15 DR. HISER: There is data, very high  
16 fluencies, fracture toughness data, that show that the  
17 materials retain ductility. Ductility is all that you  
18 need to resist initiation even of cracks.

19 So if there is no cracks, really the only  
20 failure mechanism that you have is a tensile overload  
21 of the structure. And with a highly embrittled  
22 material, actually the yield strength is increased  
23 quite a bit, so from that perspective the component  
24 has somewhat gotten more resistant to shock loads  
25 because it now can sustain a higher load before it

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1 fails in a tensile section collapse.

2 JUDGE WARDWELL: And but likewise it could  
3 have strained enough within that such that it may not  
4 reach that peak; isn't that correct? Isn't that a  
5 possibility?

6 DR. HISER: If you had, if you had a  
7 crack. And I think fundamentally it comes down to do  
8 you have a crack? If no crack, I believe there is no  
9 impact.

10 JUDGE WARDWELL: And can you get us a cite  
11 for this data that you're talking about that shows  
12 that highly embrittled materials under -- and I'm not  
13 real up to speed on the fluence, but that is a time  
14 relation type of thing, that's just a total amount of  
15 -- that is time related in regards to the magnitude of  
16 the number means it's been under an influence for a  
17 longer period of time?

18 Or is it just the rate at which it is  
19 being bombarded? And if so, have those tests been  
20 performed for to simulate 20 additional years of  
21 operation after the initial 40 years, total 60 years?

22 DR. HISER: The fracture toughness data  
23 normally correlated in terms of fracture toughness is  
24 a function of fluence. And fluence is, it depends on  
25 where you are in the vessel, what the exposure rate

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1 is, things like that.

2 But we can do that for all internal  
3 components.

4 JUDGE WARDWELL: But that relationship  
5 that I heard you talk about in regards to the data was  
6 that you have -- I forgot the words you used to  
7 indicate --

8 DR. HISER: Ductility.

9 JUDGE WARDWELL: What?

10 DR. HISER: Ductility.

11 JUDGE WARDWELL: No, no, I know what  
12 ductility is.

13 DR. HISER: Oh, sorry.

14 JUDGE WARDWELL: Did you use a phrase  
15 embrittlement strength or toughened fracture strength?  
16 Or what's the term you have for embrittlement? You  
17 said, you said you had data relating fluence to what  
18 parameter, other parameter?

19 DR. HISER: Fracture toughness.

20 JUDGE WARDWELL: Fracture toughness, okay.

21 You have data, you believe you have data  
22 related between fluence and fracture toughness. Is  
23 fluence, the fluence parameter is the rate at which  
24 the neutrons are bombarding it? Is that correct? Or  
25 is it the total amount of neutron or --

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1 DR. HISER: Yes. Flux is --

2 JUDGE WARDWELL: -- neutron embom --  
3 attacking it?

4 DR. HISER: Yes. Flux is the rate.  
5 Fluence is the time integrated.

6 JUDGE WARDWELL: That was my question.  
7 Okay.

8 DR. HISER: But again, the level, you  
9 could turn to the spot that I think Jeff will discuss  
10 in terms of -- instead of fluence in terms of time,  
11 but you would have to determine the flux. So it would  
12 depend on where you are in the vessel internals.

13 JUDGE WARDWELL: Sure. And we'll talk  
14 about that with regards to specific components and  
15 where they are, whether they'd be susceptible to it.

16 But given, given there are some internals  
17 that are under high influence -- high fluence, sorry,  
18 in the core; right?

19 DR. HISER: Yes.

20 JUDGE WARDWELL: And again, my question is  
21 I'm interested in that data that somehow comforts one  
22 to believe that a crack is needed prior to  
23 embrittlement failure, for lack of a better term. You  
24 know, rubber band disintegration, the equivalent of it  
25 in my shoe box.

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1 DR. HISER: I would just caution using a  
2 rubber band analogy is off because there's still  
3 ductility. Your rubber band doesn't have ductility  
4 left. That's why, that's why it did break. And my  
5 guess is it probably had cracks in it that ultimately  
6 caused the failure.

7 JUDGE WARDWELL: And that, that lack of  
8 ductility, whether or not it exists with the stainless  
9 steel would be indicated by those tests that you have  
10 that help support that potential -- help support your  
11 hypothesis. Is that a fair assessment?

12 DR. HISER: That's correct.

13 JUDGE WARDWELL: Okay.

14 DR. LOTT: Your Honor, this is Randy Lott  
15 from Entergy.

16 JUDGE WARDWELL: Yes.

17 DR. LOTT: I just wanted to point out that  
18 while the data that Mr. Hiser is offering is quite  
19 valuable in terms of showing that the fracture  
20 toughness is still characterizable in science and  
21 ductility in high fluence, in fact if there's not a  
22 crack there's no way to know the fracture toughness of  
23 the material because it's only used to analyze a crack  
24 component.

25 And I think part of what is protecting us

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1 here from the failures that you're describing, the  
2 unfailed, uncracked component, is really the fact that  
3 the components themselves were designed based on  
4 value, yield stress values and demonstrated in  
5 unirradiated condition that they do not exceed the  
6 stresses that are allowed under the design basis  
7 loads. They will withstand in the unfailed condition  
8 even higher stresses due to the increase in yield  
9 stress without failure.

10 So, again, the fact that you design to the  
11 unirradiated load limits helps protect us. Again, the  
12 magnitude of these shock loads, as Dr. Lahey calls  
13 them, or the local loads or the seismic loads don't  
14 change with time. It's just the ability of the  
15 material to withstand it that we're interested in.

16 JUDGE WARDWELL: Thank you, Dr. Lott.

17 If I could go back to Dr. Lahey, I did  
18 stop you from speaking because I was on a --

19 CHAIRMAN MCDADE: Before you do, could I  
20 just say one thing?

21 A suggestion. We're sort of going back  
22 and forth here among the various witnesses. And a  
23 witness may say ten things, eight of which the other  
24 witnesses agree with. But then by the time we get  
25 back to them they're only going to discuss one of the

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1 two things they disagree with.

2 So I don't know if you want to, you know,  
3 as the other witnesses are testifying, to jot down a  
4 note I you want to get back to it. I find little note  
5 cards handy to just jot things down to remind me that,  
6 yeah, let me go back to that. If anyone wants to,  
7 I've got plenty of extra note cards.

8 But anyway, I know it's, it is challenging  
9 to follow back and forth from my standpoint of exactly  
10 what is being said to who. And, you know, to the  
11 degree there is a disagreement, that might be helpful  
12 to draw your attention back to it.

13 Judge Wardwell, please.

14 JUDGE WARDWELL: Which is a good segue  
15 into when I interrupted you, Dr. Lahey, or I started  
16 asking questions as you were starting to speak just  
17 before we started this discussion about embrittlement.  
18 If you remember what that was you wanted to say,  
19 proceed with it. If not, or even if you do after you  
20 get done with that, then I would appreciate your  
21 comments on any tests you've seen in regard to  
22 fracture toughness versus fluence.

23 DR. LAHEY: Okay. The last remark I guess  
24 is a good way to start. And, you know, I didn't draw  
25 it but I did the professor thing in the air with the

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1 stress-strain. And as it gets hardened, now it moves  
2 up like that and the yield strength and the ultimate  
3 stress gets higher, no doubt as long as you're in that  
4 range with a low strain things are better.

5 That's why low amplitude/high frequency  
6 experiments are better, even if it's irradiated, in  
7 terms of failure, crack initiation.

8 If you have a large load, though, and you  
9 go beyond, you know, beyond the ultimate strength with  
10 a high enough strain, it's gone. All right? So it's  
11 not true that things are good once it's highly  
12 embrittled. It depends a lot on what the, what the  
13 strain is, what the amplitude of it is.

14 And if you have a very large shock -- can  
15 I get you to show this now? Because he said he could  
16 project it. Because if you -- I mean I can't really  
17 draw it with my finger very well. I'm sorry. I tried  
18 and it's too, too ugly.

19 But if you have --

20 JUDGE WARDWELL: This is nothing more.  
21 Let me look at it first before.

22 DR. LAHEY: It's something you would say  
23 simple spring mass system and showing an impulsive  
24 load, what happens?

25 Well, anybody who's ever had a course in

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1 differential equations, this is an equation you saw,  
2 and that any undergraduate student gets.

3 JUDGE WARDWELL: It's how the --

4 DR. LAHEY: It's what the amplitude --

5 JUDGE WARDWELL: It's the compressibility  
6 of organic soils with fiber decomposition, in case  
7 you're ever interested.

8 DR. LAHEY: Okay. And the way we, the way  
9 we model elasticity, there's a bunch of them, or  
10 plasticity.

11 MS. SUTTON: Your Honor, Kathryn Sutton  
12 for the Applicant. What are we about to look at?

13 JUDGE WARDWELL: At the moment, Ms.  
14 Sutton, I haven't the slightest idea.

15 MS. SUTTON: Nor do our experts, Your  
16 Honor.

17 CHAIRMAN MCDADE: But what we are going to  
18 do, I believe Dr. Lahey feels that this diagram will  
19 --

20 DR. LAHEY: You know, help them understand  
21 what I'm trying --

22 CHAIRMAN MCDADE: -- help to explain  
23 better, you know, the point that he's trying to make.  
24 It will be marked as an exhibit for identification.

25 What is the next New York exhibit, Mr.

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1 Sipos?

2 MR. SIPOS: I'm at 82. I believe it's  
3 582. I'll double check, Your Honor.

4 CHAIRMAN MCDADE: Okay. So but when we're  
5 done we'll mark it as a -- it's a demonstrative  
6 exhibit. It's not received into evidence. It's the  
7 testimony of Dr. Lahey that we're receiving as  
8 evidence --

9 DR. LAHEY: Fine.

10 CHAIRMAN MCDADE: -- and but it will be an  
11 exhibit for identification and part of the record in  
12 that regard.

13 MR. HARRIS: Your Honor, could the Staff  
14 at least request some copies of it so that we could,  
15 you know, have a chance to evaluate it? Because if it  
16 only shows up here right now, the witnesses may not  
17 have a chance to review it, you know, in full detail.

18 CHAIRMAN MCDADE: What we're going to do  
19 right now, Mr. Welkie is going to put it up. We will  
20 then capture it electronically. And then we can give  
21 everybody as many autographed copies as they want.

22 DR. LAHEY: Believe me, it's not suitable  
23 for framing.

24 MR. KUYLER: Your Honor, Ray Kuyler for  
25 Entergy.

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1           Entergy would like to note it's objection  
2 to the use of this. This certainly could have been  
3 provided in previous testimony.

4           CHAIRMAN MCDADE: Well, we don't know yet.  
5 I mean it's Dr. Lahey is indicating that this will  
6 help him explain his answer to a question that has  
7 been posed to him. And maybe it will and maybe it  
8 won't. But again, it's the testimony of Dr. Lahey  
9 that we're going to be evaluating.

10           DR. LAHEY: Yes, I mean if it's hard to  
11 show then we'll -- I'll try to draw it with my finger.  
12 But, oh, look at that.

13           Can you all see it? Bring it down a  
14 little if you will. All right, so just a little more.  
15 So bring it down a little bit. All right.

16           So what this is is the second order spring  
17 mass dashpot system. So as I say, anybody who's an  
18 engineer solved this equation at one point in their  
19 life. It's the second order ordinary differential  
20 equation. It's  $F$  equals  $ma$ .

21           And so what you're doing is you have the  
22 mass of the structure. All right? And then you have  
23 a force on it. And so now I'm going to hit it with a  
24 impulsive force. I could either do it delta function,  
25 but I'm going to do a step change just so you see

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1 where it goes.

2 The spring has to do with the elasticity  
3 of the metal. The dashpot has to do with the damping.

4 So if you hit it at time equals 0 with a  
5 force, then what will happen if you, if you look at X  
6 which is the position of the thing, the mass that  
7 you're modeling, versus time, at first it will, it  
8 will go up. And then I would assume it's under  
9 damped, so it will oscillate a bit, and then it will  
10 go to the steady state value which is F over the mass  
11 times the natural frequency squared.

12 So that's what a static load would be.  
13 That's where you would be.

14 But if you hit an impulsive one, you go  
15 way higher. You go much higher. So the strain, the  
16 amplitude is high. And if you're high enough in  
17 amplitude you can fracture your material.

18 If it's highly weakened, either by  
19 irradiation, by thermal embrittlement, by fatigue,  
20 anything that weakens that material, if it's weak  
21 enough you can break it.

22 And that's, that's all I was trying to  
23 say. So it's not true that if you harden it, which it  
24 will harden by irradiation, that everything is good.  
25 Because it depends on what the amplitude is of the

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1 load that you're hitting it with.

2 Notice the load. The amplitude is small  
3 relative to the peak. All right? The steady state  
4 amplitude. And that, unfortunately, all the analyses  
5 that I've seen from the last seven years of this stuff  
6 is they're doing steady state kind of loading. Any  
7 time they do accidents they implicitly assume intact  
8 geometry and don't, don't really take into account the  
9 degradation of the material itself.

10 So that's all I was trying to show.

11 JUDGE KENNEDY: Dr. Lahey, this is Judge  
12 Kennedy.

13 I'm trying to get a handle on this  
14 impulsive loading. I guess if you pick the right load  
15 you'll break anything. How do you tie this load into  
16 the types of loads that are of concern at Indian  
17 Point? I mean are you suggesting they're using the  
18 wrong loads?

19 DR. LAHEY: It depends on what causes the  
20 load. For instance, if it's a very severe earthquake  
21 and you have a structure and all of a sudden, pang,  
22 you hit it hard you can create this kind of  
23 phenomenon. You will overpower the ability of the  
24 metal to withstand the load.

25 If it's a local load, you know --

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1 JUDGE KENNEDY: I guess that's what I'm  
2 struggling with. It sounds like you get to pick the  
3 load. And I think there's -- presume there's a set of  
4 rules of engagement here that goes with the design of  
5 this facility. And I'm trying to get to the bottom of  
6 are you suggesting that Entergy is not using the  
7 appropriate loads?

8 DR. LAHEY: No.

9 JUDGE KENNEDY: Or are you suggesting  
10 there are loads out there that they need to consider?

11 JUDGE KENNEDY: Your Honor, I believe that  
12 their safety evaluations consider the various loads,  
13 the various accident type loads. And their seismic  
14 analysis takes into account those type of loads.

15 What's not done though is the effect of  
16 that on a highly degraded material. I've never seen  
17 anything that looks, that looks at the effect of the  
18 significant shock loads on a degraded material and  
19 what happens after that.

20 JUDGE KENNEDY: When the NRC Staff was  
21 discussing the ASME code loads, upset conditions and  
22 accident conditions, those loads are different than  
23 the ones you're speaking of?

24 DR. LAHEY: The type of loads that I heard  
25 them talking about were the normal -- when we were

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1 talking about the FSAR, for example --

2 JUDGE KENNEDY: FSAR?

3 DR. LAHEY: -- they were the normal local  
4 loads. And I assume then they also would talk about  
5 the seismic loads, yes.

6 JUDGE KENNEDY: So is there yet another  
7 set of loads that you think needs to be considered  
8 here that aren't currently being considered?

9 DR. LAHEY: No. My concern is that the  
10 integrity of the various structures, the internals,  
11 the bolts for example, the baffle bolts, when you  
12 apply significant shock loads to them they don't look  
13 at the degradation of the material. That's what I'm  
14 concerned with.

15 JUDGE KENNEDY: This, this takes us back  
16 to the cracking discussion, doesn't it? Or does it?

17 DR. LAHEY: Well, I, I'm --

18 JUDGE KENNEDY: Because I hear they  
19 consider it.

20 DR. LAHEY: Yeah. But I'm absolutely sure  
21 you can fail structures without a crack. If you hit  
22 it hard enough you'll fail a structure.

23 JUDGE KENNEDY: I don't think anyone here  
24 will dispute that if you get to pick the load and it  
25 has no basis in anything within the design of this

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1 plant you can probably break it. I think my concern  
2 is that Entergy, the Staff are playing within a  
3 certain set of boundaries --

4 DR. LAHEY: Right.

5 JUDGE KENNEDY: -- and the only thing I'm  
6 trying to get to is are you suggesting that there is  
7 something wrong with that boundary?

8 DR. LAHEY: The loads are fine with me.  
9 All right? The effect of the loads is what I'm  
10 concerned with.

11 JUDGE KENNEDY: Okay.

12 JUDGE WARDWELL: So by that do you mean  
13 it's -- you agree that they have incorporated the  
14 loads that should be incorporated into this analysis  
15 of any of the vessel internals?

16 DR. LAHEY: The safety analysis reports  
17 that I looked at for Indian Point look like they do  
18 all the normal accident evaluations, and similarly  
19 with the seismic. I'm not sure about the new seismic  
20 criteria now. As you may know, that has changed since  
21 the recent earthquake a few years ago. But definitely  
22 they look at that event as well.

23 JUDGE WARDWELL: And it's your position  
24 that it's the application of those loads, it's the way  
25 they apply those loads to the materials and what they

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1 -- excuse me -- consider for their resistance that is  
2 of the issue?

3 DR. LAHEY: Do they consider the  
4 degradation of the material to these type of loads?  
5 And I have seen no evidence that that has occurred.

6 CHAIRMAN MCDADE: And how would they do  
7 that?

8 DR. LAHEY: How would you do it?

9 CHAIRMAN MCDADE: Yes.

10 DR. LAHEY: You put, you put the force on  
11 the body and then you have the material properties in  
12 terms of if it's brittle or not or fatigued or not.  
13 And then see, see if it can withstand it.

14 JUDGE WARDWELL: Isn't that the lack of  
15 data you understand isn't available?

16 DR. LAHEY: One of the problems is there's  
17 not enough data to know for sure. But there's enough  
18 data to know that there can be an effect. So normally  
19 you would, because of uncertainty you would put some  
20 sort of uncertainty factor there on their cycles to  
21 failure, until you know for sure.

22 So some of these things are going to be  
23 done. As I said, the light water reactors'  
24 sustainability program is going to supply the fatigue  
25 stuff.

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1           With the embrittlement it's a much more  
2 lengthy process. There's only one place in the  
3 country you can do that. That's in Idaho in their hot  
4 cells. And it's a very long, expensive iterative  
5 process. But eventually we will have all that data.

6           JUDGE WARDWELL: But lacking that, what  
7 else would you suggest they do at this point?

8           DR. LAHEY: I would not suggest --

9           JUDGE WARDWELL: Shut down until that's  
10 done?

11          DR. LAHEY: No. I, I would not suggest  
12 you just press on. I mean that's basically what,  
13 what's being done.

14          I would suggest, and I've gotten a lot of  
15 kickback on the suggestion, that some of these things  
16 are easy to fix. You just repair them. It's not a  
17 big ticket in the scheme of things. You get rid of  
18 the problem and don't worry about it because there's  
19 certain things you'll see tomorrow when we talk about  
20 CUFen that are right on the ragged edge and there's  
21 others that aren't.

22          And similarly in core, you have stuff that  
23 is highly embrittled and stuff that's not.

24          So nobody's talking about replace  
25 everything. But the key things, get rid of the

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1 problem. That's my suggestion.

2 JUDGE WARDWELL: Let me just turn to we'll  
3 start with Dr. Lott and see if he has any other  
4 comments that he might want to make in regards to what  
5 could be done at this point in regards to addressing  
6 the lack of the application of the correct loads that  
7 you had been doing to materials that are both  
8 embrittled and fatigued.

9 DR. LOTT: I'm not sure I fully understood  
10 all of the things that were just said.

11 JUDGE WARDWELL: I was counting on you to  
12 sort them all out.

13 DR. LOTT: I think that as was said  
14 before, we're not here arguing about the loads that  
15 are applied to the components. I think that's part of  
16 the current licensing basis. And I think a lot of  
17 what we discussed about how impulse loads and all that  
18 are already dealt with within our current process.

19 So we're not talking about that. What  
20 we're talking about, the ability of the component to  
21 withstand those loads and how that may be improved or  
22 degraded over the life of the component.

23 Again, as I understand it we're talking  
24 about -- we talk about irradiation embrittlement in  
25 broad terms as a bunch of different phenomena.

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1 Because it's true, it increases yield stress, it  
2 increases the ultimate stress. It decreases the  
3 ductility, how much stretch there is in the material  
4 before it fails.

5 Our point with respect --

6 JUDGE WARDWELL: Does it fail at lower  
7 strains or higher strains or does it vary based on?

8 DR. LOTT: Well, again, that's a -- you  
9 need to look at the true stress-strain curve I guess  
10 to actually answer that question. What happens in a  
11 normal tensile bar when you pull it under these  
12 conditions is it's a great deal of strain  
13 localization.

14 So while you might see a normal stainless  
15 steel provide a long, gradual necking process to it,  
16 this steel is kind of localized with a very sharp  
17 neck. And so they do have in an engineering  
18 stress-strain curve exactly the behavior that Dr.  
19 Lahey described: a large increase in the yield stress  
20 and the ultimate stress. And limited amount of  
21 uniform elongation. And then some amount of  
22 additional deformation to failure.

23 That's typical of highly irradiated  
24 materials.

25 There's a bunch of things I guess I'd like

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1 to say. Let me just point out to you that not all of  
2 the materials, even in the internals, are highly  
3 irradiated. These very high fluences we're discussing  
4 are pretty much limited to the baffle former and  
5 baffle former bolts. And we can talk about that in  
6 the future, too, if we need to.

7 So it does not affect a wide range of the  
8 components there.

9 Again, I think we need to be careful about  
10 this whole discussion of, of what, you know, I don't  
11 know of a phenomena called irradiation weakening. I  
12 know of irradiation-induced decrease in fracture  
13 toughness which, as I said, decreases the ability to  
14 maintain its dimensional stability, whether in part to  
15 withstand fracture or at least the initiation of a  
16 crack, crack, form a crack.

17 The only, only time that comes into place  
18 is when you have a crack in the component, the  
19 fracture toughness that is decreased. And I do not  
20 believe any of these components are designed to  
21 undergo large strains in the normal application.  
22 They're not deformed, they're just not deformed that  
23 way so they're never going to fail by these other  
24 brittle mechanisms.

25 There may be more to that question. I am

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1 not sure what all was implied by it.

2 MR. STROSNIDER: This is Jeff Strosnider  
3 from Entergy.

4 I'd like to add something to this on the  
5 notion of this failure of a component without a crack.

6 JUDGE WARDWELL: Okay, please do.

7 MR. STROSNIDER: So I think the first  
8 thing to recognize is that if there's no fracture in  
9 it, then the fracture toughness is out of the picture.  
10 What's dominating the failure mechanism is the  
11 strength.

12 And as was explained, when these materials  
13 are irradiated the strength goes up. Right? So if  
14 these components could withstand the design basis  
15 loads when they were originally designed under their  
16 original condition without any embrittlement, and it's  
17 governed by strength, when the strength goes up  
18 they're going, they're still going to withstand those  
19 loads. In fact, their load carrying capacity is  
20 increased.

21 So just logically you would conclude that  
22 they still meet the current licensing basis loads,  
23 which we said include the dynamic factors, et cetera.

24 Now, what's being confused here is when  
25 they do fail, right -- and this actually Judge Kennedy

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1 was touching on this with his question earlier -- if  
2 you hit it with big enough a load, if you were to take  
3 it to a load higher than the design basis load and  
4 fail it when it's been embrittled, it will show less  
5 ductility than if it were not embrittled. But you  
6 still have to get to that load that's higher than the  
7 design basis loads in order for that to happen.

8 And oh, by the way, none of these  
9 materials are going to fail like a candy cane. And  
10 when you look at the data that's been discussed in  
11 terms of fracture toughness -- and I think people have  
12 talked about getting to that tomorrow -- you're going  
13 to see that they still have ductility. Right?

14 Now, let's take the other situation where  
15 you actually have a crack. All right? And as was  
16 explained, in the Aging Management Program if you find  
17 a crack then you will, you could, in fact a crack in  
18 embrittled material will reduce the load bearing  
19 capability. So you have to do an analysis considering  
20 what level the fracture toughness is at because that  
21 now governs failure. And you have to determine if  
22 that crack can be left in service and for how long.

23 There's one other thing I want to add to  
24 that is that there are analyses that have been done to  
25 look at the critical flaw sizes, critical crack

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1 lengths in these components when they're irradiated.  
2 They're much larger than the crack sizes that can be  
3 determined with the inspection methods they're using.  
4 And that's the other piece that you didn't get to but  
5 that's an important part of this.

6 JUDGE WARDWELL: Yeah, we'll be talking  
7 about inspection tomorrow. Yes.

8 MR. STROSNIDER: Yeah, so you'll get  
9 there.

10 But the point is none of these materials  
11 are going to, going to fail. Even with the crack in  
12 it, it's not going to fail like the candy cane. It  
13 will still field ductility. That's why they're using  
14 an elastic plastic fracture mechanics analysis method  
15 in these cases.

16 And if you look at it without a crack,  
17 it's load bearing capability goes up. So the only  
18 logical conclusion is that it's going to withstand the  
19 design basis loads as it did when it was originally  
20 designed.

21 JUDGE WARDWELL: But doesn't its ductility  
22 drop drastically with age?

23 MR. GRIESBACH: Your Honor.

24 MR. STROSNIDER: When it fails it will  
25 show less, less ductility. And this is you could look

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1 at it. I mean if you use undergraduate testing of a  
2 uni-axle tensile bar, if you take low strength and  
3 high strength materials, the more ductile one will  
4 show more, more necking, more elongation.

5 The one that's the higher strength which  
6 has less ductility will not show as much necking and  
7 it may, it may fail with a flat fracture. But it's  
8 not going to shatter, not these materials.

9 MR. GRIESBACH: Your Honor, this is Tim  
10 Griesbach for Entergy.

11 I think we should point out that --

12 JUDGE WARDWELL: I've got a follow-up  
13 question. And I'm going to forget it if I don't ask  
14 it. In fact, I may have forgotten it already. And  
15 that's why I don't like interruptions if I can avoid  
16 them because it prevents us from getting the answers  
17 we need to make a decision.

18 CHAIRMAN MCDADE: Jot it down and we'll  
19 get back to you.

20 JUDGE WARDWELL: Yeah, that's the way to  
21 do it. Except you might as well say it now because  
22 now I've forgotten what I was going to follow up on.

23 Go ahead.

24 CHAIRMAN MCDADE: Now he's forgotten what  
25 he was going to say.

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1 MR. GRIESBACH: Thank you.

2 JUDGE WARDWELL: You may go ahead now that  
3 I've forgotten what I wanted to say. But I want to  
4 point out that's why I want to minimize the  
5 interruptions because when I've got a follow-up  
6 question that I had for your compadre there --

7 MR. GRIESBACH: Okay.

8 JUDGE WARDWELL: -- it was right on point  
9 to what he had said. And now it's not on point  
10 anymore. It's been axed from this hearing.

11 So proceed.

12 MR. GRIESBACH: What I think we really  
13 would like to point out, though, is the materials that  
14 we're talking about are austenitic stainless steels  
15 for the most part. They're, they're face center  
16 cubic, which means they have much more ductility than  
17 the type of ferritic steels that tend to undergo a  
18 ductile to brittle transition and can be brittle.

19 So these types of materials don't  
20 experience that type of brittle fracture. Even in the  
21 irradiated condition they still have much ductility  
22 and strength, as we've talked about, and wouldn't fail  
23 in that brittle manner as some people have pointed out  
24 here.

25 So I think we need to keep that in mind.

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1 And the data that we can show you tomorrow will point  
2 that out as well.

3 JUDGE WARDWELL: And we will be able to  
4 see from that data highly embrittled type of results  
5 that might be indicative of what it would be like in  
6 the reactor after 60 years of operation?

7 MR. GRIESBACH: The levels of fluence in  
8 the test data is representative of exposure for a  
9 significant period of time in PWR reactors, yes.

10 JUDGE WARDWELL: Great.

11 MR. COX: Just one clarifying comment on  
12 that. That the highly, the term "highly embrittled"  
13 --

14 JUDGE WARDWELL: And this is Mr. Cox;  
15 correct?

16 MR. COX: That's correct. This is Allen  
17 Cox with Entergy.

18 When you say "highly embrittled" that's  
19 one of those words that ends with "l-y" and it could  
20 have a number of meanings. What Mr. Griesbach said is  
21 that we'll have data that's based on the fluence  
22 that's experienced at the end of 60 years. That does  
23 not necessarily equate to highly embrittled or highly  
24 irradiated.

25 JUDGE WARDWELL: I stand corrected. The

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1 embrittlement that does occur after 60 years, however  
2 it is. I won't pre-judge that.

3 I think I remember the question I was  
4 going to ask. So the various internals -- and if  
5 you're not the person to address it to, then fine,  
6 then any of your compadres can pick up on it either,  
7 also. But you made me think of it.

8 Not all internals are under a tension  
9 load; correct? With normal operations or with shock  
10 loads they're going to be under different types of  
11 load applications?

12 MR. STROSNIDER: This is Jack Strosnider  
13 for Entergy.

14 That's true.

15 JUDGE WARDWELL: And so how is that taken  
16 into effect, because one component may be very  
17 sensitive to corrosional activity based on where it is  
18 and how it may perform. And another would be under  
19 compression, another under shear, another under  
20 bending, another under tension. How is that addressed  
21 in any manner or?

22 Well, no. In fact let me rephrase that.  
23 Really that isn't addressed in your AMP because you  
24 don't, you do not evaluate anything until you see a  
25 crack based on this inspection-based AMP; is that

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1 correct?

2 MR. STROSNIDER: So this is Jack  
3 Strosnider for Entergy. And some of my colleagues  
4 here may be able to get into more detail.

5 But, again, I think if you look at this  
6 logically, when the internals were designed, right,  
7 they were designed to the ASME code section 3. They  
8 were designed to stay in the elastic range. Right?  
9 And various loadings, whether they be compressive or  
10 torsional or thermal, whatever was driving them, they  
11 were included in that original design. And they  
12 haven't changed.

13 Under the license removal you're assessing  
14 the same loads that were in the original design. So  
15 whatever those loads were, they're still there.  
16 They're the same. And what's done in the analysis in  
17 the MRP-227 is to use the design basis loads.

18 So that's the big picture answer. And I  
19 don't know if there's any more detail to add to that.  
20 I think I need to turn --

21 CHAIRMAN MCDADE: It's not that the loads  
22 are different, it's that the ability of the metal to  
23 withstand the loads is different based on  
24 embrittlement and other aging mechanisms. That's what  
25 Dr. Lahey's thesis says.

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1 MR. STROSNIDER: Well, Jack Strosnider for  
2 Entergy.

3 And just what I was trying to explain  
4 earlier is let's take two cases. If there's no crack  
5 in the component, you put the same loads on it and  
6 because it's been embrittled, all right, its strength  
7 has gone up and that's --

8 CHAIRMAN MCDADE: But ductility has gone  
9 down?

10 MR. STROSNIDER: Yeah. So you have to get  
11 to high enough a load to fail it, all right, before  
12 you're going to see that, that impacted ductility.  
13 And this was the question that I mentioned earlier  
14 that Judge Kennedy brought up is, sure, if you hit it  
15 with high enough a load it will fail. But we're not  
16 talking about unlimited loads here, we're talking  
17 about loads that are within the design basis.

18 CHAIRMAN MCDADE: But isn't what Dr. Lahey  
19 is suggesting is that there's a lack of data to show  
20 the effect of the same loads, these loads that it's  
21 undergone for the past 40 years, that those loads will  
22 not affect the particular item differently because of  
23 the embrittlement and other aging mechanisms and that  
24 there's a lack of data to demonstrate where the  
25 cut-off line is? Is that data available?

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1 MR. STROSNIDER: Jack Strosnider for  
2 Entergy.

3 What I would suggest -- and again my  
4 colleagues can maybe expand on this -- but if you want  
5 to see the impact of embrittlement on the parameter  
6 that controls failure, which is the yield strength,  
7 the yield or the ultimate strength, all you've got to  
8 do is look at the tensile test results. It goes up.

9 There's lots of tensile tests out there.  
10 All right? And, you know, that's how we know that  
11 these tensile properties the strength improves, the  
12 strength gets brighter when you irradiate the  
13 material.

14 JUDGE WARDWELL: And is it your position  
15 that the torsional strength and the compressive  
16 strength and the shear strength and the bending  
17 strength also go up? And does the data support that?

18 MR. STROSNIDER: My colleague has a  
19 response.

20 MR. GRIESBACH: Various different --

21 JUDGE WARDWELL: And to who are we --

22 MR. GRIESBACH: This is Tim Griesbach for  
23 Entergy.

24 JUDGE WARDWELL: Thank you.

25 MR. GRIESBACH: You're suggesting that

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1 various combinations of loading, be it tension,  
2 torsion, bending, those are all still dependent on the  
3 maximum tensile stress or flow stress to reach  
4 failure. So, yes, that would go up under various  
5 different load combinations without the presence of a  
6 crack.

7 JUDGE WARDWELL: Okay, thank you.

8 DR. LAHEY: Can I say? I think --

9 JUDGE WARDWELL: Pardon?

10 CHAIRMAN MCDADE: Before that I think we  
11 ought to go to Staff.

12 JUDGE WARDWELL: Okay.

13 DR. LAHEY: You'd summarized my feeling  
14 exactly.

15 CHAIRMAN MCDADE: Hold it for one minute  
16 and we'll get back to you.

17 JUDGE WARDWELL: Unless it's something  
18 really quick.

19 DR. LAHEY: No, I just agreed, if that's  
20 okay, that the essence of the --

21 CHAIRMAN MCDADE: We always have time for  
22 that.

23 JUDGE WARDWELL: Yes.

24 DR. LAHEY: It's just the difference has  
25 to do with what's the integrity of the metal, given

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1 those loads. And the problem is how to quantify it  
2 because of the lack of data.

3 The only data, if it's available, suggests  
4 these effects. But there's not enough to quantify it?  
5 So then what do you do? I mean how -- do you just  
6 press on? Or how do you --

7 JUDGE WARDWELL: So let me make sure I  
8 understand what you're saying. You agree with Entergy  
9 that if the tensile strength goes up then likewise all  
10 the other types of strengths will also go up with  
11 irradiation? Is that what you were saying?

12 DR. LAHEY: The ductility goes down.

13 JUDGE WARDWELL: Ductility goes down but  
14 the strength will go up.

15 DR. LAHEY: It has to do -- it's not just  
16 strength, it's amplitude. You have to look at --

17 JUDGE WARDWELL: Right. But you agree  
18 with that?

19 DR. LAHEY: Yes, of course.

20 JUDGE WARDWELL: Okay, that's good. Thank  
21 you.

22 DR. LAHEY: Sure.

23 JUDGE WARDWELL: Staff, do you have any  
24 comments on what we've talked about the last 10, 15  
25 minutes? The same question I asked Dr. Lott. And I

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1 forgot what that was. But you must know if you've got  
2 some burning thoughts in your mind that you've jotted  
3 down.

4 And this will probably pretty much finish  
5 us for the, yeah, for the evening. It will.

6 DR. HISER: This is Allen Hiser. Then I  
7 think Gary Stevens has something he would like to add.

8 I think the, what I articulated maybe 30  
9 minutes ago was: no crack, no problem. And I think  
10 that's the case. If the loads don't change, the  
11 ability of the material, even if the ductility drops,  
12 is unchanged. It still will perform its intended  
13 functions. And that's what we're here to assess.

14 The ductility decrease becomes important  
15 if a crack is found. If they find a crack they would  
16 have to do -- take corrective actions. It will either  
17 be repair, replacement or they would try to use an  
18 engineering evaluation to demonstrate acceptability.  
19 In that case they would have to consider the true  
20 state of the materials in terms of the embrittlement.

21 So from that perspective, the ductility  
22 may decrease but it really is not significant until  
23 there's a crack in place.

24 MR. STEVENS: This is Gary Stevens of the  
25 Staff.

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1 I made a bunch of notes as everybody was  
2 talking. And then Mr. Strosnider and Dr. Hiser talked  
3 and a lot of my notes went away. But sometimes if I  
4 say something differently maybe it will have an  
5 impact.

6 I think the point is that a structure  
7 behaves differently if a crack is present or it's not.  
8 And how it behaves is measured by different things.  
9 If a crack is present, where failure might be an  
10 outcome, things like fracture toughness and  
11 embrittlement and those kinds of things are important.

12 And in those kinds of evaluations -- and  
13 my colleagues who are more intimately familiar with  
14 them or PT-27 can say -- but the acceptance, the  
15 acceptance criteria that's in there and the evaluation  
16 procedures that are done take into account reductions  
17 in toughness, increases in crack propagation due to  
18 embrittlement. It's factored into those analyses.

19 When a crack is not present, and we look  
20 at crack initiation, as you've heard and I think most  
21 of the parties have agreed, that irradiation tends to  
22 increase the strength of the material. And if it was  
23 okay in the design and the strength goes up, it's okay  
24 under irradiated conditions. If the figure represents  
25 a load that was defined in the CLB, then it was

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1 evaluated.

2 And I think you also had a question, Judge  
3 Wardwell, on data. And I think we have a couple  
4 different things. There might be some data related to  
5 crack propagation.

6 With respect to crack initiation, one of  
7 the exhibits, I don't remember the number but it was  
8 I think a New York State exhibit for NUREG CR 6909  
9 Rev. 1, that was actually a draft document, section  
10 1.3 of that document discussed irradiation on crack  
11 initiation, the available data and what the Staff  
12 research and interpretation of that data has to say.

13 And that's when I discussed earlier of  
14 there not being a lot of data, and from our  
15 perspective the effects we don't think are  
16 significant, and a lot of our guidance equally applies  
17 to irradiated conditions, it was with respect to crack  
18 initiation.

19 That's all.

20 JUDGE WARDWELL: Thank you.

21 CHAIRMAN MCDADE: Is this a good place to  
22 break? Okay, I think this may be a good place to  
23 break for this evening. I would propose to come back  
24 tomorrow at 8:30 in the morning.

25 Does anybody have any administrative

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1 matters to take up before we break?

2 MR. HARRIS: No, Your Honor.

3 CHAIRMAN MCDADE: Entergy?

4 MR. KUYLER: No, Your Honor. Your Honor,  
5 did you say 8:30 or 8:00 tomorrow morning?

6 CHAIRMAN MCDADE: 8:30.

7 MR. KUYLER: Thank you, Your Honor.

8 CHAIRMAN MCDADE: Mr. Kuyler.

9 MR. SIPOS: One matter. I'm not sure if  
10 this is on.

11 One matter, Your Honor. At the outset  
12 today the Board did issue a ruling on the State's  
13 pending motion concerning the withdrawal of  
14 designations for confidential business information.  
15 And the State is concerned or renews its request that  
16 the Board consider redactions as well.

17 I don't know that that was addressed. I  
18 just wanted that on the record so that it's absolutely  
19 clear that the State is pursuing that.

20 CHAIRMAN MCDADE: Okay. And in that  
21 regard, what I would suggest is if you would submit a  
22 document with proposed redactions. We're saying, at  
23 this point we're saying we're not making the documents  
24 publicly available. From what you just said it  
25 appears that you're suggesting that there are

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1 significant portions of the documents that, while the  
2 Board views the documents themselves should keep the  
3 proprietary designation, you're suggesting that there  
4 are certain portions of it where that's not required  
5 or appropriate.

6 And if that's the case, you know, submit  
7 those proposed redactions initially to Entergy and  
8 Westinghouse. And if there isn't an agreement, then  
9 to the Board.

10 MR. SIPOS: Very good, Your Honor. It was  
11 an alternative argument. The State still maintains  
12 its more overarching position. But this was an  
13 alternative argument as well.

14 We will follow up on it, Your Honor.

15 CHAIRMAN MCDADE: And there's two aspects  
16 to that. One is whether or not it's necessary to be  
17 public for the purposes of the evidentiary hearing in  
18 the next couple of days. And the other is, you know,  
19 the sort of overarching concern that you seem to have  
20 that this is the kind of information that should be in  
21 the public sector.

22 So it's something that even though we  
23 would be done with this evidentiary hearing no later  
24 than COB Friday, you know, it doesn't necessarily  
25 foreclose that that document could be moved to the

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1 public -- or portions of it, publicly later.

2 MR. SIPOS: Okay. Other than that, no  
3 other issues from the State.

4 CHAIRMAN MCDADE: From Riverkeeper?

5 MS. BRANCATO: Just for the record,  
6 Riverkeeper supports the State's position regarding  
7 the confidenti -- or redaction to the confidential  
8 document issue. But other than that, no. Thank you.

9 CHAIRMAN MCDADE: Okay, thank you. We  
10 will see you tomorrow, 8:30.

11 (Whereupon, at 5:50 p.m., the hearing was  
12 recessed, to reconvene at 8:30 a.m., Tuesday, November  
13 17, 2015.)

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