

ORIGINAL

OFFICIAL TRANSCRIPT
PROCEEDINGS BEFORE

NUCLEAR REGULATORY COMMISSION

DKT/CASE NO. 50-266-OLA and 50-301-OLA

TITLE WISCONSIN ELECTRIC POWER COMPANY
(Point Beach Power Plant Units 1 and 2)

PLACE Milwaukee, Wisconsin

DATE November 17, 1982

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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In the Matter of :
WISCONSIN ELECTRIC POWER COMPANY : Docket Nos.
(Point Beach Power Plant : 50-266-CLA and
Units 1 and 2) : 50-301-CLA

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Room 398, Federal Building
517 East Wisconsin Avenue
Milwaukee, Wisconsin
Wednesday, November 17, 1982

The hearing in the above-entitled matter
convened, pursuant to notice, at 9:04 a.m.

BEFORE:

PETER B. BLOCH, Chairman
Administrative Judge

JERRY R. KLINE, Member
Administrative Judge

HUGH C. PAXTON, Member
Administrative Judge

1 APPEARANCES:

2 On behalf of Applicant:

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10 On behalf of the Regulatory Staff:

11 RICHARD BACHMANN, Esq.

12 MYRON KARMAN, Esq.

13 Washington, D.C.

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15 On behalf of Intervenor,

16 Wisconsin's Environmental Decade:

17 PETER ANDERSON, Esq.

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		<u>C O N T E N T S</u>				VOIR	CROSS ON
<u>WITNESSES</u>		<u>DIRECT</u>	<u>CROSS</u>	<u>REDIRECT</u>	<u>RECROSS</u>	<u>DIRE BOARD</u>	<u>BOARD</u>
3	Douglas Fletcher						
4	By Mr. Churchill	1419					
	By Judge Kline					1452	
5	Clyde J. Denton						
6	By Mr. Churchill	1457					
	By Mr. Anderson					1461	
7	By Mr. Churchill	1471					
8	Douglas Fletcher						
9	Clyde J. Denton						
	By Mr. Anderson			1478			
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							<u>AFTERNOON SESSION.....P. 1522</u>
11	Douglas Fletcher						
12	By Mr. Anderson			1525			

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E X H I B I T S

<u>Intervenor Number</u>		<u>Identified</u>	<u>Received</u>
19	1	1386	
20			
21	<u>Applicants Number</u>		
22	1	1418	
	2	1467	1470
23			
24			
25			

P_R_O_C_E_E_D_I_N_G_S

1
2 JUDGE BLOCH: Good morning. I am Peter Bloch,
3 Chairman of the Licensing Board for the license
4 amendment of the Wisconsin Electric Power Company, Point
5 Beach Units 1 and 2, Docket Nos. 50-266-CLA and
6 50-301-CLA. The hearing today is an evidentiary hearing
7 related to one issue that survived motions for summary
8 disposition in this case. That one issue is related to
9 the adequacy of in-plant testing to detect flaws in
10 steam generator tubes.

11 Before we proceed, we established a 48-hour
12 deadline prior to hearing for the filing of exhibits
13 which parties intended to rely on either in direct or
14 cross-examination at the hearing today, and we would
15 like to have the parties that have not filed such
16 documents but wish to rely on them address us at this
17 time about those documents and why they were not
18 prefiled.

19 MR. ANDERSON: Well, I don't think it quite
20 meets that characterization, but what we had provided is
21 an exhibit to our motion for litigable issues, a letter
22 dated February 2, 1982, from Mr. G.H. Niles, General
23 Manager, HQ Nuclear Group, Northern States Power
24 Company, addressed to Mr. Cy Bernstein, Executive Vice
25 President of Wisconsin Electric Power Company. We have

1 also called the Applicant and the Staff on Monday just
2 to reiterate one more time as an additional courtesy, we
3 intend to offer that.

4 The offering we would intend to make with this
5 actually is a limited offer, not to the truth of the
6 statements contained in that letter, but solely to the
7 fact that that gentleman made the statements or
8 expressed the opinion indicated in that letter on that
9 date to the gentleman shown, and the authenticity of
10 that letter has been agreed to by the parties on
11 transcript page 1184 of this proceeding.

12 I will provide additional copies now as well
13 and ask that it be marked by the reporter.

14 (The document referred to
15 was marked Intervenor
16 Exhibit No. 1 for
17 identification.)

18 JUDGE BLOCH: We need not rule at this time as
19 to whether or not the document is admissible into
20 evidence. Are there any objections to our permitting
21 this document to be used after the 48-hour rule had
22 expired?

23 (Pause.)

24 MR. CHURCHILL: I have no objection, Your
25 Honor.

1 May I ask, would you like us to make
2 appearances?

3 JUDGE BLOCH: Yes, that would be a good way to
4 proceed at this point. Would the parties please
5 identify themselves for the record, first Applicant.

6 MR. CHURCHILL: Your Honor, my name is Bruce
7 Churchill. I am with the law firm of Shaw Pittman Potts
8 and Trowbridge, representing the Applicant in this
9 proceeding. With me is Delissa Ridgway of the same law
10 firm.

11 JUDGE BLOCH: For the Intervenor?

12 MR. ANDERSON: The Intervenor is Wisconsin
13 Environmental Decade, Inc., and appears by its
14 Co-Director, Peter Anderson.

15 JUDGE BLOCH: For the Staff of the Nuclear
16 Regulatory Commission.

17 MR. BACHMANN: Representing the Staff, my name
18 is Richard Bachmann. To my right is my co-counsel Myron
19 Karman, and to Mr. Karman's right is the project
20 manager, Mr. Timothy Colburn.

21 MR. CHURCHILL: Your Honor, may I have one
22 moment before I respond to Mr. Anderson's document?

23 JUDGE BLOCH: Surely.

24 (Pause.)

25 JUDGE BLOCH: May I ask, Mr. Anderson, was

1 this the document that was appended to your summary
2 disposition for your motion for litigable use?

3 MR. ANDERSON: It is one element of the order
4 of the Board on October 1st. It's the same document.

5 JUDGE BLOCH: Thank you.

6 MR. CHURCHILL: I have no objection on the
7 basis of lack of notice.

8 JUDGE BLOCH: Mr. Bachmann?

9 MR. BACHMANN: The Staff has no objection to
10 the introduction of this document.

11 JUDGE BLOCH: Then the 48-hour rule will not
12 be applied to this document.

13 Mr. Churchill, would you like to present your
14 case.

15 MR. ANDERSON: Before that happens, if I may,
16 Mr. Chairman, I have a few evidentiary matters I think
17 would be appropriate to precede the testimony.

18 JUDGE BLOCH: Could you explain why it's
19 necessary to resolve them first?

20 MR. ANDERSON: Two of them are necessary to
21 resolve first, one is not. The two that are would
22 relate to the scope of the cross-examination and the
23 documents used in the cross-examination.

24 JUDGE BLOCH: Could you tell me what you have
25 in mind with respect to the documents to be used in

1 cross-examination? In terms of scope, usually we can
2 handle that by allowing you to outline for us when it
3 comes your turn some of the topics you wish to cover and
4 the way in which you wish to cover and the way in which
5 you wish to proceed, so the Board will know which way
6 you're going, and then the scope can be objected to if
7 it is too broad by the other parties.

8 But I am interested in what you are talking
9 about, about the documents you intend to rely on.

10 MR. ANDERSON: Well, as I indicated, I think
11 in the last prehearing conference, we intended to rely
12 in cross-examination on the license -- certain licensing
13 event reports, and I also recapitulated that one more
14 time in a phone call to the Applicant and the Staff on
15 Monday.

16 And what I would like to do, I think it would
17 be most appropriate, would be to have official notice
18 perhaps taken of the LER's for Unit 1, dated April 16,
19 1982, November 13, 1981, July 16, 1981, December 23,
20 1981, August 11, 1980, and for Unit 2 the LER's dated
21 May 12, 1982, May 11, 1981, and May 16, 1980.

22 And the reason I would like to do that is that

23 --

24 JUDGE BLOCH: Off the record, please.

25 (Discussion off the record.)

1 JUDGE BLOCH: On the record.

2 MR. ANDERSON: As a framework, those are the
3 LER's that at least my understanding is, with the
4 exception of the August 11, '80, Unit 1 LER, are all
5 multi-frequency inspections of the steam generator
6 tubes. The reason I would ask -- I would think it would
7 be useful to have these is, Mr. Fletcher in his
8 testimony on page 6 of the prefiled document refers to
9 his estimation of a rate of through-wall thickness per
10 year for corrosion, and I think if we make any reference
11 to that we might want to compare that to the field
12 experience at Point Beach.

13 JUDGE BLOCH: Would you say a little more
14 about why you weren't able to tell the parties about
15 these documents before the 48-hour rule expired?

16 MR. ANDERSON: I did. I told them about it at
17 the last prehearing conference, which was several weeks
18 ago, and I told them on Monday. I told them to make
19 double sure, because I had not received the transcript
20 to reassure myself that the transcript was clear.

21 JUDGE BLOCH: To be specific, I remember that
22 you rely on some LER's, but we requested that you tell
23 people specifically the documents that you were going to
24 rely on. Did you do that?

25 MR. ANDERSON: I told them from 1980 on,

1 forward. I did not list the exact dates on Monday, but
2 those are all the ones from 1980 forward.

3 JUDGE BLOCH: Are there any objections to the
4 admission of these documents under the 48-hour rule?

5 (Pause.)

6 MR. CHURCHILL: You asked, I think, if there's
7 an objection to the admission of these documents?

8 JUDGE BLOCH: To the application of the
9 48-hour rule to these documents, the waiver of the
10 application of that rule.

11 MR. CHURCHILL: Yes, I do have an objection to
12 that. I don't recall Mr. Anderson telling us about
13 those documents at the last prehearing conference or any
14 telephone conference.

15 JUDGE BLOCH: Mr. Churchill, he did say he was
16 going to rely on LER's. He did not say which ones.

17 MR. CHURCHILL: That is right, he did not
18 specify which LER's, because that is my problem. At
19 around 5:00 o'clock on Monday, which is not within the
20 48 hours, your 48-hour rule, he called us. He did not
21 say he wanted to rely on all LER's from 1980. He said
22 from 1978, and he did not specify any LER's.

23 And as I recall our discussion at the last
24 conference call, the whole purpose of the 48-hour rule
25 was so that we weren't -- no party was to be surprised

1 at the last minute at the hearing. His telling us
2 simply that he would rely on LER's from 1978 meant that
3 all we had before us was a big stack of documents and we
4 had no way of looking at the ones he intended to rely on
5 or prepare for and to be able to prepare for it.

6 JUDGE BLOCH: Well, to be clear, how many
7 LER's were there since '78 that had to do with problems
8 of tube degradation, and did you in fact review those in
9 preparation for today?

10 MR. CHURCHILL: What we did was, we gathered
11 up all the LER's from 1978. I don't know how many there
12 are, but the stack is about that high (Indicating). We
13 set about to try to review them and we gave up in a few
14 minutes because it didn't make any sense. We had no
15 idea which ones he was going to rely on.

16 So as a result, Your Honor, we are at a
17 disadvantage.

18 JUDGE BLOCH: And those LER's you are
19 referring to all deal with possible problems of tube
20 degradation and eddy current testing?

21 MR. CHURCHILL: Yes, sir. What they are are
22 the reports to the NRC after each inspection, which
23 reports on the results of the inspections.

24 JUDGE BLOCH: How does the Staff feel about
25 the application of the 48-hour rule to these documents?

1 MR. BACHMANN: If you'll give us one minute,
2 sir.

3 (Pause.)

4 MR. BACHMANN: The Staff would also like to
5 enter its objection in general to the application of
6 these documents. As Mr. Churchill said earlier, Mr.
7 Anderson called us some time after 5:00 o'clock on
8 Monday, well past working hours in Washington, D.C.,
9 certainly well past the 48-hour limit. He did indeed
10 indicate that he would rely upon all LER's subsequent to
11 1978 and, as Mr. Churchill indicated, that stack is, as
12 he gestured, approximately three inches high and a few
13 hundred pages.

14 We attempted to gather all of those documents
15 yesterday morning prior to departing for Milwaukee, but
16 obviously have not had an opportunity to really go
17 through them and analyze them. So to the extent that
18 Mr. Anderson intends to rely upon these documents in a
19 very precise or, shall we say, exact manner on a word
20 for word, line by line basis, we would certainly object
21 to that.

22 We have the documents available. We have seen
23 them. We do have most of them with us. But we really
24 have not had the opportunity to review them and our
25 witnesses certainly would not be prepared to address

1 each and every item on the ones he has now identified
2 for the first time today.

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1 MR. ANDERSON: May I respond?

2 JUDGE BLOCH: Please, Mr. Anderson.

3 MR. ANDERSON: I have this stack here from
4 '78, and this is the entire stack, and the pre-1980
5 portion which, is apparently the portion in dispute, is
6 this fraction of the total. So I think the three-inch
7 statement may not be quite in conformance with the
8 facts. I think the actual subparting in this agreement
9 is only four small LER's. I think we have what perhaps
10 might be characterized as an exaggeration.

11 MR. BACHMANN: Judge Bloch, I stand
12 corrected. I misread my project manager, and it is
13 about an inch thick from '78 on.

14 JUDGE BLOCH: Mr. Bachmann, may I ask whether
15 the staff has reviewed those documents in order to make
16 its own inferences concerning the rate of tube
17 degradation between inspections?

18 MR. BACHMANN: I am informed by the project
19 manager that they have been reviewed. To the extent
20 that we can accurately testify to that, I would have to
21 confer with my witnesses before giving you an exact
22 answer on it. They have looked at them, to answer your
23 question.

24 JUDGE BLOCH: From the standpoint of trying to
25 infer the rate of tube degradation or from some other

1 standpoint? I mean, obviously, they have been looked at
2 at the NRC. I assume all LER's are looked at, but how
3 the staff tried to infer a rate of tube degradation from
4 the filings --

5 MR. BACHMANN: Excuse me for a second.

6 JUDGE BLOCH: Mr. Churchill, I would like to
7 know whether the applicant has tried to do the same.
8 Has the applicant tried to infer a rate of tube
9 degradation from the LER's?

10 MR. CHURCHILL: Your Honor, there is no way to
11 infer the rate of tube degradation from the LER's
12 because of the particular characteristics of eddy
13 current testing process, that the LER's would not give
14 an indication of a rate.

15 MR. BACHMANN: I am informed by my contract
16 manager that what Mr. Churchill says is correct.

17 JUDGE BLOCH: Mr. Anderson, for what purpose
18 do you intend to use these LER's?

19 MR. ANDERSON: I think before I respond
20 directly, I think it may be useful and a cogent answer
21 to indicate that Mr. Churchill is partly right. What
22 you will get from the LER's is a mixture of two
23 factors. The two factors are whether you are detecting
24 it at all and the second is the rate of degradation, and
25 I don't know if it is possible statistically to sort

1 those out from the LER's.

2 But in terms of safety, it is irrelevant as to
3 what is the causative agent, the rate of degradation and
4 detectability. Their effect is the same if you don't
5 know when an insipient failure is going to be between
6 inspections.

7 And the purpose of your question and the
8 purpose of the cross examination, the basis of the LER's
9 is to demonstrate whether or not it is due to a lack of
10 detectability with the inspection techniques or the rate
11 of degradation. You don't know in between inspections
12 whether or not you are going to have an insipient
13 failure such as to cause an undue risk to the public
14 health and safety.

15 JUDGE BLOCH: The board would like to take a
16 brief recess. We will be back to make a ruling on this
17 question.

18 (Whereupon, a brief recess was taken.)

19 JUDGE BLOCH: The hearing will please come to
20 order.

21 The board considers it to be a very serious
22 matter that Decade has not complied with the 48-hour
23 rule on these documents, nor has it presented an
24 adequate explanation of why it has not. These documents
25 have been available to it for over a year. It was

1 available to Decade when they were preparing their
2 motion for litigable issues. We know that Decade has
3 been thinking about using these documents for an
4 extended time for the purpose of showing problems about
5 degradations in tubes.

6 On the other hand, this is an important public
7 policy matter, and we are reluctant to exclude
8 evidence. We think there may be a possible remedy. If
9 Decade had filed these documents in time, it could have
10 used them in any way whatever to cross examine
11 witnesses, and to use them one number at a time if it
12 wished in order to impeach the credibility of those
13 witnesses. In that instance, the surprise it would have
14 gotten from these documents would have been legitimate.

15 We would like to know the wishes of the other
16 parties concerning whether it would be appropriate to
17 ask Mr. Anderson as a condition of using these documents
18 to explain at this time in detail the inferences that it
19 believes the board should draw from the documents and
20 the specific numbers in those documents that it believes
21 are important.

22 would that be helpful, Mr. Churchill?

23 MR. CHURCHILL: Yes, and not only would it be
24 helpful, but I think that would be consistent with good
25 judicial practice, even if the documents had been

1 submitted on time.

2 JUDGE BLOCH: Mr. Bachmann?

3 MR. BACHMANN: I would agree with Mr.
4 Churchill, with one caveat, and that is that I'm not
5 quite sure that we have in our possession all of the
6 documents so identified. I would like to ensure before
7 Mr. Anderson goes through this that we do indeed have
8 each of the LER's that he identified so that we can
9 follow along.

10 JUDGE BLOCH: Off the record, please.

11 (Whereupon, a discussion was held off the
12 record.)

13 JUDGE BLOCH: We will take a five-minute
14 recess to obtain an additional set of the documents so
15 the board can be informed.

16 (Whereupon, a brief recess was taken.)

17 JUDGE BLOCH: Back on the record.

18 We have decided to defer our consideration of
19 the use of the LER's and to permit the applicant to
20 begin its case at this time.

21 Mr. Churchill.

22 MR. CHURCHILL: Your Honor, consistent with
23 your opening statements, the licensee is here to present
24 the issue -- evidence on the issue that was identified
25 by the board in its memorandum and order relating to the

1 eddy current susceptibility of the sleeves after the
2 tubes have been sleeved.

3 The way we would intend to proceed is to put
4 the sleeving reports into evidence and present Mr.
5 Fletcher, whose testimony has already been filed with
6 the board and with the parties.

7 In addition, last week, I believe, the board
8 in a conference call asked if we would be able to
9 present a witness or witnesses experienced in eddy
10 current interpretation to, as I understand it, explain
11 to the board the process of eddy current interpretation
12 so that the board could gain familiarity with how it is
13 done and how signals are called out. So, we do intend
14 to do that.

15 In the process of putting together this
16 presentation, we have gathered together several examples
17 of strip charts and photographs of the oscilloscope
18 readouts, and we would use that in conjunction with the
19 presentation. Probably the best bet would be to have it
20 marked and introduced as an exhibit, which we would do
21 at that time, and this presentation would follow Mr.
22 Fletcher.

23 JUDGE BLOCH: Two questions. One is, when you
24 move the sleeving report into evidence, I assume you
25 will only be moving into evidence that portion that is

1 relevant to today's proceeding.

2 MR. CHURCHILL: I could do that, Your Honor.
3 Or we could see if we could obtain stipulation by the
4 parties that the entire sleeving report could go in. I
5 think it would be helpful to the record. I have not
6 gone through specifically to identify which particular
7 parts would be relevant to the issue. I was assuming
8 that the board and the parties would as a matter of
9 course prefer to have the sleeving report in, but I can
10 handle that any way the board wishes.

11 JUDGE BLOCH: When you do proceed with the
12 exhibits involved, I understand that we asked our
13 questions rather late, so that the 48-hour rule cannot
14 be directly applied to these things. Do you intend to
15 make copies available to the other parties?

16 MR. CHURCHILL: Yes, sir. The only exhibits
17 we would have would be the sleeving report, which
18 everybody has, and a series of sheets of the strip
19 charts and photographs, and we do have copies for all of
20 the parties.

21 JUDGE BLOCH: Would you proceed with your
22 case?

23 MR. CHURCHILL: Yes, sir. Before I start, I
24 would like to make a clarification of a statement I
25 made, I believe it was last week, during the conference

1 call of the parties. I had stated that we had just
2 completed an eddy current inspection of the
3 demonstration sleeves at Point Beach Unit 1 which is now
4 being reviewed right now, and that there were no
5 indications of defects.

6 This is true. However, in the interest of
7 strict accuracy, I have subsequently found out that
8 there was one indication on one of the sleeves which is
9 not being interpreted as a defect but which is
10 nevertheless an eddy current indication. This is just a
11 matter of clarifying the record to make sure that what I
12 say is strictly accurate.

13 MR. ANDERSON: May I ask Mr. Churchill, will
14 the person who is testifying on the eddy current testing
15 be able to answer questions about the latest
16 inspection?

17 MR. CHURCHILL: I suspect he would, Your
18 Honor. I reserve the right to question any relevancy of
19 any questions. We had not intended to bring witnesses
20 here for that purpose. The purpose was to demonstrate
21 to the board how it is done. As a matter of fact, as
22 part of the demonstration, we do in fact have a picture
23 of that particular defect, because it was the only thing
24 of interest to show the board with sleeves, since
25 everything else was clean.

1 So, we can show you how that looks and why it
2 is thought to be a deposit or a permeability spot rather
3 than a defect.

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1 JUDGE BLOCH: I am trying to recollect what we
2 said on the record about what we hoped would be
3 presented. I thought we asked that they would in fact
4 show us the eddy current results from the most recent
5 tests. Was that not made clear on the record? Because
6 I thought we said we wanted to be able to compare the
7 tests of the sleeves to tests of unsleeved tubes.

8 MR. CHURCHILL: What we are going to do is
9 show you a picture of a standard, of the ASME standard
10 for the defects, to show what their various percent
11 through wall holes look like on a standard, and we are
12 going to show you a picture, and when I say a picture,
13 it also includes a strip chart of the calibration
14 standard which shows how we mixed the signals to take
15 out the signals that you get from the support plate and
16 the interface of the tube sheet.

17 We are going to show you a picture of a clean
18 tube that is a Point Beach tube that doesn't have
19 defects. We're going to show you a picture or two of a
20 tube -- these are unsleeved -- that have defects within
21 the tube sheet. We are going to show you a picture of a
22 defect above the tube sheet. We are going to show you a
23 picture of the baseline inspection of the sleeve at Unit
24 1, and we are going to show you a picture of the most
25 recent inspection of that same sleeve showing how there

1 is no change.

2 And in addition, we have added, because it was
3 the only thing of interest, and I thought it might be of
4 interest to the board, this particular indication on
5 that one particular sleeve which has not been identified
6 as a defect, although we are curious about it and it is
7 under further investigation.

8 I thought that was what the board had asked
9 for. We have not brought all the records of all the
10 tubes.

11 JUDGE BLOCH: What I had hoped to see was the
12 five strip charts on these five sleeve tubes plus some
13 others to compare them to, to see what the differences
14 are. Maybe five or six defects in non-sleeve tubes and
15 five or six non-defected unsleeved tubes.

16 MR. CHURCHILL: Well, we have three defects in
17 non-sleeved tubes.

18 JUDGE BLOCH: That would be adequate. How
19 about the non-defected?

20 MR. CHURCHILL: We have one picture of a
21 non-defected. I think those are pretty much all the
22 same.

23 JUDGE BLOCH: What about the four other
24 sleeved tubes which you say there are no indications of
25 defects in?

1 MR. CHURCHILL: Well, we didn't do those
2 because we don't even take pictures of those. There are
3 strip charts of each one, but they are all pretty much
4 the same, and we just selected one as typical, and then
5 we selected the followup.

6 JUDGE BLOCH: Well, why don't we discuss that
7 further when we actually hear the testimony? I had
8 expected something different, but if it turns out that
9 it is adequate, why don't we proceed on that basis?

10 MR. CHURCHILL: Well, I assumed that the
11 purpose of this was to demonstrate to the board how this
12 was done, and I guess we spent a fair amount of time
13 yesterday and today while we were here trying to put
14 together a presentation. If the board would like to see
15 more, it could give us some notice and we could get some
16 more. I think the board will find that these are pretty
17 good examples that will demonstrate the eddy current
18 inspectability process.

19 JUDGE BLOCH: As of this point, my only
20 concern is that since they were selected to demonstrate
21 something, that the in between tubes in which you
22 finally conclude there is no problem, things that there
23 may be some noise, maybe some problems that the
24 untrained eye wouldn't see, and the other five tubes
25 obviously have not been included.

1 So ambiguous readings are not going to be
2 shown to us, if I understand what you are saying.

3 MR. CHURCHILL: It is my understanding there
4 are no ambiguous readings. The sleeves were clean going
5 in and except for this one indication were all clean. I
6 can recheck that, but it was fairly -- I had a fairly
7 clear understanding that there simply weren't any
8 readings to look at. You have clean sleeves and nobody
9 would have expected there to be any indications at this
10 time.

11 (Whereupon, the Board conferred.)

12 JUDGE BLOCH: Mr. Churchill, you may proceed.
13 We have no specific further requests at this time.

14 MR. CHURCHILL: Thank you.

15 MR. ANDERSON: Mr. Chairman, I don't know if
16 it will be necessary to indicate one more possible
17 exhibit. I think it can be handled by this cross
18 examination of Mr. Fletcher, but in our July 21st, 1982,
19 motion on certain contentiable issues, we attached Mr.
20 Porter's letter to ourselves of February 28, 1980, which
21 contained the metallurgical examination of a certain
22 tube which is also discussed in your October 1st
23 letter. It is my understanding that will be a test that
24 was actually under the direction of Mr. Fletcher. We
25 would not need the second-hand information of Mr.

1 Porter's letter in that respect, but I want to indicate
2 that if my understanding of Mr. Fletcher's knowledge is
3 not correct, that letter might arise.

4 JUDGE BLOCH: Is there any objection to the
5 Porter letter being introduced without concern for the
6 48-hour rule? I must say, Mr. Anderson, that we were
7 familiar enough with this case to wonder why you hadn't
8 raised that letter with us since you relied on it so
9 heavily on summary disposition. But do the parties
10 object to the use of the Porter letter?

11 MR. CHURCHILL: Yes, sir, I object for the
12 same reasons given before.

13 JUDGE BLOCH: If I remember in the Fletcher
14 letter you didn't object because you said you knew about
15 it.

16 MR. CHURCHILL: No, sir. The reason I didn't
17 object to that is because Mr. Anderson had told us that
18 he was going to use the documents that he had identified
19 within his motion for litigable issues related to the
20 issue that was -- I don't think it was the Fletcher
21 letter. We are referring to the Niles letter. I found
22 that there.

23 Now, maybe if I find this letter referenced
24 with respect to the issues which were being litigated, I
25 might reconsider. Could I have a moment?

1 JUDGE BLOCH: It is an appendix to the motion
2 for litigable issues. It is the one the board relied on
3 most heavily in its order.

4 MR. CHURCHILL: Yes, sir, but if it is not one
5 he relied on with respect to the eddy current
6 inspection --

7 JUDGE BLOCH: Oh, it is.

8 MR. CHURCHILL: Then I have no objection.

9 JUDGE BLOCH: Mr. Bachmann?

10 MR. BACHMANN: The staff has no objection.

11 JUDGE BLOCH: That letter may be used without
12 regard to the 48-hour rule.

13 Now, Mr. Churchill.

14 Incidentally, are you sure, Mr. Anderson, at
15 this point that you have told us all the things that you
16 want the 48-hour rule waived on?

17 MR. ANDERSON: Yes, sir, but I don't think the
18 48-hour rule applies. It was noticed in their motion.
19 I just want to make sure what occurs here. I don't
20 think the 48-hour rule is being broken if it was
21 notified in July of this year, but the answer is yes to
22 your question.

23 JUDGE BLOCH: We asked that you specifically
24 tell the applicant and staff of every document you
25 planned to use, because there could have been other

1 things you used in previous parts of this case, and we
2 didn't ask them to comb that entire record. Now, the
3 two documents that you have asked for waivers on are the
4 two most prominent documents in your motion for
5 litigable issues, and those are going to be allowed in.

6 MR. ANDERSON: I think there is a disagreement
7 over whether 5:00 o'clock was an adequate -- early
8 enough on Monday, but I think the record should be clear
9 that we did indicate in that Monday call to the parties
10 that we would be using the documents attached to the
11 motion with respect to the contentions that have been
12 admitted. So I think except for the few hours'
13 difference, I don't think the 48-hour rule is being
14 broken.

15 JUDGE BLOCH: This is Monday morning?

16 MR. ANDERSON: No, Monday at 5:00 p.m. New
17 York time.

18 JUDGE BLOCH: So we are talking about meeting
19 a 24-hour rule, not a 48-hour rule.

20 MR. ANDERSON: No, 36 hours.

21 JUDGE BLOCH: Mr. Churchill, are there going
22 to be other problems if he uses other documents that
23 were attached to the motion for litigable issues on this
24 particular issue?

25 MR. CHURCHILL: Your Honor, the purpose of the

1 48-hour rule was to give us some notice. We did learn
2 at 5:00 o'clock on Monday that he intended to do that.
3 If he intends to use any other documents, I would like
4 to know about it right now.

5 I wonder if we could ask Mr. Anderson to
6 identify any other specific documents.

7 JUDGE BLOCH: Off the record.

8 (Whereupon, a discussion was held off the
9 record.)

10 JUDGE BLOCH: Back on the record.

11 MR. CHURCHILL: I was asking if Mr. Anderson
12 could specifically identify any other documents he
13 intends to use on cross examination.

14 MR. ANDERSON: As you remember, earlier I said
15 there was an evidentiary matter that we would like to
16 bring up that was not integrally related to preceding
17 this witness taking the stand. I think the answer to
18 that question requires that that matter be taken up, if
19 it is all right with you. Why don't I start on that
20 basis, and if it is not, you can interrupt me?

21 JUDGE BLOCH: Mr. Anderson, I don't understand
22 what you just said.

23 MR. ANDERSON: You have in your October 1
24 order made a ruling that is ambiguous to us as to which
25 one of our contentions was admitted, and I was looking

1 specifically at 3A and 3B, and the reason for that, if I
2 may pursue it, is as follows.

3 3A, for clarity of the record, is the eddy
4 current test portion of the third contention, and 3B is
5 the annulus portion of the third contention. And on
6 Page 13 of the October 1 order of the board, the
7 sentence is made in granting the inspectability issue, I
8 quote as follows, "However, we do not know of any expert
9 testimony concerning the likelihood that the tube would
10 press on the sleeve in enough locations -- such as one
11 passing through the tube sheet and areas where corrosion
12 may accumulate in the annulus, or at the upper and lower
13 joints -- to permit the separation of grains in one or
14 more portions of the sleeve."

15 Later on on Page 15 of the order it could be
16 construed in the second whole paragraph to take a lesser
17 view of the annulus issue. We believe that the proper
18 reading of the order should be that the annulus
19 contentions and the documents underlying them are part
20 of this for the following reasons.

21 One is, as I said, the preceding page --

22 JUDGE BLOCH: Specify what you mean by the
23 annulus contention. That corrosion can occur in the
24 annulus, or that it is more corrosive there than
25 elsewhere?

1 MR. ANDERSON: That it is the same kind and
2 type of corrosion as you would experience in the tube
3 sheet, and that there are concentration effects.

4 JUDGE BLOCH: I would rather not rule on this
5 now. It is a matter for the scope of cross examination
6 later. I don't know what the specific problem is that
7 you're going to have. Is there a document that relates
8 to this issue that you might have filed under the
9 48-hour rule? Is that your problem?

10 MR. ANDERSON: No. To answer Mr. Churchill's
11 question of what documents might we rely on on cross
12 examination. I indicated to him on Monday the documents
13 attached to the motion. If you look at 3H, for example,
14 it relates to copper deposits in the steam generator
15 that might accumulate in the annulus, and that is listed
16 under the annulus. 3B contentions, not the 3A
17 contentions.

18 JUDGE BLOCH: Without ruling on the relevance
19 of that document, the 48-hour rule was supposed to apply
20 to any document that you want to use. If you thought it
21 was within the scope of the order, you should have filed
22 a document.

23 MR. ANDERSON: That is why I called the
24 parties on Monday at 5:00 p.m., to state that we intend
25 to use the documents that relate to the contention, that

1 are attached to our motion that relate to the
2 contentions that were admitted, and we have a situation
3 here, I think, also.

4 Mr. Bachmann also found it a little
5 ambiguous. I filed the admission to be extended. I
6 don't think we have a need to have the document, because
7 I think that Mr. Fletcher is the person who prepared the
8 analysis reflected in that document.

9 But just to be fully responsive, in the event
10 he does not recall that analysis, I am making that
11 response.

12 JUDGE BLOCH: Mr. Churchill?

13 MR. CHURCHILL: May I comment, Your Honor? I
14 think the board order is perfectly clear that his
15 annulus contention has not been admitted. I don't think
16 there's any ambiguity in that whatsoever. Page 16 of
17 the order does make that clear.

18 Also, the board has framed the specific
19 contention.

20 Secondly, I think this points up part of the
21 problem that we are having with Mr. Anderson's so-called
22 compliance with the 48-hour rule. First of all, they
23 missed the 48 hours. Secondly, he tried to tell us it
24 was all LER's, without specifying and identifying which
25 ones. Now he said that when he told us it was the issue

1 he was referring to the documents related to the
2 admitted contention. He put us on no notice that he
3 intended that he was going to try to argue that some
4 other contentions other than the plainest reading of
5 this order were in fact admitted.

6 It seems to me that Mr. Anderson is planning
7 surprises for us. It seems to me that the purpose of
8 the 48-hour rule was to avoid surprises. You have
9 indicated you were not going to rule on this now, but I
10 think this will give you an indication of my position on
11 this particular issue or document when it comes up.

12 MR. BACHMANN: The staff agrees generally with
13 Mr. Churchill. However, I would say generally when Mr.
14 Anderson called me or I returned his call some time
15 after 5:00 o'clock on Monday, he indicated that he would
16 rely upon those documents in the appendix to his motion
17 concerning litigable issues that remained subsequent to
18 the board's order.

19 On that basis, we would not object to his use
20 of those documents in the appendix to his motion that
21 specifically apply to -- relate to the remaining
22 contention following the board's order. I agree with
23 Mr. Churchill that any other documents in that appendix
24 that do not specifically relate to the remaining
25 contention should not be considered at this hearing.

1 JUDGE KLINE: Mr. Chairman, was that the form
2 in which the applicant was informed also? That Mr.
3 Anderson said he intended to use documents in the
4 appendices to the motion that were relevant? Was there
5 any further discussion as to what he meant by that?

6 MS. RIDGEWAY: He didn't use the term
7 "relevant." He said that were used in support of the
8 issues that were admitted by the board.

9 JUDGE BLOCH: Okay. We will defer ruling on
10 the applicability of the 48-hour rule on specific
11 documents until they are attempted to be used. That is,
12 on these further documents, until they are attempted to
13 be used. At that time we will rule both on relevance
14 and on the applicability of the 48-hour rule.

15 Now, Mr. Churchill, your case.

16 MR. CHURCHILL: Your Honor, I would like to
17 ask that the sleeving report, which is officially known
18 as the Point Beach Steam Generator Sleeving Report,
19 dated September, 1981, revised 1982, identified as
20 WCAP-9960, Revision 1, which is a part of the
21 application in this proceeding, be marked as Applicant's
22 Exhibit 1.

23 JUDGE BLOCH: Will you make the copy available
24 to the Reporter?

25 MR. CHURCHILL: Your Honor, the rules require

1 that we proffer three copies. I don't think we have
2 three copies at this time, but I understand they are in
3 the mail to us, and we may have them by the end of the
4 day.

5 MR. ANDERSON: Mr. Churchill, do you intend to
6 ask for proprietary protection or for portions of this
7 document?

8 MR. CHURCHILL: Yes, sir. This document has
9 proprietary information, as is indicated on the record.
10 Therefore this exhibit would have to be afforded
11 proprietary protection.

12 JUDGE BLOCH: Mr. Churchill, do you intend to
13 make available for the record the deleted copy so that
14 we will also have a public version for our record?

15 MR. CHURCHILL: Your Honor, as you know, the
16 non-proprietary version is also on the record in this
17 proceeding. We could make available copies of that as
18 well. I would have to, I think, call Pittsburgh and
19 have some sent up. I didn't think that would be
20 necessary as an exhibit, but I could do that.

21 JUDGE BLOCH: Off the record.

22 (Whereupon, a discussion was held off the
23 record.)

24 JUDGE BLOCH: Back on the record.

25 In the off the record discussion, the board

1 that the testimony you are to give is to be the truth,
2 the whole truth, and nothing but the truth, that any
3 errors in following that advice could be subject to
4 possible prosecution for perjury? Do you understand
5 what I said, Mr. Fletcher?

6 MR. FLETCHER: Yes, I do, Judge.

7 JUDGE BLOCH: Please proceed.

8 Whereupon,

9 DOUGLAS FLETCHER

10 was called as a witness, and having been first duly
11 sworn, took the stand, and was examined and testified as
12 follows.

13 DIRECT EXAMINATION ON BEHALF OF THE APPLICANT

14 BY MR. CHURCHILL:

15 Q Good morning, Mr. Fletcher.

16 A (WITNESS FLETCHER) Good morning.

17 Q Could you state for the record your full name
18 and title at your place of employment, please?

19 A (WITNESS FLETCHER) Yes, my name is W.D.
20 Fletcher, and I am an employee of Westinghouse Electric
21 Corporation, located in Pittsburgh. My business address
22 is Avenue A and West Street in Pittsburgh.

23 (Pause.)

24 JUDGE BLOCH: During our break, we tried to
25 resolve a mechanical feedback problem.

1 Please proceed, Mr. Fletcher.

2 THE WITNESS: In Pittsburgh, Pennsylvania.

3 BY MR. CHURCHILL: (Resuming)

4 Q Mr. Fletcher, what has been your role with
5 respect to the Point Beach sleeving programs?

6 A (WITNESS FLETCHER) I am manager of steam
7 generator development and performance engineering in the
8 Nuclear Technology Division of Westinghouse, and my role
9 has been to manage the activity related to the
10 qualification and verification of the sleeving process.
11 In addition to that, to oversee the activities related
12 to eddy current testing, development, as is performed at
13 my location in Pittsburgh.

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1 BY MR. CHURCHILL: (Resuming)

2 Q Do you have before you a copy of a document
3 dated November 2, 1982, entitled "Licensee's Testimony
4 of W.P. Fletcher"?

5 A (WITNESS FLETCHER) Yes, I do.

6 Q Was that document prepared by you, sir?

7 A (WITNESS FLETCHER) This document was prepared
8 by me and also under my direction.

9 Q And are the facts given in this document true
10 and correct to the best of your knowledge and belief?

11 A (WITNESS FLETCHER) Yes, they are.

12 Q And the attachment to the document, "Statement
13 of Qualifications and Experience," are those also true
14 and correct?

15 A (WITNESS FLETCHER) Yes, they are.

16 Q Do you adopt this document as your testimony
17 in this proceeding?

18 A (WITNESS FLETCHER) Yes, I do.

19 MR. CHURCHILL: Your Honor, I would move that
20 Mr. Fletcher's testimony as set forth in this document
21 be incorporated into the record as if read.

22 JUDGE BLOCH: Is there any objection?

23 MR. ANDERSON: So long as it is subject to
24 motion to strike at the appropriate moment, no
25 objection.

1 JUDGE BLOCH: Well, they are now subject to a
2 motion to strike, Mr. Anderson. If you have a motion
3 strike, make your motion.

4 MR. ANDERSON: I do not.

5 MR. BACHMANN: No objection from the Staff.

6 JUDGE BLOCH: The testimony is admitted and
7 shall be bound into the record, please.

8 (The documents referred to, the "Licensee's
9 Testimony of W.P. Fletcher" and his "Statement of
10 Qualifications and Experience," follow:)

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November 2, 1982

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of)	
)	
WISCONSIN ELECTRIC POWER COMPANY)	Docket Nos. 50-266
)	50-301
(Point Beach Nuclear Plant,)	(OL Amendment)
Units 1 and 2))	

LICENSEE'S TESTIMONY OF W. D. FLETCHER

Q. Please state your name, address, and occupation.

A. My name is W. D. Fletcher. My address is Westinghouse Electric Corporation, Forest Hills Site, Avenue A & West Street, Pittsburgh, Pennsylvania 15221. I am presently Manager, Steam Generator Development and Performance Engineering in the Nuclear Technology Division of the Westinghouse Electric Corporation. A statement of my qualifications and experience is attached to this testimony.

Q. The contention in this proceeding is:

That the license amendment should be denied or conditioned because applicant has not demonstrated that eddy current testing is adequate to detect serious stress corrosion cracking or intergranular attack, in excess of the technical specification prohibiting

more than 40 percent degradation of the sleeve wall, in sleeves that would be inserted within steam generator tubes.

Please describe the technical specification referred to in the contention.

A. Technical Specification 15.4.2.A, "Steam Generator Tube Inspection Requirements," of the Technical Specifications which are included in the operating licenses for Units 1 and 2 of the Point Beach Nuclear Plant, specifies the requirements for inservice inspection of the steam generator tubes. Paragraph 5 of Technical Specification 15.4.2.A defines "defect" as an imperfection that exceeds 50% of the tube wall thickness, and "plugging limit" as an imperfection of 40% of the tube wall thickness. Paragraph 6 requires the licensee to plug tubes which leak or have degradation exceeding the 40% plugging limit. Paragraph 3 requires that the tubes shall be examined for degradation in accordance with Appendix IV, "Eddy Current Examination Method of Nonferromagnetic Steam Generator Heat Exchanger Tubing," of the ASME Boiler and Pressure Vessel Code, Section XI, "Inservice Inspection of Nuclear Plant Components."

Technical Specification 15.4.2.A is consistent with NRC Regulatory Guide 1.83, "Inservice Inspection of Pressurized Water Reactor Steam Generator Tubes."

Q. Does eddy current testing, as performed by Westinghouse, meet the requirements specified in Paragraph 3 of Technical Specification 15.4.2.A?

A. Yes. Eddy current testing (ECT) fully complies with the requirements of ASME Boiler and Pressure Vessel Code, Section XI, as required by Paragraph 3 of Technical Specification 15.4.2.A.

Q. Is the ECT sufficiently sensitive to detect intergranular attack (IGA) and stress corrosion cracking (SCC) at the 40% plugging limit in steam generator tubes?

A. Yes. While such degradation may not in all cases be detected with absolute certainty because of variations in the sizes and configurations of the degradation, and because of test signal interferences from non-uniform materials in the test vicinity, inservice ECT methodology has progressed to the stage where we can generally expect to detect IGA and SCC that has progressed to 40% of the tube wall thickness.

Q. Is the ECT sufficiently sensitive to detect IGA and SCC at the plugging limit in the sleeves to be installed in the Point Beach steam generators?

A. Yes. The ability to detect IGA and SCC in the pressure boundary portion of the sleeve between the upper and lower joints is enhanced over the ability of ECT to detect such degradation in the corresponding portion of an unsleeved tube.

ECT utilizes an electromagnetic field, emanating from the eddy current probe within the tube or sleeve, to examine the tube or sleeve wall. Degradation in the wall of the tube or sleeve causes variations in the effective electrical conductivity and/or magnetic permeability of the wall material.

These variations are measured directly by changes in the coil voltage of the eddy current probe. The outer edge of the tube is only about 0.007" (7 mils) from the inner surface of the tubesheet hole. The uneven characteristics of the surface of the tubesheet hole cause signals which can interfere with the interpretation of eddy current indications. Signals can also be caused by the magnetite in the sludge surrounding the tube in the vicinity of the tubesheet, as well as by conductive impurities which may be deposited outside of the tube. These signals, referred to as "noise," can be reduced by the use of multifrequency mixing techniques such that the adequacy of the inspection is maintained, even though some residual interference remains.

Significantly less noise is present when the sleeve is tested. The outer surface of the sleeve is nominally 75 mils away from the surface of the tubesheet hole. This means that, compared to the tube, the sleeve wall being examined is now much farther away from the surface of the tubesheet hole, and much farther away from any sludge and impurities which may be present on the outer surface of the tube. The noise from these three sources is significantly reduced by the greater distance. In addition, the tube surrounding the sleeve acts as an electromagnetic shield which further reduces the interfering signals from these exterior noise sources.

The portion of the sleeve above the top of the tube sheet will also experience improved eddy current inspectability

because, as stated above, the outer surface of the sleeve is farther away from the sludge and impurities which may be present on the outer surface of the tube, and because of the electromagnetic shielding by the tube. Even if the tube were to leak in the sleeved region, exposing the outer surface of the sleeve to conductive interferences, the adequacy of the inspections is maintained through the use of multifrequency mixing techniques to reduce the resultant noise.

Q. The Licensing Board has asked that we provide additional information about ECT, the rate of progression of IGA and SCC in steam generator tubes, and the consequences of failing to detect such degradation. Can you comment on this?

A. Certainly, although I should state first that eddy current testing is not the only, or even the primary, means of providing assurance that tube degradation does not lead to an unsafe condition. A number of other factors are present, including the corrosion resistance of the tubing material, the toughness and ductility of the tubing material which results in detectable and controllable leakage before risk of rupture occurs (the "leak-before-break" characteristic), hydrostatic testing, leak rate limitations, and the conservatism of NRC's "plugging limit."

NRC's licensing requirements assume that some leakage will occur. Such leakage is monitored constantly while the plant is in operation. The leakage is detected by monitoring the secondary system condenser air ejector and steam generator

blowdown for radioactivity. The Technical Specifications . require the units to be shut down for repairs if leakage exceeds a predefined rate. Eddy current testing is used to help reduce the potential occurrence of leakage, but is not expected to eliminate it totally.

The rate of corrosion in tubes or sleeves is dependent on the environment to which they are exposed. With regard to the outer diameter (OD) of the sleeve, it will not be exposed to the secondary side environment unless degradation in the original tubing propagates through-wall and opens sufficiently to permit solution to enter the annulus. However, because of the expected increased corrosion resistance of the thermally treated Inconel 600 sleeve material, compared to that of the mill annealed Inconel 600 of the tube, the sleeve would be more resistant to attack even if the same combination of environmental factors which led to attack in the original tubing were to develop in the annulus.

For IGA, a rate of about 15% of tube wall thickness per year was conservatively estimated from eddy current testing and examinations of tubes in the field. This value is consistent with laboratory data for mill annealed Inconel 600 tubing exposed at 600°F to 10% NaOH solutions. In these same laboratory tests, thermally treated Inconel 600, which represents the sleeve condition, had a lower IGA rate, by a factor of 2 or 3. A larger reduction, of the order of 10, was observed in the caustic SCC rate for thermally treated Inconel 600. An

estimate of propagation rate, should conditions exist for caustic induced IGA and SCC for the sleeve material, is:

IGA: 5-10% of wall/year (during operation)

SCC: 5-15% of wall/year (during operation)

The test data do not indicate a change in corrosion rate over time.

The characteristics of the tube and sleeve material, Inconel 600, are such that, whether or not IGA is present, SCC progressing through the tube wall will result in leakage before the time when the tube has the potential for rupture during accident or normal operating conditions. This "leak-before-break" characteristic is based on the concept that a corrosion crack, initiating from the OD, would penetrate through-wall and result in a small but detectable leak before the crack would propagate to the "critical crack length," i.e., such a length that the tube could develop a large leak rate in the event of a postulated accident. This concept is particularly applicable to materials such as Inconel 600 with high ductility and toughness, that is, with the capability to withstand high stresses by deforming rather than fracturing.

To illustrate this concept, consider the initiation of a stress corrosion crack on the OD of a sleeve. If the crack were to occur, it would most likely be axial, that is, parallel to the axis of the sleeve, due to the dominating effect of the internal pressure hoop stress. The crack would propagate in length as well as depth in such a manner that a small

penetration of the sleeve wall would eventually occur. The aspect ratio, or the ratio of the length to depth of a propagating corrosion crack prior to through-wall penetration, has been found, from examinations of degraded tubes, to be about 2 to 5. Assuming a value of 5, such a crack would propagate to penetrate the sleeve wall while its OD length would be no more than 0.250".

Primary to secondary leakage would begin to be detected at this time. This would provide an early indication of degradation, permitting an orderly shutdown for inspection and resolution should the cracking process continue with an accompanying increase in leakage rate to Technical Specification limits. The maximum through-wall crack length which could exist without exceeding the plant's Technical Specification limits for leakage, 500 gpd per steam generator (0.3 gpm per steam generator), would be about 0.4" at normal operating pressures. If, assuming a 0.4" through-wall crack length, one would also postulate the simultaneous occurrence of a steam line break accident, the leakage would not be expected to be excessive, because the 0.4" long crack could withstand the increased pressure differential without bursting.

Laboratory and operating experience confirm the validity of the leak-before-break concept. Degraded tubes normally do not result in large breaks, but penetrate locally resulting in minor leakage which is readily detectable and can be remedied. Virtually all leakage events in Westinghouse steam generators were of this kind.

The NRC's 40% plugging limit takes into account margins for eddy current testing uncertainty, as well as margin for continued degradation for operating intervals between inspections. When a tube has 40% indicated degradation, it still has margin to resist rupture under both normal operating and accident condition differential pressure.

The maximum primary-to-secondary pressure differential occurs following a postulated feedline break or steam line break accident which reduces the secondary side pressure to zero. Analysis of this accident condition, contained in the Point Beach Sleeving Report (WCAP-9960, Rev. 1, pgs. 6.120-6.121), indicates that for uniform thinning completely around the circumference, the sleeve can degrade to 38% of its original wall thickness and still resist rupture under both the normal operating and accident loads. This corresponds to 62% degradation or a margin of 22% beyond the 40% degradation limit. Thus, the NRC's 40% plugging limit is conservative.

The above analysis is generic, and assumes a maximum ΔP of 2560 psi. For Point Beach, this value is conservative. The effect of this conservatism on the minimum sleeve wall thickness calculation is to increase the amount of degradation that can be tolerated and still resist rupturing.

Burst tests were performed on portions of tubes removed from Point Beach which had IGA on the order of 40 to 60% penetration of the tube wall. This testing required differential pressures in excess of 5000 psi to cause bursting of the

degraded tubes. This indicates substantial additional margin over the conservatively estimated pressures resulting from postulated accidents.

The consequences of sleeve degradation would be no worse than, and in all probability less than, the consequences of degradation in the corresponding portion of an unsleeved tube. Extensive examination of removed tube samples has shown that IGA occurs in the Point Beach steam generator tubes within the tubesheet. In addition, as a result of increased knowledge and field experience with the interpretation of ECT signals from IGA over the last two years, IGA is detectable at less than 40% through-wall penetration. It is not expected that IGA would progress undetected by either eddy current testing or by primary-to-secondary leak detection to the point where rupture could occur. However, for the sake of argument, if rupture of the sleeve were assumed to occur within the tubesheet as a result of IGA (or SCC), the leak path would be obstructed by the tube-to-tubesheet narrow annulus, and the leak rate would be significantly reduced compared to the rate from a ruptured tube postulated to occur above the tubesheet.

Recent experience with Point Beach steam generators has shown that tube degradation is not now occurring above the tubesheet to any significant degree. Again, for the sake of argument, if rupture of the sleeve were assumed to occur above the tubesheet, the consequences would be no worse than the consequences of an equivalent rupture of an unsleeved tube. As

a practical matter, although not required, it is assumed that some additional leak limiting capability would be provided by the presence of the surrounding tube, even if the tube had experienced degradation.

In summary, eddy current inspectability of sleeves, the leak-before-break characteristics of the sleeves, the additional corrosion resistance of the sleeve material, and the added margin in the ability of the corroded material to resist rupture provide reasonable assurance of the protection of public health and safety against unacceptable leakage during normal and accident conditions.

Q. How does the presence of sleeves affect the safety considerations you have just discussed?

A. In the region in and above the tubesheet, sleeving, in effect, substitutes a new primary pressure boundary which adds margin to that portion of the pressure boundary provided by the original tube. As I stated earlier, inspectability of the sleeves is better than that of the unsleeved tubes in the sleeved region, the sleeves are less likely to be subjected to the caustic environment to which the tubes are exposed, and the thermally treated Inconel 600 provides additional resistance to both IGA and SCC, compared to the tube material. The leak-before-break principle described above is applicable both to the tubes and the sleeves. Moreover, even if rupture of a sleeve were to occur, the consequences would be no more, and

likely less, than the consequences of a rupture of an unsleeved tube in the sleeved region.

The NRC's General Design Criterion 14, Appendix A, 1C C.F.R. Part 50 requires that:

The reactor coolant pressure boundary shall be designed, fabricated, erected and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture.

Sleeving provides an even lower probability of occurrence of these three events in the sleeved portion of the pressure boundary.

STATEMENT OF QUALIFICATIONS AND EXPERIENCE

W. D. Fletcher

EXPERIENCE

My name is W. D. Fletcher; I am presently Manager, Steam Generator Development and Performance Engineering in the Nuclear Technology Division of the Westinghouse Electric Corporation.

I graduated from Hardin-Simmons University in 1950 with a Bachelor degree in Chemistry and from Fordham University in 1960 with a Masters degree in Chemistry.

I was employed with the Vitro Laboratories from 1951 to 1955, where I performed research on organo-phosphorus compound synthesis, reaction kinetics and mechanisms of organo-phosphorus compounds, phase studies, bench scale and pilot plant production of organo-phosphites, high and low temperature kinetic studies of boron hydride synthesis, and electro-kinetic studies of electrophoretic deposition of inorganic oxides in the manufacture of reactor fuel elements.

In 1957 I began my employment with Westinghouse and have been engaged in-development work on the heterogeneous catalysis of reactions between hydrogen and oxygen produced through radiolysis of reactor coolants, reaction kinetics and

mechanisms, catalyst development and evaluation in high temperature and pressure aqueous solutions; evaluation and study of reactor coolant contaminants and means of coolant purification; study of behavior of fission and corrosion products in reactor coolants; in-pile studies of reactor coolants as pertains to chemical shim technology; reactor plant chemistry control, analyses, and data collection and interpretation of all operating reactor systems designed by Westinghouse.

Since 1970, I have been directly involved in development and design activities related to Westinghouse steam generators. Under my direction, steam generator programs related to operations have been executed involving chemistry and materials as well as specific design configurations.

As Manager, Steam Generator Development and Performance Engineering, I am responsible for three design-development groups that involve steam generator thermal/hydraulics, advanced concepts design and analysis and design of field modification to steam generators.

I am a member of the American Chemical Society, the National Association of Corrosion Engineers, the American Nuclear Society, and the American Society of Mechanical Engineers.

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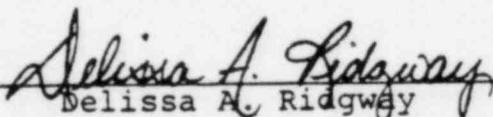
UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of)
)
WISCONSIN ELECTRIC POWER COMPANY) Docket Nos. 50-266
) 50-301
(Point Beach Nuclear Plant,) (OL Amendment)
Units 1 and 2))

CERTIFICATE OF SERVICE

This is to certify that copies of "Licensee's Testimony of W. D. Fletcher" were served, by deposit in the U.S. Mail, first class, postage prepaid, to all those on the attached Service List, except that those marked with an asterisk were served by hand delivery or by deposit with Federal Express, this 2nd day of November, 1982.



Melissa A. Ridgway

Dated: November 2, 1982

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1 BY MR. CHURCHILL: (Resuming)

2 Q Mr. Fletcher, I have one or two questions of
3 clarification for you. Are you familiar with the
4 testimony of the Staff that has been prefiled in this
5 proceeding but has not yet been admitted into evidence?

6 A (WITNESS FLETCHER) Yes, I am.

7 Q The Staff in that testimony stated at page 4
8 of the testimony of Emmett Murphy that outside the tube
9 sheet Westinghouse reported a reduction in signal
10 response of 30 percent for the sleeve as compared to the
11 signal in the unsleeved tube.

12 JUDGE BLOCH: I'm sorry, Mr. Churchill, our
13 version has more words in it than you just read. Could
14 we read it if we're going to respond to it? Does your
15 version read the way you just read it?

16 MR. CHURCHILL: That was not a quote.

17 JUDGE BLOCH: I think I prefer that we get a
18 quote and get the response.

19 MR. CHURCHILL: Very well, I can get the
20 quote.

21 JUDGE BLOCH: The Board can read it if you
22 prefer.

23 MR. CHURCHILL: That would be fine.

24 JUDGE BLOCH: The section says: "Outside the
25 tube sheet Westinghouse reports a reduction in signal

1 response for the sleeve ranging from 30 percent for a 40
2 percent through-wall standard calibration hole to zero
3 percent for a 100 percent through-wall calibration
4 hole."

5 MR. CHURCHILL: Yes, sir.

6 BY MR. CHURCHILL: (Resuming)

7 Q And my question, Mr. Fletcher, is that what
8 you would expect, that signal reduction for sleeve
9 inspectability at Point Beach?

10 A (WITNESS FLETCHER) No, I would not expect
11 that. Let me explain. I believe that this makes
12 reference to the fact that if you take a sleeve standard
13 and set up the eddy current instrumentation with regard
14 to that sleeve in air outside the steam generator and
15 then you also outside the steam generator take the
16 sleeve standard and insert it in a tube, that there is
17 in fact a signal reduction. So that the response for a
18 given setting with the eddy current instrumentation for
19 a sleeve in a tube is less than that for a sleeve in air.

20 As a result of that, of that finding, then,
21 the establishment of the proper settings with the
22 appropriate amount of amplification for the signals from
23 a standard are obtained before eddy current tests in a
24 steam generator with a sleeve standard inserted in a
25 tube, so as to accommodate and to account for the signal

1 reduction. As such, then, the gains of the
2 instrumentation and the amplification is restored to the
3 value required to see the full range of signals in the
4 standard sleeves.

5 JUDGE BLOCH: Let me clarify that. What you
6 are saying is that there's a different response to the
7 instrumentation because the sleeve is inside of the
8 tube, that recognizing that difference in response you
9 come up with a different calibration standard and a
10 different amplitude of signal generated, so that the
11 sensitivity of the instrument is the same as it would be
12 as if you had your sleeve and it wasn't inside of a
13 tube?

14 WITNESS FLETCHER: That is correct, Your
15 Honor.

16 JUDGE BLOCH: If I used any of the words
17 wrong, please use your own words to correct me.

18 WITNESS FLETCHER: I just want to restate it.
19 The setting up of the instrumentation now is done with a
20 sleeve standard inside a tube such as to achieve the
21 proper amplification of the signals from that sleeve
22 standard, so that there is no loss in sensitivity when
23 done in that manner. If the instrumentation were simply
24 set up with the sleeve in air outside the steam
25 generator, then there would be a loss of the order of 30

1 percent for a 40 percent through-wall standard
2 calibration hole.

3 BY MR. CHURCHILL: (Resuming)

4 Q Mr. Fletcher, would you turn to page 3 of your
5 testimony, please. You have testified that in-service
6 eddy current testing methodology has progressed to the
7 stage where we can generally begin to detect IGA, and by
8 IGA I mean intergranular attack, and SCC, which we use
9 to refer to stress corrosion cracking, that has
10 progressed to 40 percent of the tube wall thickness.

11 Now, the Staff at page 6 of Mr. Murphy's
12 testimony has stated, and I paraphrase, but the essence
13 of what the Staff is stating is that it is not always
14 possible to detect IGA at 40 percent of through-wall
15 degradation or greater. In view of this, I wonder if
16 you could elaborate a little more on your testimony
17 about IGA detectability and some of the improvements
18 that have been experienced and are expected to be
19 experienced over the last few years and in the immediate
20 future.

21 JUDGE BLOCH: Mr. Churchill, just so that our
22 record is very clear, so that we are not making any
23 misunderstandings of terminology, we need to get it so
24 basic that we would like to have a discussion of IGA and
25 stress corrosion cracking and how you use those terms

1 before you even go into the next question.

2 BY MR. CHURCHILL: (Resuming)

3 Q Mr. Fletcher, we would be happy to hear you
4 define IGA and SCC.

5 A (WITNESS FLETCHER) All right. With IGA, that
6 is short for intergranular attack, which is the effect
7 from a corrosion process on the grain boundaries, on the
8 grains within the material. Now, intergranular attack
9 --

10 JUDGE BLOCH: Is the effect from a corrosion
11 process on the grains of the material?

12 WITNESS FLETCHER: On the grain boundaries of
13 the material.

14 JUDGE BLOCH: An effect separating those grain
15 boundaries?

16 WITNESS FLETCHER: An effect that weakens the
17 grain boundaries. Now, in intergranular attack or IGA,
18 that weakening of the grain boundaries can proceed in a
19 three-dimensional fashion. That is, it can effect a
20 relatively broad area of the material as well as
21 penetrating into the tube surface and proceeding into
22 the tube wall.

23 Now, I refer to that as a three-dimensional
24 effect on the grain boundaries or a weakening of the
25 grain boundaries, in that it can be broad on the surface

1 as well as it can penetrate into the tube wall.

2 JUDGE BLOCH: So this could occur at the same
3 time at the surface and at some distance below the
4 surface?

5 WITNESS FLETCHER: It begins at the surface
6 and progresses in, then, to the tube wall.

7 JUDGE BLOCH: And the immediate effect is to
8 reduce the strength of the tube at those grain
9 boundaries?

10 WITNESS FLETCHER: There is a reduction in the
11 strength of the material affected through the weakening
12 of the grain boundaries.

13 JUDGE BLOCH: And the stress corrosion
14 cracking, how does that differ from IGA?

15 WITNESS FLETCHER: Stress corrosion cracking
16 is also a weakening of the grain boundaries, but it is
17 characterized by the penetration into the tube metal in
18 a very narrow crack-like feature that proceeds into the
19 tube wall in what I will refer to as a two-dimensional
20 fashion, and that is the effect on the outer surface of
21 the tube is limited to a very narrow line, I will call
22 it, while proceeding into the tube wall.

23 The two forms of corrosion by comparison are
24 quite different in terms of how they affect the tube
25 wall, but they are very similar with regard to their

1 cause, which has been assigned to the presence of
2 caustic, that is the agent that weakens the grain
3 boundaries in both cases.

4 I might further add that intergranular attack
5 is weakly dependent upon stresses in the tube wall,
6 whereas with stress in the tube wall the expected form
7 of tube wall degradation would be stress corrosion
8 cracking.

9 JUDGE BLOCH: Repeat the very last part of
10 that, without the stresses?

11 WITNESS FLETCHER: With tube stresses, with
12 stresses in the tube wall, one could expect to see
13 stress corrosion cracking.

14 JUDGE BLOCH: And without it you get only
15 IGA?

16 WITNESS FLETCHER: Without stresses in the
17 tube wall, given that other conditions are the same, you
18 would not expect to see stress corrosion cracking
19 initially.

20 JUDGE BLOCH: Initially, can you measure this
21 separation in grain boundaries by instrumentation? That
22 is, what distance are the boundaries separated, or is
23 that question meaningless?

24 WITNESS FLETCHER: The instrumentation that
25 would be used to measure the separation of the grains

1 would be typically eddy current, for example.

2 JUDGE BLOCH: No, I'm talking about more in a
3 laboratory. If you had this IGA in a laboratory you
4 could use whatever tools you wanted to, electron
5 microscope, whatever you had, what distances would we be
6 talking about?

7 WITNESS FLETCHER: In the case of
8 intergranular attack or IGA, if you were to examine a
9 polished specimen in the laboratory with a scanning
10 electron microscope you would see very little separation
11 between the grains of the metal, even though the grain
12 boundary had been weakened.

13 JUDGE BLOCH: Less than a ten-thousandth of an
14 inch?

15 WITNESS FLETCHER: I am not prepared to say
16 what the distance would be. Much of the result that you
17 would see under a scanning electron microscope would be
18 the history of the metal. If there were some strains
19 present and the only effect on the metal was
20 intergranular attack, there could be some local
21 separation even though you might be talking about a flat
22 specimen that was not placed deliberately under any
23 stress. There could be local separation of the grains.
24 So it could range from virtually no separation to some
25 finite visible separation under the -- using the

1 benefits of a scanning electron microscope.

2 Now, in the case of stress corrosion cracking,
3 however, the separation of the grains would be visible
4 to the eye. They would be quite apparent where the
5 presence of stress in the sample would have permitted
6 that separation to have occurred at the weakened grain
7 boundary.

8 JUDGE BLOCH: Now, this is even when the
9 stress corrosion cracking first begins, it would be
10 visible to the eye?

11 WITNESS FLETCHER: When it first begins,
12 probably not visible to the eye.

13 JUDGE BLOCH: Are you thinking about a certain
14 depth of penetration of the tube, after which you would
15 expect to be able to see it at the surface?

16 WITNESS FLETCHER: I'm speaking generally of a
17 depth that would penetrate the tube wall or
18 approximately there.

19 JUDGE BLOCH: You mean 100 percent
20 penetration, 40 percent penetration?

21 WITNESS FLETCHER: That is rather difficult to
22 characterize precisely, but certainly if the crack were
23 through-wall you would expect to see that by the naked
24 eye. We don't usually inspect by the naked eye in the
25 laboratory. We make a metallographic sample and examine

1 that closely under the microscope.

2 But if it were completely through-wall, you
3 would see some separation. If it were partly
4 through-wall, with the aid of an optical microscope you
5 would be able to see the separation in the case of
6 stress corrosion cracking.

7 JUDGE BLOCH: There's something about a 45 to
8 50 percent through-wall penetration. Would you expect
9 to be able to see that without the aid of a microscope?

10 WITNESS FLETCHER: I would say that that would
11 be probably difficult to see without the aid of a
12 microscope.

13 JUDGE BLOCH: And what would you expect a
14 scientific measurement of that separation to say about
15 the distance involved, about how great a distance is
16 involved with 50 percent through-wall penetration?

17 WITNESS FLETCHER: Well, I am not sure that
18 the distance that you would observe measured under an
19 optical microscope, for example, or not, would have any
20 particular significance in terms of diagnosing what the
21 form of degradation to the tube wall would be. You
22 would classify it as stress corrosion cracking. The
23 optical microscope examination of a polished specimen
24 would permit you then to conclude as to the form of
25 corrosion that you were dealing with.

1 JUDGE BLOCH: But I do have a reason for
2 asking about the distance. If the answer is you don't
3 know what the distance would be, that would be
4 satisfactory. But I want to know if you know what the
5 distance would be with a 50 percent through-wall stress
6 corrosion crack, the distance of separation.

7 WITNESS FLETCHER: There is no unique
8 distance. It would depend upon the level of stress. If
9 the sample were under, let's say, a relatively high
10 stress, then you would get greater separation.

11 JUDGE BLOCH: What would be a reasonable
12 minimum separation with relatively low stress, and what
13 would you expect the maximum separation to be at 50
14 percent through-wall?

15 WITNESS FLETCHER: I would say -- and mind
16 you, I'm speaking very generally, Judge Bloch, because
17 the variable of stress would really dictate what I would
18 see -- I would see a few mils, a few thousandths of an
19 inch separation, that could range to perhaps a hundredth
20 of a mil.

21 JUDGE BLOCH: Now, is this based on your
22 having read tests done to make these measurements, or on
23 some other information that you have about what the
24 actual measurement would be?

25 WITNESS FLETCHER: No, I'm speaking generally

1 of the type of crack separation that I am familiar with
2 and having looked at a large number of samples over the
3 last number of --

4 JUDGE BLOCH: You personally have looked at
5 them and measured them and found that they would be a
6 few mils? You have looked at samples that were a few
7 mils in separation?

8 WITNESS FLETCHER: No. The reason for my
9 hesitation is that I have not made the measurement per
10 se, and I have generalized a range that I recall from
11 having --

12 JUDGE BLOCH: Recall from what, reviewing
13 literature?

14 WITNESS FLETCHER: No, reviewing samples in
15 the laboratory.

16 JUDGE BLOCH: You mean writeups that other
17 people have made of samples?

18 WITNESS FLETCHER: No, looking at the samples
19 themselves. In other words, part of what we do is to
20 examine samples that have been removed from an operating
21 plant steam generator, a tube sample, performing the
22 examination by taking a slice of a tube, cutting a
23 portion of the tube into a small piece, mounting that in
24 an epoxy-type compound, polishing it and then examining
25 it under a light or an optical microscope.

1 I have reviewed a number of these over the
2 years.

3 JUDGE BLOCH: And sometimes they are what you
4 say, a few mils. Is that two mils, three mils, seven
5 mils?

6 WITNESS FLETCHER: To be any more precise than
7 that, I would really want to get some actual samples and
8 give you a better answer, because the deliberate precise
9 measurement of the distance between the crack spaces is
10 not ordinarily done. You are looking for the type of
11 corrosion that has occurred, and once you have examined
12 the specimen under the optical microscope you can draw a
13 conclusion as to the type of corrosion, be it
14 intergranular or transgranular, and you draw your
15 conclusions from it.

16 JUDGE BLOCH: "Transgranular," that is a new
17 term, "transgranular."

18 WITNESS FLETCHER: Yes. Transgranular is a
19 condition that would cause corrosion through the grain
20 of the material, as opposed to following the grain
21 boundaries. And transgranular corrosion is not seen in
22 this particular Inconel 600 material that we are dealing
23 with.

24 JUDGE BLOCH: And would you ever get as much
25 as 50 percent through-wall IGA?

1 WITNESS FLETCHER: Yes, you could get 50
2 percent through-wall IGA.

3 JUDGE BLOCH: Mr. Churchill.

4 BY MR. CHURCHILL: (Resuming)

5 Q Mr. Fletcher, let me repeat the question that
6 I was asking you before. I thank you very much for that
7 clarification of IGA and SCC. I think it helps us all.

8 You stated in your testimony that we can
9 generally expect to detect IGA and SCC that has
10 progressed to 40 percent of the tube wall thickness.
11 The Staff has suggested that IGA could progress farther
12 than 40 percent and might be missed. I was therefore
13 wondering if you could elaborate on your testimony in
14 this regard and explain how IGA is detected, some of the
15 advances or improvements that have been made over the
16 past several years in our ability to detect IGA,
17 including the use of -- accompanying other forms of
18 corrosion, such as stress corrosion, that often
19 accompanies IGA, and so forth.

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1 WITNESS FLETCHER: When the inspections were
2 performed at Point Beach Unit Number 1 in '79, it also
3 led to removal of several tube samples for examination.
4 The examination of those tubes showed the presence of
5 intergranular attack which was not completely found by
6 eddy current testing that preceded removal of those
7 tubes.

8 Now the intergranular attack, as I explained
9 before, is a relatively tight network of corrosion that
10 has affected the grain boundaries.

11 JUDGE BLOCH: You say in '79 you found IGA
12 that had not been present in the tubes. Now I know of
13 one test that was done like that on the summary
14 disposition motions. Were several tubes that exhibited
15 this characteristic?

16 WITNESS FLETCHER: There were three tubes that
17 were removed for examination from Point Beach in 1979
18 and each of these tubes showed the presence of
19 intergranular attack and the presence of that IGA on a
20 tube was not always indicated by the eddy current tests
21 that preceded tube removal.

22 At that point it was judged that the reason
23 the eddy current was not able to detect the presence of
24 the IGA was because the grain boundaries had not
25 separated sufficiently as to cause a reduction in

1 conductivity, which is a principle on which the eddy
2 current testing depends. So work at that time began to
3 try and improve upon the eddy current inspectability of
4 tubes with intergranular attack.

5 One of the principal difficulties in
6 developing the eddy current technique was the absence or
7 the inability to produce a specimen of tubing that had
8 intergranular attack on it that did not also have stress
9 corrosion cracking.

10 Now we understand that the stress corrosion
11 cracking can be found by eddy current testing. In the
12 samples that were removed from the Point Beach Unit
13 Number 1 plant, in the process of removing those tube
14 samples the grain boundaries affected by intergranular
15 attack were separated so that the laboratory examination
16 of those tube samples could clearly show the presence of
17 corrosion on the tube surface.

18 But that was not what was needed in order to
19 develop an eddy current technique, particularly since it
20 is to the presence of intergranular attack where the
21 grain boundaries had not separated. So much work has
22 taken place to produce a sample in the laboratory that
23 would give us the condition of IGA but without the
24 presence of the stress corrosion cracks that could
25 accompany such corrosion.

1 Much work has been done to take a sample of
2 Inconel-600 tubing and expose it to a caustic solution
3 in a short period of time or an acid solution in a short
4 period of time, all aimed at developing the surrogate
5 for the IGA that was found on the steam generator
6 tubes. More recently, we have been successful in
7 developing a technique whereby a sample of tubing can be
8 exposed to an acid condition and form an intergranular
9 corrosion without there being the presence of stress
10 corrosion cracking accompanying it.

11 What we end up with --

12 JUDGE BLOCH: Just a minute. When you said
13 intergranular corrosion, do you mean the same thing as
14 intergranular attack?

15 WITNESS FLETCHER: Excuse me. Intergranular
16 attack without stress corrosion cracking being present.

17 Now, the proof of the sample being like the
18 samples removed from the plant has taken place from
19 metallographic examination by taking these
20 laboratory-produced samples of IGA, performing the
21 metallography, and comparing, showing that the grain
22 boundaries have in fact been affected as they have been
23 affected in the plant.

24 So we are quite confident that today we have a
25 surrogate standard or sample that is being used for the

1 detection of the intergranular attack with there being
2 no stress corrosion cracking that would accompany it.

3 Now, with the samples from the laboratory,
4 then, we have been able to develop and to prove to
5 ourselves that we can recognize the presence of
6 intergranular attack using intergran technique. We have
7 produced samples of tubing with intergranular attack
8 that have in the laboratory been produced to depths of
9 penetration by IGA of approximately 75 percent or less,
10 all the way down to 20 percent of penetration by IGA,
11 and have then observed the response from eddy current
12 testing by using these laboratory samples.

13 That response is shown not as a sharp signal,
14 as one would expect from the presence of stress
15 corrosion cracking, but it is a change or a drift in the
16 base line of one of the signals that comes from the eddy
17 current tester that shows that in the presence of IGA
18 there is a definite deviation in this base line as long
19 as the probe is sensing the presence of this condition.

20 Now the drift or the change in the base line
21 of the eddy current signal --

22 JUDGE BLOCH: Just to be clear, when you are
23 doing these feasibility tests, is it done in any way in
24 a double-blind fashion to see whether it can be done
25 reliably? Or you are just trying to see whether it is

1 feasible and test out the reliability of the test
2 later?

3 WITNESS FLETCHER: Well, the first step is to
4 learn to see how the eddy current tester responds to
5 this condition and that is just about where we are today.

6 JUDGE BLOCH: When you say "drift in the base
7 line" --

8 WITNESS FLETCHER: Yes.

9 JUDGE BLOCH: I take it many things could
10 produce a drift in the base line and some may or may not
11 be detectable as differences from the drift that would
12 be associated with IGA. Is that correct?

13 WITNESS FLETCHER: That is correct, and so
14 that has to be resolved. In other words, you have to
15 recognize the signal from IGA and be able to
16 discriminate its signal and its characteristics of drift
17 from other possible sources of drift that may also
18 affect the base line.

19 JUDGE BLOCH: For example, if there were very,
20 very small difference in the location of the probe at
21 the time of testing, could that also create a difference
22 in the base line?

23 WITNESS FLETCHER: I'm not exactly sure
24 exactly what you mean by a difference in the location of
25 the probe. The probe in our samples, as would be in a

1 steam generator, traverses from one end of the sample to
2 the other.

3 JUDGE BLOCH: While it is traversing, though,
4 I take it there is some error of its exact location as
5 it moves, that you can't produce precisely the same
6 location every time it traverses through a tube.

7 WITNESS FLETCHER: Well, the principle when
8 you traverse the tube with the probe is that you will
9 pass all locations of interest.

10 JUDGE BLOCH: But does the exact location, the
11 distance of the probe from the walls, affect the base
12 line and does that location change at all from one test
13 to the next?

14 WITNESS FLETCHER: Well, you initially set up
15 the instrumentation with a standard that the
16 instrumentation is set up with the same probe that you
17 plan to use when you test your examples, for example, so
18 that you establish a base line at that point, and that
19 accounts for the distance between the probe and the tube
20 well.

21 JUDGE BLOCH: You mean every time the probe
22 traverses the tube, the distance between the probe and
23 the tube wall is exactly the same?

24 WITNESS FLETCHER: The eddy current
25 instrumentation is get up with a tube of the same

1 diameter that you plan to investigate in a separate
2 tube, and the distance between the probe and the tube
3 wall is ostensibly the same. However, as the probe
4 goes --

5 JUDGE BLOCH: It is not ostensibly that I am
6 interested in. There are always errors in tolerances
7 and everything mechanical, aren't there? Aren't there
8 some differences when you set it up the next time as to
9 how far the probe is going to be from the wall? Is it
10 exactly the same?

11 WITNESS FLETCHER: No, it would never be
12 exactly the same, but it is reduced. That is, the
13 differences are reduced and normalized when you set up
14 the instrumentation, so that if you used a different
15 probe, then the change in distance from the other probe
16 that you used could be accounted for in how you set up
17 the instrumentation. So you end up with a base line.

18 JUDGE BLOCH: I hope that these differences in
19 base line from the way you set up the probe could be
20 explained further in later testimony. It is not
21 necessary for me to ask the question, but you are saying
22 there is a difference in the base line with IGA.

23 WITNESS FLETCHER: That is correct.

24 JUDGE BLOCH: I guess we need to know what
25 other things will produce differences in the base line

1 that are not IGA that might be confused with IGA.

2 WITNESS FLETCHER: Yes. Well, that is a part
3 of the development program that is ongoing, is to
4 determine the reliability and the ability for the eddy
5 current to discriminate or for the reader to
6 discriminate between various signals that might be
7 picked up as the probe traverses the tube.

8 Now we have in the laboratory, again, been
9 able to very easily distinguish or determine the
10 presence of the surrogate intergranular attack condition
11 in the tube and are looking to prove its reliability,
12 looking to show that the interferences which one might
13 expect in the steam generator tube would not confuse the
14 reader of the signal nor provide for ambiguities that
15 lead to uncertainties in interpretation.

16 JUDGE BLOCH: Would you characterize the
17 present state of this as developmental and promising?

18 WITNESS FLETCHER: I would characterize it as
19 developmental and very highly promising in that we have
20 been able to move in the direction of determining that
21 the degree of shift of the base line is related to the
22 extent of depth of penetration. We are not there yet.

23 The development has not gone to the point
24 where we can make that determination with satisfactory
25 confidence, but the samples do show that we can detect

1 its presence and we can detect its presence down to
2 levels well below 40 percent of penetration of IGA, this
3 having been determined by moving the probe through the
4 tube sample and then performing metalography on the tube
5 sample to confirm the depth of penetration by IGA, and
6 we have seen signal response or eddy current response to
7 penetrations by IGA down to approximately 20 percent, so
8 that we are able to detect its presence.

9 But let me point out it is not a field-ready
10 technique that we are ready to use in the field today.
11 I think that we have made a considerable amount of
12 progress because of the ostensible continued
13 conductivity to eddy currents by the condition IGA.
14 Then we have had to learn how to see how the eddy
15 current response to that condition, which is different
16 than the eddy current response to the presence of stress
17 corrosion cracking --

18 JUDGE BLOCH: In that program, when a
19 laboratory is trying to determine whether it can detect
20 the IGA, does it know in advance whether the sample has
21 IGA in it?

22 WITNESS FLETCHER: We have gone through a
23 black box routine where samples with and without IGA
24 have been unknown to the operator of the equipment in
25 the laboratory. Also, the depths have been unknown to

1 the operator. So yes, we are using that as a technique
2 to prove to ourselves that we are able to detect it
3 reliably without --

4 JUDGE BLOCH: And does the operator try to
5 estimate the depth as well as its presence or absence?

6 WITNESS FLETCHER: Indeed, that is what we are
7 doing right now, is estimating the depth. We are not
8 complete with our program, you understand. It is that
9 this is where we are today in terms of making advances
10 in the detectability of IGA, as well as developing the
11 ability to size depth of penetration.

12 JUDGE BLOCH: I infer from your answer that at
13 the present time the reliability of the depth estimates
14 is not very great, that you are aiming to improve on
15 that.

16 WITNESS FLETCHER: That is correct.

17 MR. CHURCHILL: Your Honor, I wonder if we
18 could request a ten-minute recess at this point. I will
19 have one or two more questions of Mr. Fletcher is all.

20 JUDGE BLOCH: Are there any objections to
21 that? A ten-minute recess is granted. I have 11:47 --
22 excuse me, 10:57, 10:57.

23 (A brief recess was taken.)

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1 JUDGE BLOCH: Mr. Churchill.

2 BY MR. CHURCHILL: (Resuming)

3 Q Mr. Fletcher, just one or two more questions.
4 We are talking about baseline and baseline drift. Just
5 to be clear on the record, could you explain what you
6 mean by baseline and whether or not that is the same
7 baseline as some of us have heard referred to the
8 original inspection that is done?

9 A (WITNESS FLETCHER) Yes. I had not meant to
10 interchange terms there. There is a baseline, a
11 baseline inspection that is performed off steam
12 generator tubes or sleeves that are just installed.
13 That baseline refers to establishing the eddy current
14 signature, if you will, prior to those tubes or sleeves
15 going into operation.

16 When I referred to earlier in my testimony, to
17 the baseline, I am really talking or referring to the
18 baseline established on a strip chart recorder that is
19 one of the outputs from the eddy current test, and it is
20 a line that is drawn on this strip chart recorder, and
21 it is a deviation from that line that I am referring to
22 as a shift in the baseline, so the two are not meant to
23 be synonymous.

24 JUDGE BLOCH: I understand the second one. I
25 don't understand how the first one differs.

1 WITNESS FLETCHER: The first one is simply the
2 acquisition of the signatures in the new tube of a steam
3 generator called a baseline inspection, or a sleeve in a
4 tube, and it consists of data that is put on a strip
5 chart recorder in addition to a magnetic tape and that
6 type of thing. It is a record of the eddy current
7 signature characteristics of that inspection.

8 JUDGE BLOCH: Well, let's clarify it. The
9 data that you get when you make your baseline
10 consistent, part of this strip chart, and in part of
11 other data. Now, what is that other data?

12 WITNESS FLETCHER: There are several strip
13 chart outputs from the inspection of a steam generator
14 tube from the various frequencies that are used. All of
15 that data are recorded on magnetic tape, and then they
16 can be drawn from the magnetic tape, put on strip chart
17 recorders or signals made from them which can be
18 photographed.

19 JUDGE BLOCH: But it is the deviation from
20 this baseline data which was found in more than one
21 strip chart, different charts from different frequencies
22 that you call a deviation or a drift from the baseline.

23 WITNESS FLETCHER: That is correct. Where
24 there is intergranular attack or IGA present in the
25 tubes that we are examining in the laboratory, we

1 establish a straight line on the strip chart, if you
2 will, and as the probe traverses past the region where
3 IGA is present, there is a shift from that established
4 line.

5 JUDGE BLOCH: In fact, what you do in the
6 laboratory is very similar to what you try to do in the
7 field, isn't it?

8 WITNESS FLETCHER: Indeed it is. Indeed it
9 is.

10 JUDGE BLOCH: You get a baseline which
11 consists of these charts, and then you see a drift from
12 that as a result of your experimental procedures.

13 WITNESS FLETCHER: That is correct. In a more
14 generic sense, a baseline inspection consists of
15 examining many tubes that are a part of that baseline
16 inspection. That package is called a baseline
17 inspection. In the laboratory I am referring to a
18 simple strip chart recorder that utilizes the same type
19 of information, but it is used differently. It is not
20 for historical purposes or for record purposes in terms
21 of the development of the recognition of IGA.

22 JUDGE BLOCH: It is a baseline on the
23 experimental sample from which you will measure change,
24 from the experimental procedure.

25 WITNESS FLETCHER: Indeed it is.

1 BY MR. CHURCHILL: (Resuming)

2 Q Mr. Fletcher, one more point of
3 clarification. I take it from what you have said that
4 generally and eventually you would expect stress
5 corrosion cracking to accompany IGA. Is that correct?
6 And if so, I wonder if you would explain how, using
7 today's techniques, we generally do depict the presence
8 of IGA.

9 A (WITNESS FLETCHER) The presence of IGA from
10 examination of the plant eddy current data as well as
11 from examination of tubes pulled from Point Beach Unit
12 Number 1 has shown that IGA will penetrate or may
13 penetrate a certain depth into the tube wall, and that
14 there is invariably some stress corrosion cracking that
15 precedes the depth with which IGA has penetrated, so
16 that our present techniques, the conventional eddy
17 current techniques are sensitive to the presence of a
18 stress corrosion cracking.

19 And stress corrosion cracking from examination
20 of these samples has been present where IGA has
21 penetrated the tube wall to a certain depth.

22 JUDGE BLOCH: To what depth?

23 WITNESS FLETCHER: The order of perhaps 30 or
24 40 percent depth.

25 JUDGE BLOCH: So you say generally when you

1 get a 40 percent IGA, you get some accompanying stress
2 corrosion cracking?

3 WITNESS FLETCHER: Yes, we would expect to see
4 that on the basis of the laboratory samples. Or the
5 samples that we have removed from the plant that have
6 been examined in the laboratory.

7 JUDGE BLOCH: Let's be clear. The ones in the
8 laboratory were not under stress, so I take it there you
9 didn't get stress corrosion cracking. Is that right?

10 WITNESS FLETCHER: No, the metallography shows
11 the presence of stress corrosion cracking that
12 accompanies the IGA. Now, the condition was set up in
13 the plant, that is, the stress was in the tubes while
14 the tubes were in operation in the plant.

15 JUDGE BLOCH: I think we are talking at the
16 same time about the laboratory tests and about the tubes
17 that were removed from the plant. If we're talking
18 about one rather than the other -- you are now talking
19 about the tubes that were removed in 1979?

20 WITNESS FLETCHER: That is correct, Judge
21 Bloch.

22 JUDGE BLOCH: And those --

23 WITNESS FLETCHER: We saw stress corrosion
24 cracking accompanying the presence of IGA.

25 JUDGE BLOCH: But the laboratory tests where

1 you were trying to measure IGA, you are not seeing SCC.

2 WITNESS FLETCHER: We don't want to see it for
3 laboratory purposes in terms of establishing a standard
4 for IGA alone, the difference being that we need a
5 sample of IGA without SCC being present, so that we can
6 have some previous notice of its presence prior to the
7 development of stress corrosion cracking.

8 MR. CHURCHILL: Your Honor, that completes the
9 direct examination of this witness, and he is now ready
10 for cross examination.

11 JUDGE BLOCH: Mr. Anderson, the board has some
12 technical questions about the testing that it is
13 interested in getting answers to, but we would await
14 your pleasure as to whether you would prefer to conduct
15 your cross examination first or whether we might first
16 pursue some of these technical questions, in the
17 interest of having a clear record.

18 MR. ANDERSON: I think that would help, and I
19 would be glad to wait.

20 JUDGE BLOCH: You would be glad to wait.

21 BOARD EXAMINATION

22 BY JUDGE KLINE:

23 Q Mr. Fletcher, the board would find it helpful
24 if you would amplify your testimony on Page 3 regarding
25 the physical principles involved in eddy current

1 testing. We have several questions. I will just
2 outline them for you, and then we can go over them one
3 at a time.

4 First is, what is the nature of the signal
5 that the eddy current instrument sends? How does the
6 signal physically interact with the test material, and
7 how is the response signal detected?

8 Now, back to the first. With regard to the
9 nature of the signal, what portion of the
10 electromagnetic spectrum does the instrument actually
11 use?

12 A (WITNESS FLETCHER) Dr. Kline, I believe you
13 are getting somewhat out of my level of expertise with
14 regard to the precise details of eddy current testing
15 which get into the area of the physics of the eddy
16 current process. I think that could be addressed more
17 properly by someone who is directly involved in the
18 design and electronics of that type of instrumentation.

19 MR. CHURCHILL: Mr. Fletcher, would it help if
20 we took down the board's questions in this area and took
21 a break so that we would have a chance for
22 consultation?

23 JUDGE BLOCH: I am not sure it would help the
24 board too much, since the witness has said it is
25 somewhat beyond his expertise. I am interested in

1 whether the staff witness is able to go into the
2 technical questions about how this test actually works,
3 what parts of the spectrum are actually involved, that
4 type of question.

5 MR. BACHMANN: One moment, Judge Bloch.

6 MR. CHURCHILL: When you asked what type of
7 test, are you asking for the frequency of the test
8 signal?

9 JUDGE KLINE: The testimony says that they are
10 using an electromagnetic field, but the electromagnetic
11 spectrum is very broad. I presume you are not using
12 ex-rays, for example. I presume that it is a magnetic
13 signal over an electric signal of some kind, but we
14 would like to have a description of the physical signal
15 that the instrument generates.

16 MR. CHURCHILL: I wonder if it would be
17 helpful if we went off the record a little bit, and I
18 conferred with the witness to find out what he thinks he
19 might answer and who we might have available for these
20 kinds of questions.

21 MR. BACHMANN: Judge Bloch, before we go off
22 the record, I would like to state that the staff does
23 not have anyone available that could address the nature
24 and the physical properties of the instrumentation used
25 in eddy current testing. In fact, I have been informed

1 that we don't have anyone on the staff, period, not just
2 here, that is knowledgeable about that. However, we do
3 at times employ consultants in that work, but we would
4 not be able to address that today at all.

5 JUDGE BLOCH: Thank you very much, Mr.
6 Bachmann.

7 Yes, we will take a recess. How much time do
8 you believe you need? We would like to give you an
9 adequate time for this consultation.

10 MR. CHURCHILL: Twelve minutes, Your Honor.

11 JUDGE BLOCH: Granted.

12 (Whereupon, a brief recess was taken.)

13 JUDGE BLOCH: Back on the record.

14 The hearing will please come to order.

15 Mr. Churchill, my fellow judges have informed
16 me that the record may actually have become quite muddy
17 on what the baseline is, in addition to what the other
18 questions are that in fact the witness may have too
19 readily agreed with the Chairman about what a baseline
20 is, so you may also want to try to clarify that for the
21 record.

22 MR. CHURCHILL: I will also instruct my
23 witness not to too readily agree with the Chairman.

24 Your Honor, we have a gentleman here by the
25 name of Clyde Denton who is, I believe, an expert in the

1 type of questions that you may be wishing to ask, and I
2 would like to call him to the stand.

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1 JUDGE BLOCH: Please, Mr. Denton.

2 Mr. Denton, you understand that the testimony
3 you are about to give is before an agency of the United
4 States Government, that it may deal with important
5 safety and environmental questions. We expect you to
6 tell the truth, the whole truth and nothing but the
7 truth, and that a failure to fulfill that obligation
8 could be subject to possible penalty for perjury.

9 WITNESS DENTON: Yes, I do.

10 Whereupon,

11 CLYDE J. DENTON

12 was called as a witness and, having been duly sworn by
13 the Chairman, was examined and testified as follows:

14 JUDGE BLOCH: Okay, Mr. Churchill.

15 DIRECT EXAMINATION

16 BY MR. CHURCHILL:

17 Q Mr. Denton, would you state your full name for
18 the record?

19 A (WITNESS DENTON) My name is Clyde Denton,
20 Clyde J. Denton.

21 Q By whom are you employed and what is your
22 occupation?

23 A (WITNESS DENTON) I am employed by Zetec,
24 Inc. I am the General Manager of Zetec, Inc.

25 Q And could you give us a brief statement of the

1 history of your training and experience in the field of
2 eddy current testing?

3 A (WITNESS DENTON) Well, as a matter of fact, I
4 graduated from a school about four blocks up the street
5 here. It's called the Milwaukee School of Engineering.
6 I went to work at Hanford in 1955 and I have been doing
7 eddy current testing since 1956.

8 I originated the eddy current testing program
9 for steam generators in the Navy Nuclear Program and in
10 the commercial world.

11 JUDGE BLOCH: When you say you originated the
12 eddy current testing program in the Navy, what does that
13 mean?

14 WITNESS DENTON: Well, there were no eddy
15 current inspections of steam generators before we
16 started doing it.

17 JUDGE BLOCH: And was the technique itself
18 developed by the Navy or taken from elsewhere?

19 WITNESS DENTON: Basically the systems we are
20 using are based on work done by Hugo Libby at the
21 Hanford project, which I used to work for Hugo.

22 JUDGE BLOCH: If you could talk more slowly, I
23 could hear more readily. By the Hanford project?

24 WITNESS DENTON: Yes, the atomic project at
25 Hanford, yes. So I am Level-3 ASNT and data

1 interpreter.

2 JUDGE BLOCH: I'm sorry. That language is
3 strange. You are a Level-3 ASNT?

4 WITNESS DENTON: From the American Society of
5 Nondestructive Testing.

6 BY MR. CHURCHILL: (Resuming)

7 Q Is that pretty good?

8 A (WITNESS DENTON) There is a lot of Level-3s.

9 JUDGE BLOCH: Could you explain a little more
10 what a Level 3 is?

11 WITNESS DENTON: Well, there is -- the
12 National Society for Nondestructive Testing has
13 certification levels, of which three is the higher
14 certification. It means, supposedly, that you can write
15 procedures and interpret data.

16 JUDGE BLOCH: And what was your degree from
17 the Milwaukee School?

18 WITNESS DENTON: I have a degree in Applied --
19 it's an A.A.S. I forget what it stands for. It's
20 electronics.

21 JUDGE BLOCH: It is electronic engineering?

22 WITNESS DENTON: It is a two-year electronics
23 course.

24 JUDGE BLOCH: So that is a Master's Degree?

25 WITNESS DENTON: No, no. It is Associate in

1 Applied Science. That's what it is.

2 BY MR. CHURCHILL: (Resuming)

3 Q Are there a lot of Level 3s in this country?

4 A (WITNESS DENTON) There is a large number of
5 Level 3s. There are Level 3s for all of the
6 disciplines. I don't know how many Level 3s there are
7 for eddy current testing.

8 Q But there might not be very many for eddy
9 current testing?

10 A (WITNESS DENTON) I don't want to narrow
11 myself down. There might be several.

12 Q Several? All right, thank you.

13 You say you are the General Manager of Zetec.
14 What is the relationship of Zetec to the Point Beach
15 sleeving program?

16 A (WITNESS DENTON) We are a subcontractor of
17 the Westinghouse Corporation. We interpret data
18 collected by Westinghouse in this case.

19 JUDGE BLOCH: For what purposes have you done
20 work for Westinghouse other than just this particular
21 case?

22 WITNESS DENTON: Our company manufactures all
23 the eddy current test equipment that is used by
24 Westinghouse to inspect the plant as well. We are an
25 equipment manufacturer as well as a service

1 organization.

2 BY MR. CHURCHILL: (Resuming)

3 Q And Zetec is the company who performs the eddy
4 current evaluations for the Point Beach plant?

5 A (WITNESS DENTON) Yes, that is correct.

6 MR. CHURCHILL: Thank you, Mr. Denton.

7 Your Honor, he is ready to answer questions.

8 JUDGE BLOCH: Mr. Anderson, do you have any
9 voir dire?

10 VOIR DIRE EXAMINATION

11 BY MR. ANDERSON:

12 Q Mr. Denton, do you prepare and inspect the
13 evaluations of all tapes or just those submitted to you
14 by Westinghouse?

15 A (WITNESS DENTON) That is the same answer.
16 All tapes collected by Westinghouse are submitted to
17 us.

18 Q And do you perform any in-plant tests, or do
19 you just take the work submitted to you from the field?

20 A (WITNESS DENTON) In the case of Point Beach,
21 we just take the tapes from the field because that is
22 Westinghouse jobs.

23 Q And do you submit your reports to Westinghouse
24 or the utility?

25 A (WITNESS DENTON) To Westinghouse.

1 MR. ANDERSON: Okay.

2 JUDGE BLOCH: Are there any objections to the
3 use of this witness? Please continue.

4 Judge Kline?

5 JUDGE KLINE: Okay. I want to go back and
6 explore just the basic physical principles on which eddy
7 current testing works and we will go back to our three
8 questions.

9 First of all, what signal does the eddy
10 current instrument send or generate?

11 WITNESS DENTON: The instrument that is being
12 used is a four-channel instrument. It drives a coil of
13 wire. The basic thing that goes up the tube is just a
14 bobbin with two coils of wire on it. The two coils can
15 either -- each coil either works by itself or in
16 conjunction with the other coil.

17 Both coils are driven, so they are driven with
18 an alternating current, which means there is an
19 associated magnetic field around the coil. That
20 magnetic field causes current to flow in the tube wall.
21 If the tube wall is sound, you have an A-current
22 pattern. If the tube wall has a flaw, the current
23 pattern is changed and we work on the change of the
24 current pattern.

25 It is the loading of the coil. It is a

1 constant thing. It is driven sinusoidally. It is not
2 like ultrasonic system that sends a pulse and then
3 waits. It is a continuous drive sinusoidal system.

4 JUDGE KLINE: And how does the signal then
5 interact with the test specimen?

6 WITNESS DENTON: In fact, the magnetic field
7 couples with the test system, which causes current to
8 flow in the tube wall.

9 JUDGE KLINE: It is an induced current?

10 WITNESS DENTON: It is an induced current,
11 yes. So in a sound material the current flows because
12 we are using frequencies high enough, which is another
13 one of your questions. We are using frequencies high
14 enough that there is a skin effect, so there is more
15 current on the inner tube wall surface, in this case,
16 and less current on the outer tube wall surface.

17 JUDGE KLINE: And how has the signal been
18 detected or measured?

19 WITNESS DENTON: Well, the electronics of the
20 system are looking at the coil. At the same time we are
21 driving the coil we are looking at the coil. So when
22 you have an interruption of current flow in the tube
23 wall, there is an apparent change of impedance of the
24 test coil, which the equipment then works on and
25 displays.

1 JUDGE KLINE: So there is not a separate
2 detector, then?

3 WITNESS DENTON: It is looking at the coil all
4 the time. You drive the coil and look at the coil. It
5 is the same coil, yes. There are two coils in the
6 probe. That shouldn't be misleading. We drive both
7 coils and monitor both coils.

8 JUDGE BLOCH: How do you know that some of the
9 signal change isn't due to a change in the input to the
10 coil as opposed to the induced current being fed back to
11 the coil?

12 WITNESS DENTON: The coil now is a complex
13 impedance, so we are always looking at a complex answer,
14 so we determined -- we make the prediction of depth
15 based on the phase angle of the signal, which is a time
16 domain because we are able to do it because of the skin
17 effect.

18 The current flowing next to the coil is
19 centered in the current flowing on the outside of the
20 tube wall. If you decrease the drive to the tube wall,
21 that would just be an amplitude change and not a phase
22 change. So you could in fact have the signal amplitude
23 going up and down without changing your real answer.

24 JUDGE KLINE: How is this signal or response
25 displayed? What kind of coordinate system?

1 WITNESS DENTON: Well, really it is done two
2 ways. Everything is put on magnetic tape recordings and
3 can be looked at either with the X and Y displayed as a
4 lissitude pattern, which really what we look at.

5 JUDGE KLINE: What kind of a pattern?

6 WITNESS DENTON: It is a regular X-Y display.
7 It is a flying spot, or however you are used to thinking
8 of that type of thing. So you are able to move the spot
9 in a complex direction.

10 MR. CHURCHILL: Excuse me, Your Honor, we have
11 prepared, or maybe I should ask Mr. Denton whether this
12 exhibit that we have prepared for later might be
13 helpful. Would that be helpful to show the Board at
14 this time?

15 WITNESS DENTON: It might be easier, if you
16 are at that point.

17 I think this will give you some idea without
18 going into all the detail about what the recordings
19 would mean.

20 JUDGE KLINE: At this point what I need is,
21 just taking this trip chart, just what the coordinate
22 system is. For example, other than being an X-Y system,
23 specifically is the Y axis a current axis and the X
24 axis --

25 WITNESS DENTON: You can think of this as

1 representing a complex impedance in which the real is in
2 the Y direction and the imaginary is in the X
3 direction. It is a typical complex number.

4 So if you just look at the first page, you
5 will see the two ways that we do record. We are able to
6 observe it on the oscilloscope in the complex form, and
7 then you can separate the X from the Y and put one from
8 each on each channel of the strip chart recorder or any
9 combination of those.

10 JUDGE BLOCH: I'm sorry. I can't think of it
11 as being real in one direction and imaginary in the
12 other.

13 WITNESS DENTON: I don't either.

14 JUDGE BLOCH: Could we try to use different
15 language that I can understand?

16 WITNESS DENTON: One is inductive reactance
17 and one is resistance. With inductive reactance
18 normally would be presented in the vertical and
19 resistance in the horizontal.

20 JUDGE BLOCH: I think primarily for my
21 purposes let's talk more specifically about the first
22 piece of paper that was handed to us here -- Lab
23 Standard 2V/D. Do you want to try to get that into
24 evidence?

25 MR. CHURCHILL: Yes, I would. The document

1 that I have distributed to the Board and to the parties,
2 and I have also given three copies to the reporter, is a
3 series of seven sheets stapled together. It does not
4 have a cover, but the pages are numbered one through
5 seven.

6 The first sheet is, as the Chairman noted, it
7 is a Lab Standard, underneath it just 2V/D, and this
8 particular page is entitled "Standard Defect Run." I
9 would ask if this could be labeled Applicant Exhibit 2.

10 JUDGE BLOCH: It shall be so labeled and bound
11 into the transcript pursuant to our deciding that is it
12 accepted into evidence.

13 (The document referred to
14 was marked Applicant
15 Exhibit Number 2 for
16 identification.)

17 (Applicant's Exhibit Number 2 follows:)

18
19
20
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24
25

insert #2

LAB STANDARD
2 V/D

STANDARD DEFECT RUN

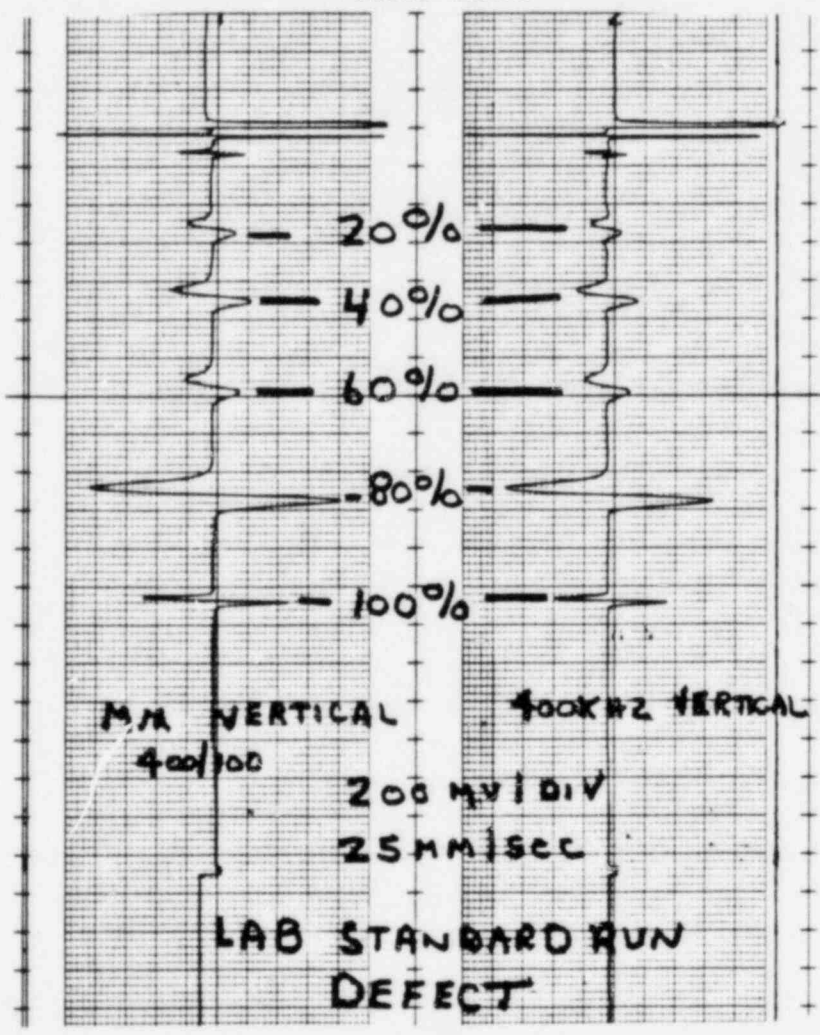
400

100



400/100 MIX

STRIP CHART

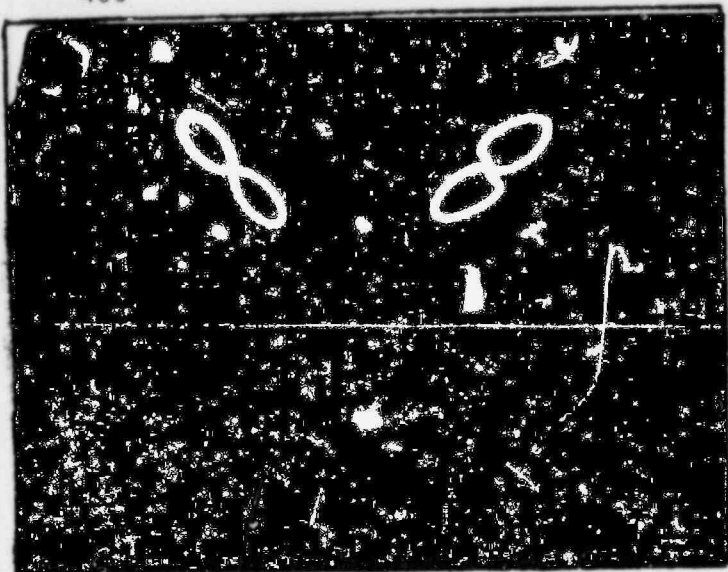


LAB STANDARDS
2 V/D

SUPPORT RING

400

100

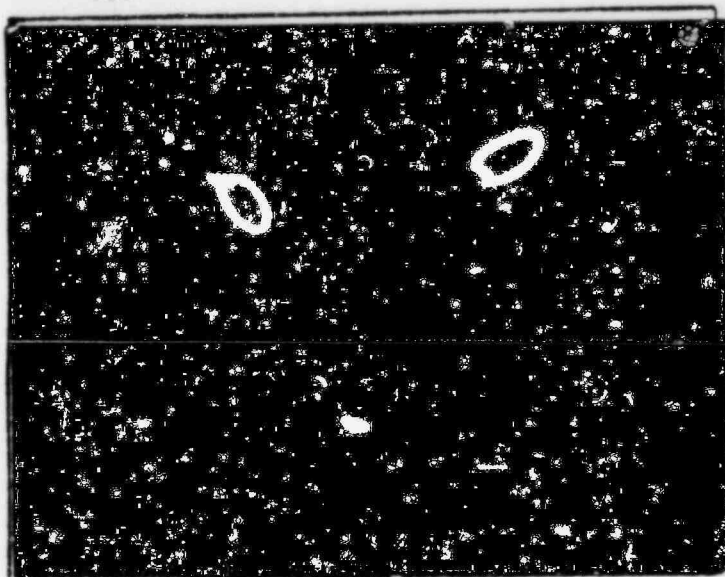


400/100 MIX

TUBESHEET

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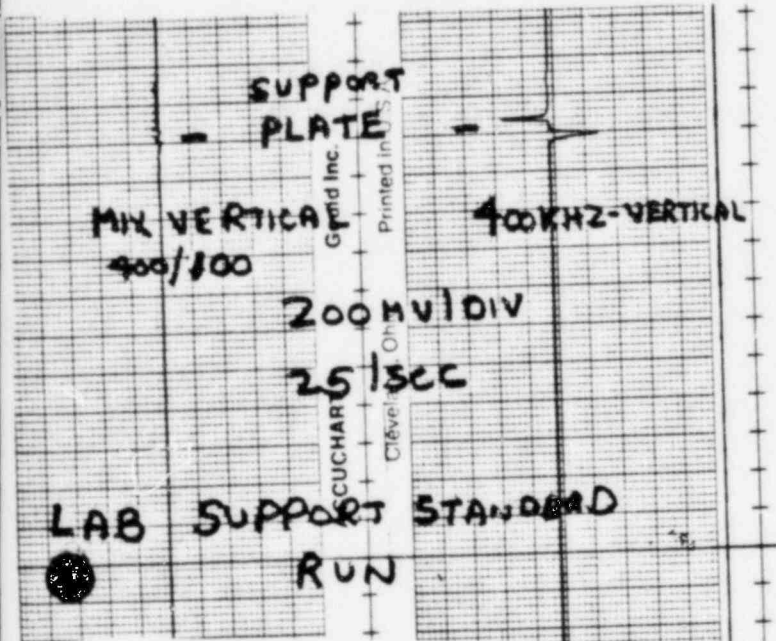
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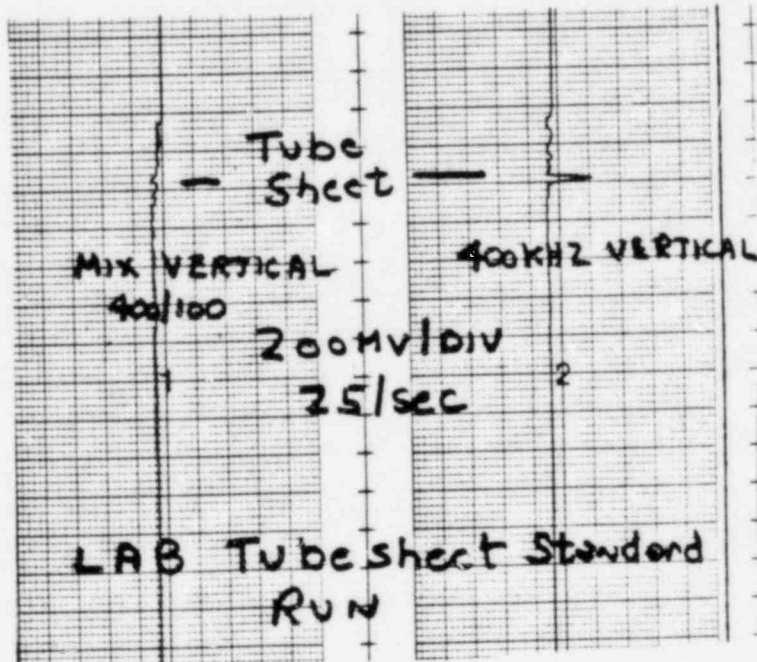
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STRIP CHARTS

SUPPORT RING



TUBESHEET



POINT BEACH #1 (WEP)
NOVEMBER 1981
2 V/D

S/G - A INLET
BEFORE SLEEVING

NO INDICATION
TUBESHEET SIGNAL

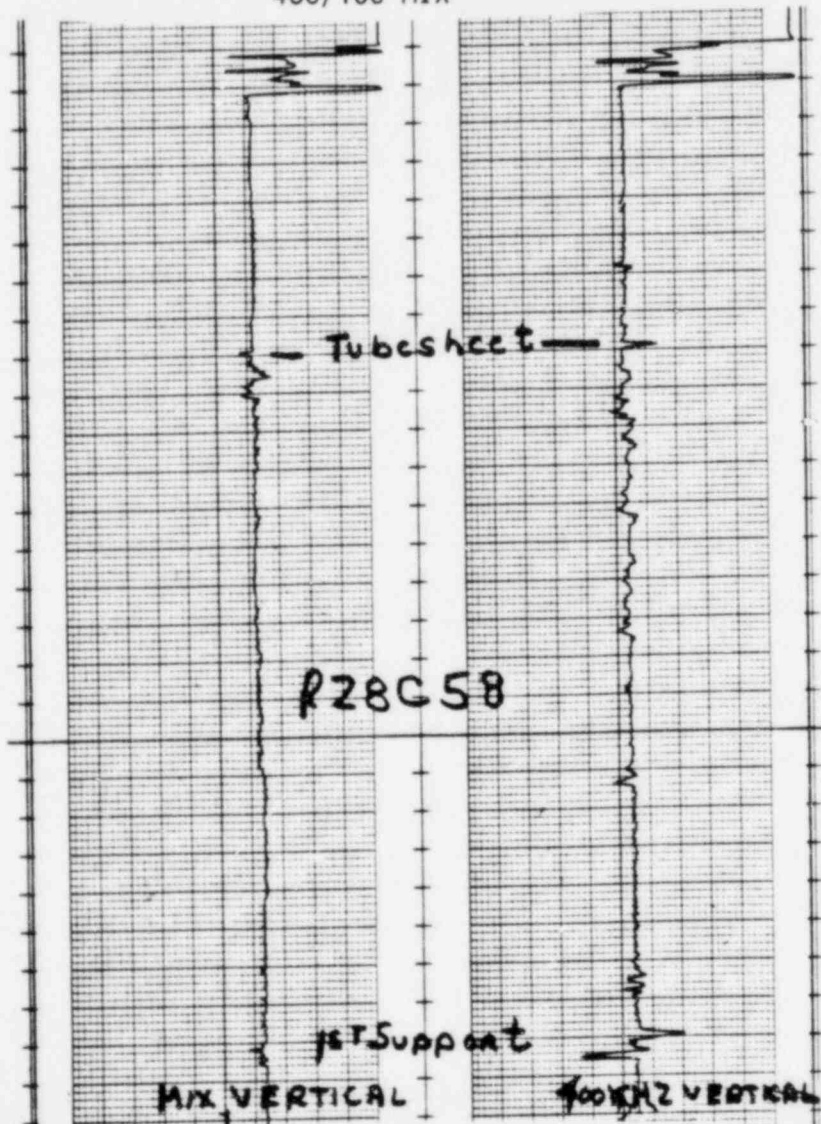
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R28 C58

100



400/100 MIX



POINT BEACH #1 (WEP)
NOVEMBER 1981
2 V/D

LEAKER 18" ATE

S/G - A INLET
BEFORE SLEEVING

89% 20" ATE

400

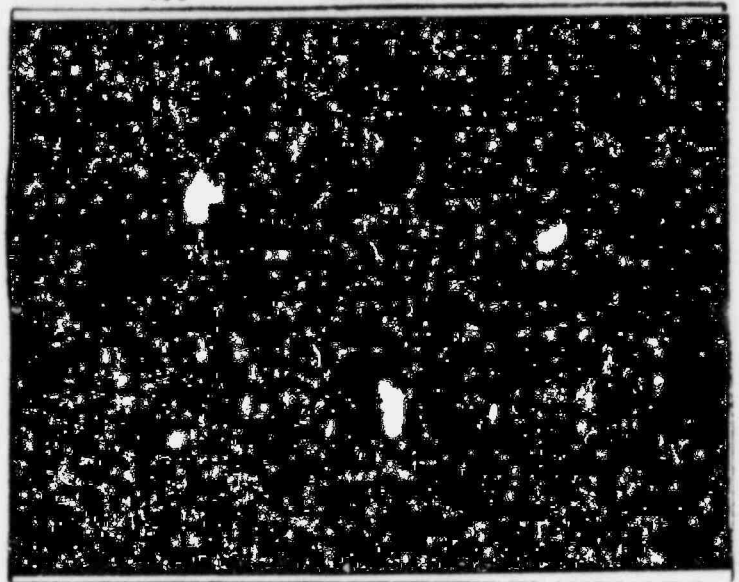
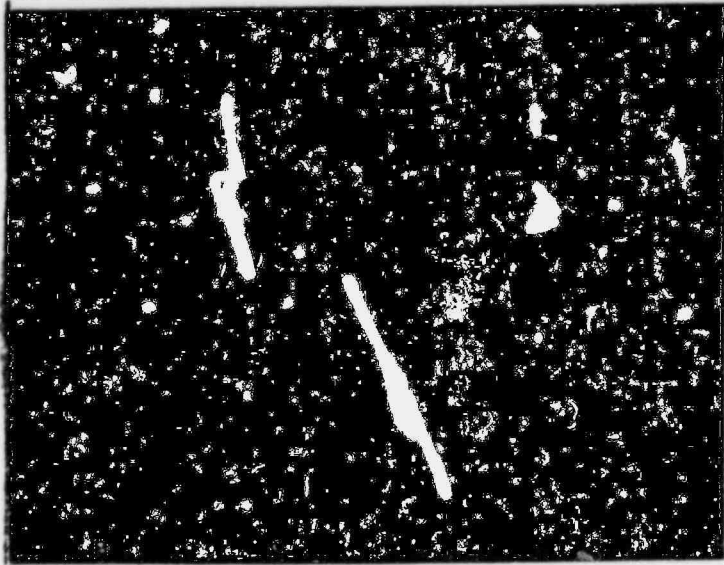
R27 C49

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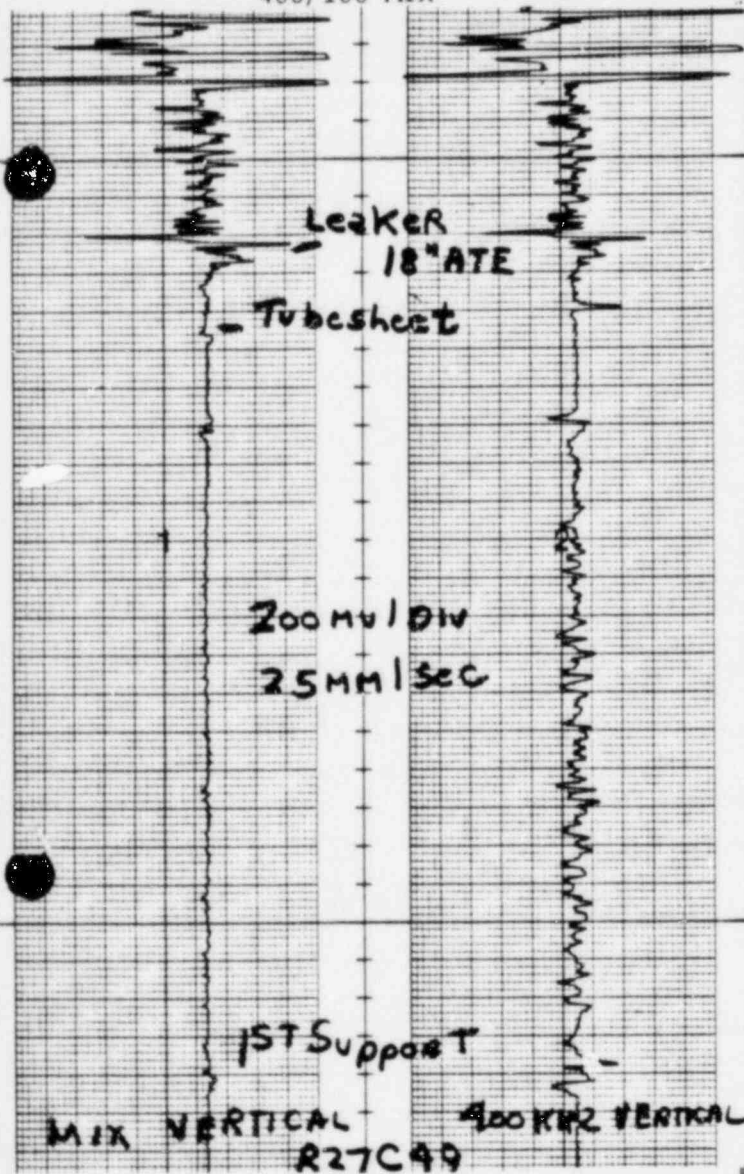
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R8 C75

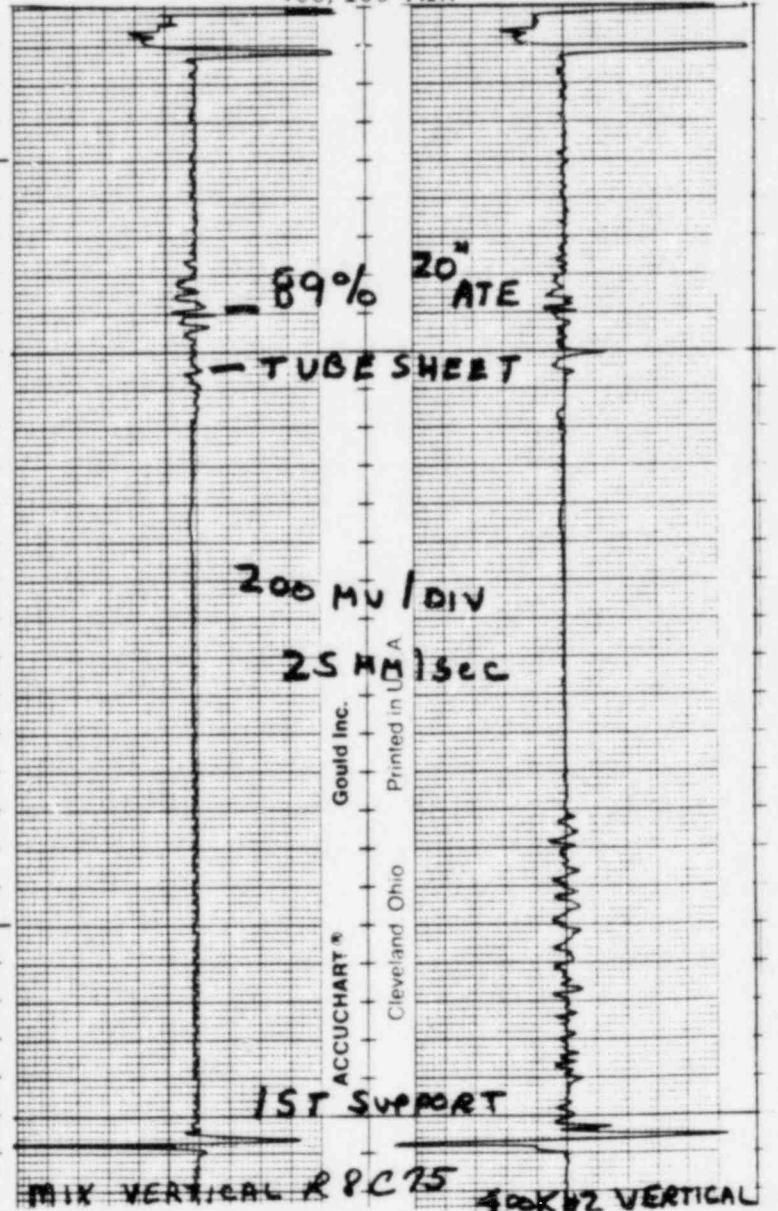
100



400/100 MIX



400/100 MIX



ACCUCHART®
Gould Inc.
Cleveland Ohio
Printed in U.S.A.

POINT BEACH #1 (WEP)
NOVEMBER 1981
2 V/D

S/G - A INLET
BEFORE SLEEVING
38 1/2" ATS

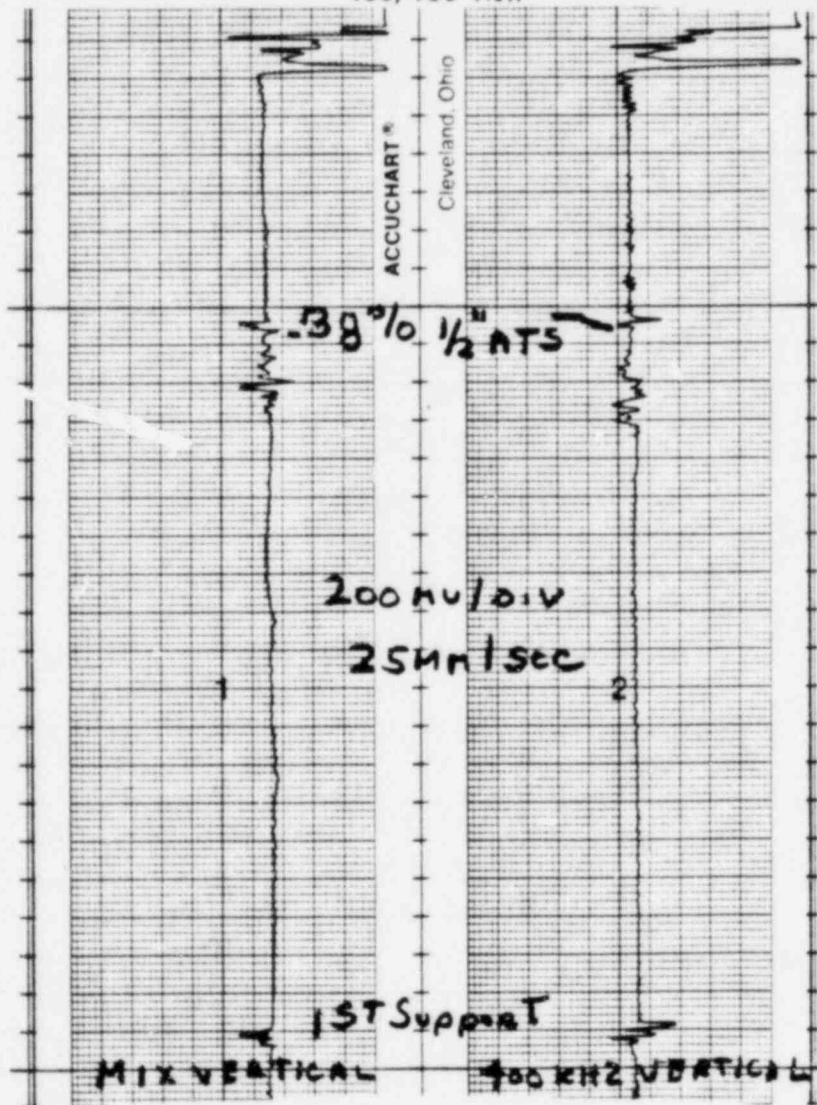
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R33_C54

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400/100 MIX

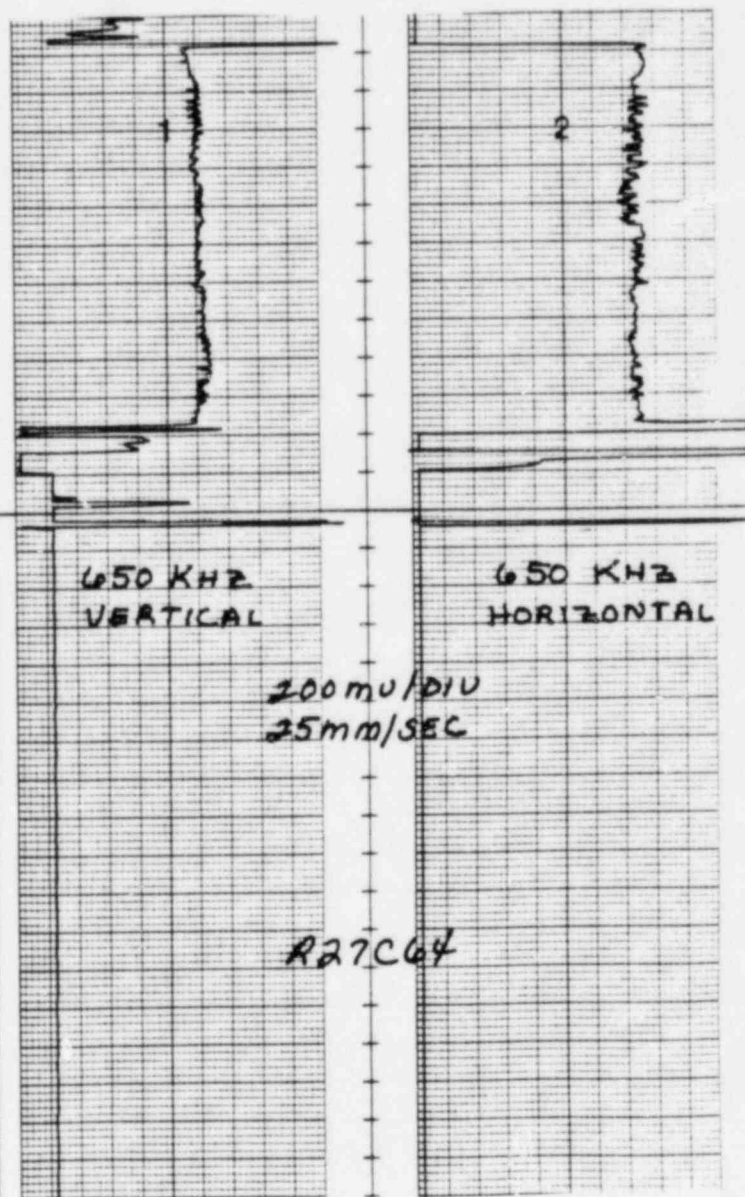
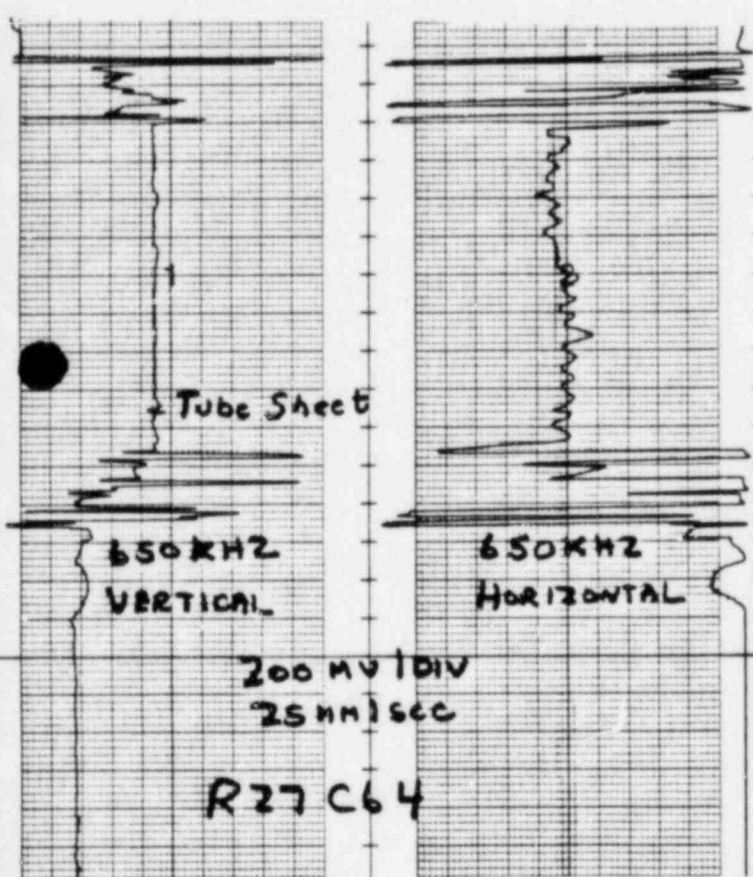


POINT BEACH #1 (WEP)
SLEEVING BASELINE NOVEMBER 1981
S/G - A INLET
650 kHz
INSPECTION UNDISTORTED SLEEVE

POINT BEACH #1 (WEP)
SLEEVING BASELINE OCTOBER 1982
S/G - A INLET
650 kHz
INSPECTION UNDISTORTED SLEEVE

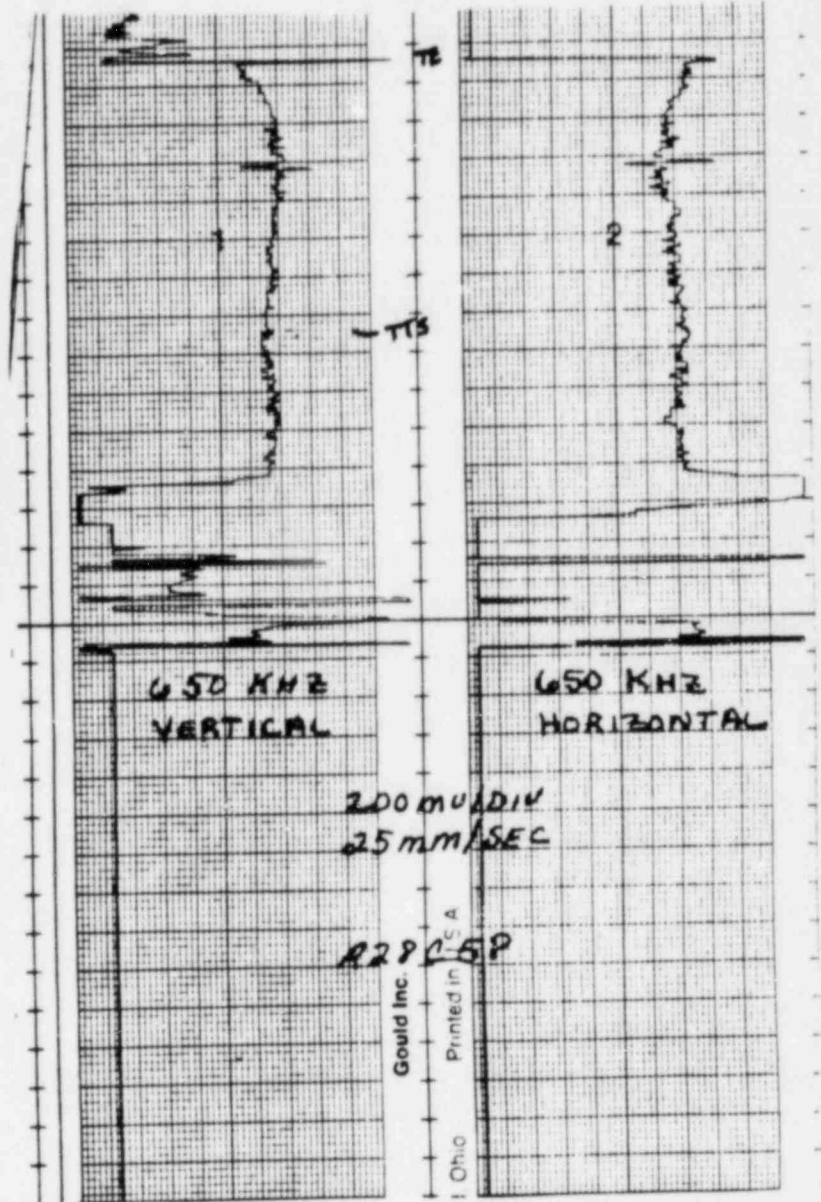
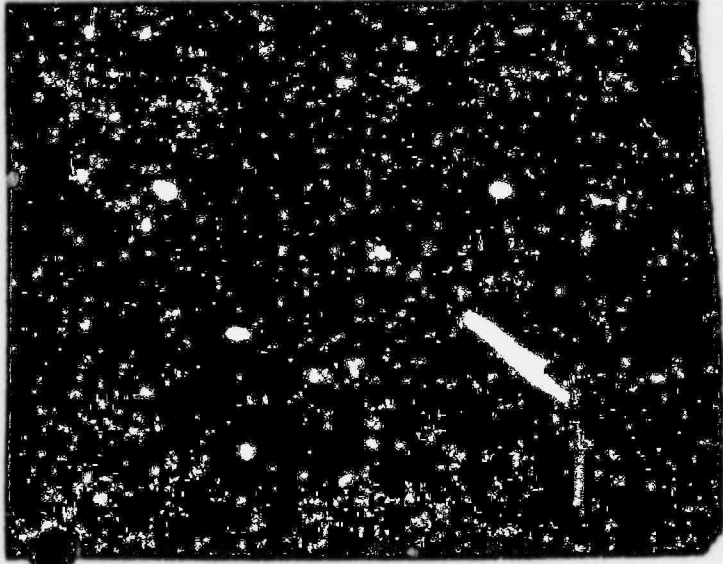
R27C64

R27C64



POINT BEACH #1 (WEP)
IN-SERVICE SLEEVING INSPECTION OCTOBER 1982
S/G - A INLET
650 kHz - INSPECTION UNDISTORTED SLEEVE

R28C58



1 MR. CHURCHILL: What we did is Mr. Fletcher
2 brought down from Westinghouse --

3 JUDGE BLOCH: I'm sorry, but it sounds to me
4 like you are beginning to testify.

5 MR. CHURCHILL: No, I think he brought it down
6 from Westinghouse. I think what I am trying to do is
7 provide a basis for getting this introduced into
8 evidence.

9 JUDGE BLOCH: Do you think it will be faster
10 if it could be stipulated to?

11 MR. CHURCHILL: I was going to explain it
12 quickly and ask the parties if they would stipulate to
13 its introduction.

14 These are the strip chart readouts and some
15 pictures from the oscilloscope, other particular
16 indication from the strip chart readouts from standards
17 and various tube sleeves at Point Beach, and I would ask
18 at this time that it be accepted into evidence.

19 The purpose of this, Your Honor, is to help to
20 explain to the Board, as the Board requested last week,
21 what eddy current testing is all about, how it is tested
22 and read.

23 JUDGE BLOCH: Who is the individual that
24 supervised the collection of these things and knows that
25 these are the real charts that we would worry about?

1 MR. CHURCHILL: I believe that Mr. Fletcher
2 could do it. I could ask him one or two questions or we
3 could just stipulate it into the record if the other
4 parties don't object.

5 JUDGE BLOCH: Mr. Fletcher, do you know these
6 are the authentic charts that are being discussed?

7 WITNESS FLETCHER: Yes, Your Honor. To the
8 best of my knowledge, these charts were prepared under
9 my direction from tape recordings that were duplicates
10 of the tapes from the eddy current inspection from the
11 Point Beach plant.

12 JUDGE BLOCH: Did you in fact start by making
13 a larger sample than the one we have now, or is this the
14 entire sample that you made from the outset?

15 WITNESS FLETCHER: No. This collection here
16 is representative of the entire sample that we put
17 together or collected together.

18 JUDGE BLOCH: Are there any objections to the
19 admission of this exhibit into evidence?

20 MR. ANDERSON: No.

21 MR. BACHMANN: The Staff has none.

22 (The document previously
23 marked Applicant Exhibit
24 Number 2 for
25 identification was

1 received in evidence.)

2 JUDGE BLOCH: It shall remain bound into the
3 record.

4 JUDGE KLINE: The purpose of the Board
5 questions is just to understand the physical principles
6 of the instrument and I don't want to go into the
7 details of what each chart shows at this time. but it
8 does appear -- I assume that you are taking the top page
9 or the top picture on the first page. Is that an
10 oscilloscope display?

11 WITNESS DENTON: Yes, it is.

12 JUDGE KLINE: And that oscilloscope display
13 looks absolutely inscrutable to me. I haven't the
14 faintest understanding of what it means and I hope that
15 you can clarify.

16 MR. CHURCHILL: Your Honor, perhaps I can
17 explain what we had intended, and the order seems to be
18 shifting a little bit. We were going to have Mr.
19 Denton, as well as Mr. McKee who works for Mr. Denton
20 and reports to him. Mr. McKee is the man who actually
21 reads and interprets the eddy current signals as they
22 are brought to him from the Point Beach plant.

23 It was our intent to have Mr. Denton and Mr.
24 McKee following Mr. Fletcher, make a presentation using
25 Exhibit 2 to explain this. That is where -- that is the

1 order that I had intended to do this. I can do it in
2 any order that you wish, but perhaps the best way to do
3 is continue with Mr. Fletcher, with Mr. Denton's help,
4 for now until the Board has exhausted the questions,
5 turn over Mr. Fletcher for cross examination, and later
6 Mr. McKee and Mr. Denton could go through this in more
7 detail.

8 But we, of course, will do it in any order the
9 Board wishes.

10 JUDGE BLOCH: Mr. Churchill, we are not really
11 looking for an in-depth understanding at this point of
12 how you interpret it. We were looking for some
13 understanding of what that thing was at the top of this
14 page. It looks like a butterfly, but if your response
15 means that Mr. Denton can't tell us that --

16 MR. CHURCHILL: No, sir. Not at all. I just
17 thought since we were introducing exhibits out of order
18 that you might be wondering what I had in mind.

19 JUDGE BLOCH: We accept your order of
20 presentation, but we just thought we ought to clarify
21 the physical principle a little bit more at this point.

22 BY MR. CHURCHILL: (Resuming)

23 Q Mr. Denton, would you explain what that
24 inscrutable thing is on the top of page 1, please?

25 A (WITNESS DENTON) Actually, I can understand

1 the confusion because this display is on a memory
2 oscilloscope so you lose the concept of time when you
3 are looking at it. So if you just glance briefly at the
4 strip chart below it, which does have time, then you can
5 see as the probe is pulled through the standard the
6 strip chart is running and you see that the flaws are
7 actually separate, individual flaws.

8 But on the memory scope they just pile up on
9 top of each other. So you are looking at five flaws
10 simultaneously, which makes the things as -- we would
11 agree it is difficult. Then, due to the wonder of
12 electronics, we are able to split the beam on the
13 oscilloscope and look at three different channels, doing
14 this simulataneously.

15 So all three of those presentations -- well,
16 in this particular, case, the upper left corner is the
17 primary test frequency. The upper right corner is what
18 we call a subtractor frequency because we use it to
19 subtract the tube supports. And the lower is the sum of
20 adding the two upper signals together, which there is no
21 way you can look at that and understand why the answer
22 came out the bottom the way it is.

23 Q Mr. Denton, I wonder if you could show us what
24 you would see if you saw only an 80 percent defect?
25 What would it show up on the scope as?

1 A (WITNESS DENTON) If you had only the 80
2 percent flaw, it would be the large signal, standing
3 essentially vertical in the middle of the pattern, as
4 you can see, because we do have phase and amplitude in
5 this. It is obvious all of these signals are occurring
6 at different phase angles.

7 The way we make our living is reading phase
8 angles, basically.

9 JUDGE KLINE: When you make your analysis, is
10 your principal reliance on the strip chart or the
11 oscilloscope display?

12 WITNESS DENTON: We only use the strip chart
13 for screening for deflection and for the vertical
14 locations of the indications in the tubes. The flaws
15 are read from the oscilloscope. We cannot retrieve the
16 phase angle from the strip chart recording.

17 JUDGE KLINE: Could you define "phase angle"?

18 WITNESS DENTON: Well, this gets slightly more
19 complicated, but the signal that you are looking at, the
20 oscilloscope signal that you are looking at, you can see
21 it has a center point. The signals that you are looking
22 at revolve around the center point at the test
23 frequency. So electronically we essentially
24 strobe-attack that signal and just look at it at one
25 instant in the rotation.

1 So we have the electronic capability of
2 looking at that at any phase angle that we choose to.
3 So the standard that we use is we set probe motion
4 horizontal, which we then say that is zero time because
5 the change -- the signal caused by the motion of the
6 probe is due to magnetic coupling changes, which is
7 really at the sea of light, whereas current flow in the
8 tube is relatively slow.

9 So we just electronically set the viewer time
10 horizontal and to the left, and then measure the phase
11 angle between zero and an electronics clockwise -- later
12 in time is clockwise. Centering time is
13 counter-clockwise. So we may measure phase angles in
14 the clockwise direction from what we set as zero time.

15 So in this particular material, 100 percent
16 flaw is essentially 40 degrees, which you see the signal
17 at about 40 degrees setting here is about 100 percent
18 flaw.

19 JUDGE BLOCH: You are pointing to the upper
20 left of the three.

21 WITNESS DENTON: Well, the angle, of course,
22 is the same straight through. We actually measure clear
23 across.

24 JUDGE BLOCH: Of the three blurbs you
25 described in the upper left?

1 WITNESS DENTON: Yes, that is right.

2 JUDGE BLOCH: The angle is about 40 percent?

3 WITNESS DENTON: About 40 degrees for 100
4 percent flaw.

5 JUDGE BLOCH: And the angle on the one in the
6 middle, the lowest? It looks like it might in some
7 places be greater.

8 WITNESS DENTON: That is not untypical because
9 we have now added in the signal from the lower
10 frequency, which does tend to rotate it. But that is
11 not to be a concern because we have a calibration curve
12 that relates phase angle to depth for each of those
13 signals.

14 JUDGE BLOCH: Well, also, is this chart -- is
15 this a single frequency chart or multiple frequency?

16 WITNESS DENTON: This is a two-frequency
17 chart, with the third signal being the sum of those
18 two.

19 JUDGE BLOCH: And the one which is the sum is
20 the small?

21 WITNESS DENTON: The summation of the two top
22 ones is shown on the bottom. So any signal less than --
23 in phase angle less than the 100 percent is on the ID of
24 the tube because it is centered in time. Signals later
25 in time are on the OD of the tube.

1 JUDGE PAXTON: Mr. Denton, just to make
2 matters clear, you mentioned taking it off of an
3 oscilloscope and that appears on a magnetic tape.

4 WITNESS DENTON: We play the magnetic tape to
5 get the information retrieved.

6 JUDGE PAXTON: The magnetic tape is distinct
7 from anything you have on this page?

8 WITNESS DENTON: Except that the signals that
9 you are looking at probably originated from a magnetic
10 tape, yes, you're right.

11 JUDGE PAXTON: The charts are distinct from
12 magnetic tape?

13 WITNESS DENTON: That is true. We can also,
14 of course, mix strip charts from the magnetic tape if we
15 want to retrieve some other combination of strip
16 charts.

17 JUDGE BLOCH: How much time is represented
18 here?

19 WITNESS DENTON: This probe travels during the
20 inspection at one foot per second.

21 JUDGE BLOCH: Is this one second we're talking
22 about, or half a second?

23 WITNESS DENTON: The standard is probably
24 about a foot long.

25 JUDGE BLOCH: So that's one second.

1 WITNESS DENTON: Well, if you want to practice
2 your mathematics, I will just lead you through it. It's
3 25 millimeters per second on the strip chart recorder,
4 and each of those measures is 5 millimeters. So one can
5 get time back off the strip chart.

6 I always get confused, myself.

7 JUDGE BLOCH: So it's a lot -- well more than
8 one second?

9 WITNESS DENTON: That may well be. It was
10 pulled by hand, so it is a standard and not a test
11 tube.

12 JUDGE BLOCH: Have you completed the direct on
13 this portion of the testimony, Mr. Churchill?

14 MR. CHURCHILL: Yes, sir, I have. This
15 started out to be the direct examination of Mr.
16 Fletcher. He has now been assisted by Mr. Denton, and I
17 know that people are eagerly awaiting to cross-examine
18 Mr. Fletcher, and I guess the question is whether Mr.
19 Denton should remain to be cross-examined on what he
20 just said to the extent that any of us might feel we
21 could even attempt to try or should he be excused for
22 cross-examination and solely Mr. Fletcher -- perhaps we
23 should ask the parties whether they need any cross of
24 what Mr. Denton has testified to.

25 JUDGE BLOCH: The parties? Mr. Anderson?

1 MR. ANDERSON: I'll wait until when he returns
2 with the other gentlemen.

3 JUDGE BLOCH: Mr. Bachmann?

4 MR. BACHMANN: The Staff has no
5 cross-examination of Mr. Denton, nor Mr. Fletcher.

6 JUDGE BLOCH: Mr. Denton, you are temporarily
7 excused. You remain sworn as a witness.

8 WITNESS DENTON: Thank you.

9 (Witness excused.)

10 JUDGE BLOCH: Mr. Anderson.

11 CROSS-EXAMINATION ON BEHALF OF INTERVENOR,
12 WISCONSIN ENVIRONMENTAL DECADE

13 BY MR. ANDERSON:

14 Q Mr. Fletcher, from your qualifications I
15 understand you have a position with Westinghouse
16 Electric Corporation basically in charge of coordinating
17 the steam generator program?

18 A (WITNESS FLETCHER) That has been a part of my
19 duties, Mr. Anderson.

20 Q Would you set forth for the record the reasons
21 why your testimony would be relevant as to what decision
22 would be appropriate for the Point Beach nuclear plant
23 in particular?

24 MR. CHURCHILL: Your Honor, could we have a
25 clarification of that question?

1 MR. ANDERSON: I am trying to find out whether
2 he is familiar with Point Beach as well as his
3 Westinghouse duties.

4 JUDGE BLOCH: Well, Mr. Fletcher's been
5 admitted as a witness in this proceeding. The question
6 is whether you can challenge the truth of what he said.
7 You didn't ask any questions on voir dire. I don't
8 understand why you are asking the question at all.

9 MR. ANDERSON: I'm trying to ascertain the
10 extent of his knowledge about Point Beach in particular,
11 as opposed to his knowledge about the Westinghouse
12 testing program scenario.

13 MR. CHURCHILL: I would suggest that Mr.
14 Anderson take particular parts of Mr. Fletcher's
15 testimony that might be pertinent and ask him about
16 that, rather than asking him a general question about
17 his knowledge about Point Beach.

18 MR. ANDERSON: There's a question pending and
19 there's no objection. I would like an answer.

20 MR. CHURCHILL: Yes, I have an objection. I
21 have an objection on the basis of obfuscation. I can't
22 understand the question. I wonder if Mr. Anderson --

23 JUDGE BLOCH: I understood the question. The
24 question is the extent of Mr. Fletcher's direct
25 experience with the Point Beach steam generator.

1 MR. CHURCHILL: Well, then, sir, I have the
2 objection that I would like it more specific. If he
3 wants to ask Mr. Fletcher's experience with steam
4 generators, he should say what particular aspect of Mr.
5 Fletcher's testimony he is referring to.

6 MR. ANDERSON: I think under the modern rules
7 of evidence the cross-examination is not limited to the
8 substance of the direct testimony as long as it is
9 relevant to the proceeding. And he was qualified to
10 testify with respect to it.

11 MR. CHURCHILL: No, sir. The
12 cross-examination is limited to his direct testimony.

13 MR. ANDERSON: I don't believe that is
14 correct; as long as it is relevant to the contentions in
15 this proceeding.

16 JUDGE BLOCH: Mr. Anderson, Mr. Fletcher has
17 testified about eddy current testing, its accuracy and
18 its use for steam generators. I don't understand how
19 your question could possibly reflect on his credibility
20 as a witness or in any way be relevant to an attack on
21 his testimony.

22 MR. ANDERSON: I'm not sure I would use the
23 word "attack" at this point, until the hearing unfolds.

24 JUDGE BLOCH: What is it relevant to? Is it
25 relevant to his credibility on what he said?

1 MR. ANDERSON: It's relevant to, first of all,
2 what kind of questions I could ask that would be
3 answerable by this witness.

4 JUDGE BLOCH: He's not your witness. You are
5 supposed to cross-examine on what he said.

6 MR. ANDERSON: And what information he has
7 that might be relevant to the determination that this
8 Board has to make.

9 MR. CHURCHILL: Your Honor, no. He is
10 entitled to cross-examine only on the direct testimony
11 of this witness.

12 MR. ANDERSON: I don't believe that is
13 correct.

14 JUDGE BLOCH: Would Staff like to comment?

15 MR. BACHMANN: The Staff would like to point
16 out the Prairie Island decision, 1 NRC 1, which states
17 that the Intervenor may cross-examine on those portions
18 of witnesses' testimony which relate to matters which
19 have been placed into controversy by at least one of the
20 parties to the proceeding. It goes on from there.

21 I think that pretty much states the bounds of
22 cross-examination.

23 JUDGE BLOCH: I take it, Mr. Anderson, you
24 have no comments on the applicability of Prairie Island
25 1?

1 MR. ANDERSON: I am not talking about that. I
2 am talking about the rules of evidence that are
3 applicable generally to administrative agencies.

4 MR. BACHMANN: Judge Bloch, this was a
5 decision made by the Commissioners.

6 MR. ANDERSON: Perhaps you have a citation to
7 it?

8 JUDGE BLOCH: Prairie Island 1. Do you happen
9 to have it?

10 MR. BACHMANN: No, that is 1 NRC 1. That is
11 the citation.

12 JUDGE BLOCH: Mr. Anderson, on general
13 principles as well, the object of cross-examination is
14 to examine the veracity of what has been said, to
15 examine into the matters that have been testified to.
16 Generally, if you want to call your own witnesses you
17 may do so. You also could have on discovery, have
18 inquired more broadly than is allowed in trial.

19 This is not your witness. You must
20 cross-examine on what has been testified to, and
21 therefore the question will not be allowed.

22 BY MR. ANDERSON: (Resuming)

23 Q Mr. Fletcher, would you state your familiarity
24 with the licensee event reports of the company?

25 A (WITNESS FLETCHER) I am aware of some of the

1 licensee event reports submitted by the Point Beach
2 plants. I am not familiar with all of them.

3 Q Which ones are you not familiar with?

4 JUDGE BLOCH: Can you describe generally the
5 kind of reports that you are familiar with and the ones
6 that you are not?

7 WITNESS FLETCHER: I have only read a few of
8 the reports that pertain to some of the steam generator
9 inspections, but I cannot cite for you which ones I have
10 read or which ones I have not read. The licensee event
11 reports are submitted by the Applicant and so I will
12 have an occasion to read them as a random process, not
13 as a regular routine.

14 BY MR. ANDERSON: (Resuming)

15 Q Well, let me leap ahead and look, for example,
16 at page 6 of your prepared testimony, and you talk about
17 the rate of tube wall thickness per year for IGA in the
18 field. Could you indicate, for example, in that respect
19 what "in the field" means?

20 A (WITNESS FLETCHER) "In the field" in my
21 testimony refers to observations that have been made of
22 the apparent rate of IGA progression in steam generator
23 tubes that were inspected over the years at another
24 plant.

25 Q Are you saying, then, when you came here to

1 testify about what should be done for Point Beach, you
2 looked at the operating experience of a plant different
3 from the plant you were testifying here about today?

4 A (WITNESS FLETCHER) The basis of the statement
5 is a different plant, yes.

6 Q And when chemical analyses are done of the
7 composition of the impurities in the steam generators at
8 Point Beach, do you familiarize yourself with them?

9 MR. CHURCHILL: Objection, Your Honor. What
10 part of the testimony, may I inquire, is he
11 cross-examining on now?

12 MR. ANDERSON: Am I required to answer that?

13 JUDGE BLOCH: Let me see if I can phrase a
14 Board question that might satisfy your purposes.

15 Do you have any reason for believing that the
16 rate in your testimony on page 6 is applicable to Point
17 Beach?

18 WITNESS FLETCHER: Yes, I believe it is
19 applicable, Judge Bloch, because the diagnosis of the
20 examination of pulled tubes from the other plant showed
21 it to be IGA with stress corrosion cracking, but IGA,
22 and it was diagnosed to be the result of caustic, the
23 presence of caustic on the tube surface.

24 JUDGE BLOCH: Have you made a detailed
25 comparison of the amount of caustic in that reactor and

1 the amount of caustic present at different times at
2 Point Beach?

3 WITNESS FLETCHER: Detailed comparisons are
4 rather difficult to do, since the amount of extraneous
5 material such as sludge which may be present in varying
6 amounts can give you varying concentrations or varying
7 levels of the caustic species present. It is rather
8 clear that, from the data, that caustic was present,
9 though.

10 JUDGE BLOCH: Well, can you give us some idea
11 of the error you expect to be present in this kind of a
12 generalization from a single other steam generator to
13 the Point Beach steam generator? How much error do we
14 expect to be present in trying to make that
15 generalization?

16 WITNESS FLETCHER: I think the comparison or
17 the analogous work is that work which we have performed
18 in the laboratory with caustic solutions to produce
19 intergranular attack or IGA in test specimens. That
20 gave us data that was consistent with the figure that I
21 cite in my testimony of about 15 percent of tube wall
22 thickness per year from the laboratory data, and this
23 was consistent with that which we noticed from the
24 field.

25 So the data from Point Beach plant is expected

1 to be consistent with that and expected to be analogous
2 with that.

3 JUDGE BLOCH: So you are relying more on the
4 laboratory limits than you were on the generalization
5 from the field data?

6 WITNESS FLETCHER: Well, I say they are
7 consistent with one another. The laboratory data are
8 certainly definitive in terms of the environment, in
9 terms of the times for corrosion to occur, the
10 metallographic examination of the sample. So the
11 laboratory testing is certainly more definitive.

12 JUDGE BLOCH: What is the train of logic from
13 which we get from the laboratory test to the 15 percent
14 rate for Point Beach? Obviously, the exposure in the
15 laboratory was at a far higher rate of caustic than you
16 expect it to be at Point Beach. What was the rate in
17 the laboratory and how did you get to your estimate for
18 Point Beach?

19 WITNESS FLETCHER: Well, the first thing one
20 has to do, Judge Bloch, is set up the conditions which
21 will form IGA. In the laboratory that has been
22 determined to be produced when a tube specimen is
23 immersed in a solution of sodium hydroxide caustic of
24 approximately ten percent concentration. And there are
25 a range of concentrations that will provide the

1 intergranular attack.

2 Once you have achieved a concentration of ten
3 percent or perhaps even greater, the rate of IGA does
4 not significantly change. If you have an extremely
5 dilute solution of sodium hydroxide, you would not
6 expect any IGA at all.

7 JUDGE BLOCH: So you would say the rate of IGA
8 approaches an upper limit of 15 percent; it occurs at
9 approximately 10 percent sodium hydroxide?

10 WITNESS FLETCHER: And at higher
11 concentrations.

12 JUDGE BLOCH: But the upper limit of the rate
13 is approximately 15 percent?

14 WITNESS FLETCHER: That is correct, that is
15 approximately the value.

16 JUDGE BLOCH: So that regardless of how
17 caustic the environment might be at Point Beach, you
18 wouldn't expect the rate to exceed 15 percent.

19 WITNESS FLETCHER: I would not expect the rate
20 to vary much from 15 percent of a through-wall
21 thickness.

22 JUDGE BLOCH: Well, what is "much"?

23 WITNESS FLETCHER: A few percent.

24 JUDGE BLOCH: So it might really approach an
25 upper limit of 18 percent, but very gradually?

1 WITNESS FLETCHER: Yes, I think so. I think
2 that the influence of concentration is not so strong
3 once you have achieved a concentration of approximately
4 ten percent caustic. The error band on 15 percent of
5 through-wall thickness may be 3 percent, perhaps. There
6 is a variability in what you achieve in laboratory
7 testing that would be approximately 10 to perhaps 20
8 percent of the value, of the average value.

9 JUDGE BLOCH: Do you think we have ever gotten
10 concentrations, local concentrations in steam generators
11 of ten percent caustic?

12 WITNESS FLETCHER: The thermodynamic
13 conditions certainly exist for that. There is no direct
14 measurement of that concentration, owing to the
15 temperature and the temperature differences, which
16 dictate what concentrations you can achieve. In the
17 thermodynamic sense, you can achieve up to 15 percent
18 concentration of sodium hydroxide.

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1 JUDGE BLOCH: Mr. Anderson, I hoped that
2 solved the question you are trying to ask.

3 MR. ANDERSON: No, the question is still
4 outstanding, and the question was, does Mr. Fletcher hav
5 any familiarity with chemical analyses done by
6 Westinghouse on impurities in the steam generators at
7 Point Beach.

8 WITNESS FLETCHER: Yes, I have familiarity
9 with that.

10 BY MR. ANDERSON: (Resuming)

11 Q So when a study is done, some analysis is done
12 and a report is submitted to the licensee, you have some
13 review process over that? Or at least you familiarize
14 yourself with that report?

15 A (WITNESS FLETCHER) Well, certain amounts of
16 those reports or certain reports I do review, yes.

17 Q Before I proceed, let me cover the point you
18 made in your supplemental testimony.

19 JUDGE BLOCH: Excuse me. Just so I know where
20 we are going, what reports are we talking about? Is it
21 reports on the level of caustic in the generator?

22 MR. ANDERSON: What we will be coming to later
23 on is, I will establish where his expertise is, is the
24 extent of, for example, metallic substances like copper,
25 because that can have an effect on the eddy current

1 signal.

2 JUDGE BLOCH: But the witness has said he sees
3 certain reports. I just want to know what kinds of
4 reports we are talking about.

5 MR. ANDERSON: The report I am talking about
6 right now, for example, is one referenced in the motion
7 for litigable issues.

8 JUDGE BLOCH: Well, let's ask about that
9 report, and maybe Mr. Fletcher can clarify for us what
10 reports we are talking about which he said he sees.

11 MR. ANDERSON: That report was a report in a
12 letter dated February 4th, 1974, for Mr. G. W. Heard,
13 Engineer, Systems Chemistry Operations, PWR Systems
14 Technology, Westinghouse Electric Corporation, addressed
15 to a Mr. Glenn A. Reid, Plant Superintendent of Point
16 Beach Nuclear Plant.

17 JUDGE BLOCH: Are you familiar with that
18 report?

19 WITNESS FLETCHER: Only vaguely. I don't have
20 a copy of that report.

21 MR. CHURCHILL: Your Honor, I think we are
22 getting into the area of the 48-hour rule on whether or
23 not he has identified documents, and I also think we are
24 getting into the area of the relevancy, because if we
25 are talking about impurities deposited on surfaces and

1 interference of eddy current signals, it depends on what
2 it is from. I guess we will have to see where he is
3 going from that, because I think it is going to be
4 beyond the scope of the contention as framed by this
5 board.

6 JUDGE BLOCH: Mr. Anderson, that document you
7 are now referring to does not appear to be one we
8 discussed when we talked about the 48-hour rule. Was it
9 one?

10 MR. ANDERSON: Yes, it was. It is one listed
11 on Page 9 on the motion for litigable issues, dated July
12 21st, '82. Now, I think -- I was not going to get back
13 to this until later. I wanted to first go sequentially
14 through the testimony, if I may.

15 JUDGE BLOCH: Why?

16 MR. ANDERSON: I intended, unless the board
17 wishes otherwise, to go through the testimony
18 sequentially and not reach this until a later point. I
19 was just with these two questions trying to find what
20 the ambit of his knowledge is before I proceed with any
21 other cross examination.

22 JUDGE BLOCH: Do you need a further answer at
23 this point?

24 MR. ANDERSON: No, I don't.

25 JUDGE BLOCH: Let's proceed.

1 BY MR. ANDERSON: (Resuming)

2 Q In response to a follow-up question by Mr.
3 Churchill in your supplementary testimony, Mr. Fletcher,
4 if I understood you correctly, you made reference to the
5 testimony of the staff about a 30 percent degradation.

6 JUDGE BLOCH: Off the record, please.

7 (Whereupon, a discussion was held off the
8 record.)

9 JUDGE BLOCH: Back on the record, please.

10 BY MR. ANDERSON: (Resuming)

11 Q In response to a question by Mr. Churchill
12 with respect to your supplemental testimony, he asked
13 you to make reference to Mr. Murphy's testimony on Page
14 4 about a reduction in signal response under certain
15 conditions, and you answered, if I understood you
16 correctly, that yes, there is a reduction in the signal
17 response, but it can be compensated for by increasing
18 the amplification. Is that correct?

19 A (WITNESS FLETCHER) Signal reduction is
20 compensated for by increasing amplification with a
21 standard sleeve inserted in a tube.

22 Q Now, if you increase the amplification, would
23 that reduce the ability to discern, separate out noise
24 in the signal?

25 A (WITNESS FLETCHER) No. The amplification is

1 made through adjustment of the electronic controls in
2 the eddy current equipment such that you get a minimum
3 deflection or amplitude of the eddy current signal from
4 the standard holes.

5 Q Are you saying that if you increase the
6 amplification --

7 JUDGE BLOCH: You get a minimum deflection
8 from the standard holes?

9 WITNESS FLETCHER: Yes. In other words, the
10 requirements are that the instrumentation be set up such
11 that if you have a 20 percent hole standard, 20 percent
12 penetrating into the tube wall, that the signal from
13 that be a minimum distance or a minimum length on the
14 oscilloscope that is used for calibration.

15 BY MR. ANDERSON: (Resuming)

16 Q Are you saying if you increase the amplitude,
17 you increase the signal response?

18 A (WITNESS FLETCHER) That is correct.

19 Q Why wouldn't it be the case -- when you always
20 increase the amplitude, what limits are imposed on you
21 for unlimited increases in amplitude?

22 A (WITNESS FLETCHER) Well, the purpose of
23 setting up the amplitude on the eddy current equipment
24 is such that you achieve a visibility for at least a 20
25 percent penetration into the tube wall, but at the same

1 time a 100 percent through wall penetration is still in
2 scale. If you were to increase the gain or the
3 amplification such that the 20 percent occupied the full
4 scale, then you would not be able to have on scale --
5 then the larger signals are derived from a 100 percent
6 through hole standard.

7 Q Is there any then limit -- strike that.

8 What would be lost, then, if you increased the
9 amplitude, if you had taken part of the upper band off
10 the scale? What discernment capability would be lost,
11 if any, if you had taken the upper portion of the signal
12 off the scale by increasing the amplitude?

13 A (WITNESS FLETCHER) The procedure and the
14 requirements for setting up the eddy current equipment
15 are described in the ASME Section 11, Appendix 4 that
16 establish the range and the limitations for signal
17 displacement or amplitude, so those are the procedures,
18 and that is the stipulated requirement for establishing
19 the calibration or settings on the eddy current
20 equipment.

21 Q Now, on another matter in the supplemental
22 testimony --

23 JUDGE BLOCH: Mr. Anderson, I would like to
24 follow up on that. At Point Beach, the technical
25 specifications required by the tube that has more than a

1 40 percent through wall crack be plugged. Would you be
2 testing more accurately or less accurately if you set
3 your scale so that 40 percent was the maximum reading on
4 the scale?

5 WITNESS FLETCHER: Judge Bloch, you will have
6 to perhaps explain to me accuracy. Are you talking
7 about accuracy in terms of 41 percent versus 40
8 percent? The detectability of a 40 percent indication
9 is within the acceptance standards established by the
10 code.

11 JUDGE BLOCH: That is a 40 percent standard
12 notch, right?

13 WITNESS FLETCHER: That is a 40 percent
14 penetration that is established from the calibration
15 standard that is used to set up the equipment. That
16 ranges all the way from 20 percent penetration through
17 to a 100 percent penetration. So that is the full scale
18 on which the equipment is set up.

19 JUDGE BLOCH: I am wondering why this standard
20 is establish so that your 100 percent is at the bottom
21 of the scale instead of 50 percent or 60 percent. Is
22 there no disadvantage for increasing the amplitude other
23 than the readings going off-scale?

24 WITNESS FLETCHER: Well, let's consider this.
25 As Mr. Denton explained earlier, the actual penetration

1 of a -- into a tube wall is really given by the phase
2 angle. Now, when the equipment is set up, there are
3 certain displacements or amplitudes that must be
4 achieved in setting up that equipment as described in
5 the code procedure, but the actual penetration of the
6 tube wall is derived from the phase angle as opposed to
7 the amplitude. So the procedure sets both amplitude,
8 that is, the procedure for standardization, the use of
9 standards to set up the equipment sets up both amplitude
10 as well as the phase angle derived from the standard
11 notches, standard drilled holes as such.

12 Then you have a full spectrum from 100 percent
13 penetration all the way back to 20 percent penetration.
14 That is displayed on the first page of the exhibit that
15 was referred to by Mr. Denton.

16 JUDGE BLOCH: Okay. If we do the eddy current
17 test with an unsleeved tube, we use a certain
18 amplitude. You are saying when we do it with a sleeved
19 tube, we increase the amplitude.

20 WITNESS FLETCHER: The gain settings are such
21 as to make up for the sensitivity lost when a sleeve is
22 placed in a tube.

23 JUDGE BLOCH: And by doing we lose is no
24 sensitivity at all in the test data?

25 WITNESS FLETCHER: That is correct.

1 BY MR. ANDERSON: (Resuming)

2 Q Did you also in your supplemental testimony
3 indicate, as I understood you to say, that after a 30
4 percent through wall defect intergranular attack you
5 will find that accompanied by a stress corrosion crack?

6 A (WITNESS FLETCHER) That is what we found on
7 tube samples removed from Point Beach plant.

8 Q And will that stress corrosion cracking be
9 such that it will be detectable by eddy current testing
10 in the field?

11 A (WITNESS FLETCHER) It depends. Stress
12 corrosion cracking may or may not be detected at the 30
13 percent level. It is expected to be detected when the
14 depth of penetration exceeds 40 to 50 percent.

15 Q Well, on all occasions or just sometimes would
16 you expect it to be detected at 40 percent or more?

17 A (WITNESS FLETCHER) Well, the formation of a
18 stress corrosion crack can be such that it would be an
19 extremely small volume effect that could penetrate the
20 tube wall to, say, 40 percent. And if its length is
21 very short, and the volume of material that is disturbed
22 in terms of conductivity may be so small as to give you
23 a very small amplitude signal, therefore a very small
24 crack, short in length, short in axial length, even
25 though it might penetrate to 30 or 40 percent of the

1 tube wall, may not be discerned as a 30 or 40 percent
2 penetration.

3 Q Well, let us assume that the axial extent of
4 the defect is more than 50 mils to take into account the
5 size of the bobbin.

6 A (WITNESS FLETCHER) Excuse me?

7 Q Let us assume the extent of the defect is 50
8 mils or more to take into the problem the measurement
9 problems with the bobbin size. If we make both of them
10 50, would you then be able to have a 100 percent
11 certainty of detecting intergranular attack at 40
12 percent or more in the field?

13 MR. CHURCHILL: Can we have clarification? I
14 thought you were talking about stress corrosion cracking
15 before.

16 MR. ANDERSON: I am, but he said it was 30
17 percent or more when accompanied by stress corrosion
18 cracking.

19 BY MR. ANDERSON: (Resuming)

20 Q Is that correct?

21 A (WITNESS FLETCHER) What I said was, we would
22 expect the stress corrosion cracking to be present when
23 IGA had penetrated through the tube wall to the extent
24 of 30, 40 percent or so.

25 Q The question is, if we assume the defect is 50

1 mils or more in extent, is it your testimony that in the
2 field eddy current tests will also detect a defect of 40
3 percent or more through wall defect?

4 MR. CUNNINGHAM: Objection. Could Mr. Anderson
5 explain what he means by defect of 50 mils? What kind
6 of defect? What dimension of defect are you talking
7 about?

8 MR. ANDERSON: Just pure axial length.

9 BY MR. ANDERSON: (Resuming)

10 Q In other words, besides limitation you were
11 getting at, if I understood, it was implicit in your
12 answer, Mr. Anderson, related to the size of the bobbin
13 and relating to measurement below a certain defect,
14 axial length of defect.

15 A (WITNESS FLETCHER) Mr. Anderson, I was making
16 no reference to the size of the bobbin.

17 Q What is the reason why certain size or extent
18 would not be detectable?

19 A (WITNESS FLETCHER) It has to do with the
20 change in conductivity of the tube wall as is measured
21 by the eddy current. If it is a very small volume
22 effecting a change of conductivity, which is what the
23 eddy current senses, then you expect a small signal, and
24 that is called a small volume signal.

25 Q Without defining the width of the defect, just

1 answering the question with respect to a 50 mil axial
2 length, is it your testimony that you can always in the
3 field detect a 40 percent or more defect caused by
4 intergranular attack?

5 A (WITNESS FLETCHER) Mr. Anderson, I thought we
6 were talking about stress corrosion cracking, but you
7 said intergranular attack in the presence of 50 mil
8 intergranular attack and axial extent.

9 Q Well, we assume it is going to be accompanied
10 by stress corrosion cracking because it is more than 30
11 percent, aren't we? That was your previous answer.

12 A (WITNESS FLETCHER) Mr. Anderson, you have me
13 confused, because I thought we were talking axial extent
14 and now you are talking depth.

15 Q I am talking both.

16 A (WITNESS FLETCHER) You are talking both.

17 JUDGE BLOCH: Mr. Fletcher, could you try to
18 explain the variables that affect whether or not you
19 could always detect through wall cracks.

20 WITNESS FLETCHER: I guess the variables
21 involved would be the volume, what is referred to as the
22 volume of metal that is involved with the corrosion
23 being present. For example, if I had a very short crack
24 that may have penetrated 30 or 40 percent through the
25 tube wall, but because of its shortness the metal is

1 really not separated. It is a tight crack. It would
2 get a very small response from the eddy current
3 testing.

4 JUDGE BLOCH: At what length of crack would
5 you expect to always be able to detect it?

6 WITNESS FLETCHER: I would expect to detect a
7 crack when it had achieved something, let's say,
8 something on the order of 150 to 250 mils, a thousandth
9 of an inch. Now, a 50 mil long crack I cannot say at
10 this point. That sounds very short.

11 BY MR. ANDERSON: (Resuming)

12 Q Let me make sure I am correct. A 150 mil
13 axial length defect that penetrates 40 percent or more
14 instigated by intergranular attack, would you state that
15 that will always be depicted in the field or not?

16 A (WITNESS FLETCHER) Again, Mr. Anderson, you
17 have confused me a little bit on introducing IGA in that
18 we are talking about stress corrosion cracking.

19 JUDGE BLOCH: Okay. Let's answer this one the
20 way it was asked. You did say intergranular attack.

21 WITNESS FLETCHER: Yes. Could you repeat the
22 question, then? I am sorry. I was focused on stress
23 corrosion.

24 BY MR. ANDERSON: (Resuming)

25 Q Sure. A defect precipitated by intergranular

1 attack that is 150 mils in axial extent and 40 percent
2 through wall defect, will you always be able to detect
3 that in the field?

4 A (WITNESS FLETCHER) I can't say that we would,
5 Mr. Anderson. That is the type of variable that we are
6 evaluating in the program on reliability and
7 repeatability of the detection of intergranular attack.
8 Now we are talking about an axial length there that is
9 generally much shorter than what we have seen in field
10 samples.

11 JUDGE BLOCH: Let me ask you a related
12 question.

13 WITNESS FLETCHER: Yes.

14 JUDGE BLOCH: If you have a 40 percent through
15 wall stress corrosion crack that you had detected, let's
16 make it 35 percent so it is within limits, 35 percent
17 through wall, with what frequency would you expect that
18 stress corrosion cracking would be accompanied by IGA
19 that would actually make the total defect exceed 40
20 percent?

21 Do these things frequently occur in
22 association with each other, so you would expect
23 whenever you have stress corrosion cracking you get
24 further IGA right below it?

25 WITNESS FLETCHER: Judge Bloch, let me turn

1 that around for you, because as we view the process, the
2 first thing that occurs would be the formation of IGA on
3 the outer surface of the tube, and as that proceeds into
4 the tube wall, then you would begin to develop stress
5 corrosion cracking that would proceed in the same
6 direction toward the inner surface of the tube wall, so
7 that that is what I referred to earlier in my testimony,
8 in that you would expect to find stress corrosion
9 cracking emanating from the intergranular attack as the
10 IGA proceeds into roughly beyond 30 or 40 percent
11 penetration by IGA.

12 Then you would expect to see the formation of
13 the fingers of stress corrosion cracking.

14 JUDGE BLOCH: Is the mechanism something like
15 this? You have IGA of 30, 40, 50 percent. You have
16 pressure within the tube. This pressure causes the
17 separation along the weakened grain boundary so that you
18 now have stress corrosion cracking. Would you expect
19 that separation to occur for the entire depth of the IGA
20 or only a portion of it?

21 WITNESS FLETCHER: I would expect that once
22 separation began, it would be for the entire depth of
23 IGA.

24 JUDGE BLOCH: Under those circumstances, you
25 would never expect IGA to underlie stress corrosion

1 cracking. It would always proceed to the full extent of
2 the IGA.

3 WITNESS FLETCHER: I would expect it to
4 proceed to the full extent of IGA, once the pressure
5 stresses begin to open up and to open up the grain
6 boundaries that have been affected by IGA, and are the
7 basis for the progression of stress corrosion cracking
8 that proceeds beyond the IGA front.

9 JUDGE BLOCH: What is the foundation? What is
10 the basis for that opinion? Is that a judgment based on
11 knowledge of these processes? Is it empirical
12 information? How do you know that it will always go to
13 the full depth of the IGA?

14 WITNESS FLETCHER: Well, that is what we have
15 observed from samples that have been removed from the
16 plant that have been examined in such a way as to show
17 that the grains can be separated or are separated, and
18 they separate out to the initiation point for
19 intergranular attack.

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1 There is cleavage between the grain boundaries
2 as one proceeds into the tube wall toward the inner
3 surface.

4 JUDGE BLOCH: You said from the plant. You
5 are familiar with more than just this plant?

6 WITNESS FLETCHER: Yes.

7 JUDGE BLOCH: To your knowledge, whenever they
8 have done -- whenever they have done laboratory tests on
9 tubes in which stress corrosion cracking is present,
10 that stress corrosion cracking is not accompanied by
11 further IGA beneath the stress corrosion cracking.

12 WITNESS FLETCHER: I am sorry, Judge Bloch,
13 you have lost me on that one.

14 JUDGE BLOCH: We were asking whether a stress
15 corrosion crack might have IGA beneath it in the sense
16 that it is deeper than the stress corrosion crack. The
17 grain boundaries are weakened to a depth greater than
18 the stress corrosion crack itself, but there is no
19 separation down there. It is still just IGA, not stress
20 corrosion crack. I think you just said that laboratory
21 samples of stress corrosion cracking indicate that that
22 never occurs, that the IGA is never found further
23 through the wall than the stress corrosion crack.

24 WITNESS FLETCHER: We have found IGA of itself
25 that has not penetrated the tube wall sufficient for

1 stress corrosion cracking to be present in local
2 regions. But to my acquaintance with all of the samples
3 that we have looked at, we have never seen IGA or
4 pockets of IGA beneath the area where stress corrosion
5 cracking might occur.

6 BY MR. ANDERSON: (Resuming)

7 Q In your answer to my last question, did you
8 assume there was no stress corrosion cracking
9 accompanying that 40 percent IGA defect, or did you
10 not?

11 MR. CHURCHILL: Could we have the last
12 question back again? That was quite a while ago.

13 JUDGE BLOCH: Why don't we ask the question
14 again.

15 BY MR. ANDERSON: (Resuming)

16 Q Of course. I asked you previously about the
17 defect that was 150 mils in axial extent instigated by
18 an IGA and 40 percent through-wall defect, and you made
19 an answer.

20 Did your answer imply or assume that there was
21 a crack accompanying that IGA or not?

22 A (WITNESS FLETCHER) Could we have the answer
23 read back, please?

24 (The reporter read the record as requested.)

25 JUDGE BLOCH: On the record, Mr. Anderson.

1 MR. ANDERSON: I would like to wait for an
2 answer from Mr. Fletcher.

3 WITNESS FLETCHER: What is the question?

4 BY MR. ANDERSON: (Resuming)

5 Q The question was in your previous answer did
6 you contemplate that that intergranular defect was
7 accompanied by a stress corrosion crack?

8 A (WITNESS FLETCHER) Mr. Anderson, as I
9 understood your question, I thought we were talking just
10 about intergranular attack. So my response had to do
11 with just intergranular attack without any reference to
12 stress corrosion cracking.

13 JUDGE BLOCH: As I recollect, the Chair had
14 asked that he respond only with respect to IGA.

15 BY MR. ANDERSON: (Resuming)

16 Q But your testimony also is that -- correct me
17 if I'm wrong, Mr. Fletcher -- that when IGA exceeds 30
18 percent of a through-wall defect it will always be
19 accompanied by a stress corrosion crack. Is that your
20 testimony?

21 A (WITNESS FLETCHER) I gave you a range on
22 that. Thirty to 40 percent has been our experience from
23 examination of tube samples from the field.

24 Q And based upon your answer to Mr. Bloch, once
25 it is accompanied by a crack the crack will extend the

1 entire extent of what was previously intergranular
2 attack?

3 A (WITNESS FLETCHER) We would expect that to be
4 true where it would extend through the IGA.

5 Q Okay. Now, modifying the question you
6 previously answered to be one with 150-mil axial extent
7 defect, 40 percent or more through-wall defect, your
8 testimony would be that it would always be accompanied
9 by a crack, even if it was propagated by an
10 intergranular attack initially. Is that correct?

11 A (WITNESS FLETCHER) I think my words would be
12 generally expect to see that when the penetration had
13 exceeded about 30 percent of the tube wall by
14 intergranular attack. The laboratory example of tube
15 samples removed from the field have indicated the
16 presence of this accompanying stress corrosion cracking.

17 Q Now when you have used the word "generally",
18 does that mean up to 49 percent of time you would not?
19 What does "generally" mean?

20 A (WITNESS FLETCHER) No. "Generally" means
21 that for the most part we have seen these cracks
22 accompany. That is the majority. That is, let's say,
23 more than 75 percent of the time I cannot rule out there
24 would be an exception to that.

25 Q So your testimony is that 25 percent of the

1 time it may not be accompanied by a crack?

2 A (WITNESS FLETCHER) I have given you a figure
3 of merit. I have not tried to be accurate.

4 JUDGE BLOCH: Mr. Fletcher, is there a
5 particular portion in the steam generator where an
6 intergranular attack might not be accompanied by stress
7 corrosion cracking?

8 WITNESS FLETCHER: It could be, Judge Bloch,
9 as has been discussed earlier. If one considers that
10 the tube in the tube cheat hole may be completely
11 compacted by the presence of a sludge, a very hard,
12 non-resilient sludge-type material, that the tube may
13 not be in a condition to expand, which increases the
14 stresses which would be a prerequisite for the formation
15 of stress corrosion cracking.

16 JUDGE BLOCH: Outside of that area, would you
17 always expect 40 percent through-wall IGA to be
18 accompanied by a stress corrosion crack?

19 WITNESS FLETCHER: I would expect that based
20 upon the field samples we have seen.

21 BY MR. ANDERSON: (Resuming)

22 Q Now another answer to a supplemental question
23 by Mr. Churchill dealt with some laboratory experiments
24 you were doing about improving IGA detection. Is that
25 not true?

1 A (WITNESS FLETCHER) That is correct, Mr.
2 Anderson.

3 Q Now when you prepared your testimony, you
4 understood, did you not, that the question being asked
5 was whether eddy current testing is adequate to detect
6 serious stress corrosion cracking or intergranular
7 attack, did you not?

8 A (WITNESS FLETCHER) Yes. I had read the -- I
9 have read the issue.

10 Q Would you state why you do not include this
11 laboratory program in your direct testimony?

12 MR. CHURCHILL: Objection, Your Honor. The
13 testimony is in response to the questions set forth
14 right there.

15 MR. ANDERSON: And that question asked about
16 detection of intergranular attack, Mr. Churchill.

17 MR. CHURCHILL: What was the question that was
18 asked that you think is insufficiently or incompletely
19 answered?

20 MR. ANDERSON: That is exactly what the
21 question is. The question is about the laboratory
22 tests.

23 MR. CHURCHILL: Which question, please?

24 MR. ANDERSON: The question is the question
25 posed by the Board, Mr. Churchill.

1 MR. CHURCHILL: The Board did not pose the
2 question. The Board raised a contention. This is a
3 series of questions and answers.

4 MR. ANDERSON: I am referring solely to the
5 Contention. I am asking why the witness did not choose
6 to discuss the laboratory test in addressing the
7 Contention, which he stated in the question on page
8 number 1.

9 MR. CHURCHILL: Your Honor, there is a
10 contention in this hearing. There is testimony
11 presented. The Applicant presents his testimony. There
12 is no such thing as the right of somebody to say well,
13 why didn't you say more or you could say well, why
14 didn't you say less. We addressed this issue as best we
15 could at the time.

16 We have looked at the Staff's testimony. We
17 thought it would be helpful to clarify it some more.

18 MR. ANDERSON: I think Mr. Churchill is
19 testifying. I am asking those questions of Mr.
20 Fletcher.

21 JUDGE BLOCH: Mr. Anderson, you are suggesting
22 there is an incomplete answer in the Licensee's
23 testimony. Mr. Churchill is saying --

24 MR. ANDERSON: No, I am not. I am suggesting
25 that the timeliness of the supplemental testimony is in

1 question.

2 JUDGE BLOCH: You now wish to attack the
3 timeliness of the supplementary testimony? Why is it
4 appropriate to do that now when you could have done it
5 when it was presented?

6 MR. ANDERSON: Because I need to ask these
7 questions before I can determine whether I want to
8 object to it without ascertaining whether the
9 information was all the time. It may or may not be
10 timely. If it is recently prepared, it is timely; if it
11 is not, it is not timely.

12 MR. CHURCHILL: Your Honor, we are simply
13 trying to put on the best information that we have in
14 the best way that we know how. If somebody wants more
15 relevant information related to this, we have a witness
16 here to ask it. He has been responding to questions of
17 the Board and to Mr. Anderson.

18 MR. ANDERSON: The supplemental testimony was
19 in response to questions by yourself, Mr. Churchill, not
20 by anyone else.

21 JUDGE BLOCH: And by Mr. Churchill.

22 Mr. Anderson, at that time it would have been
23 appropriate for you to object to the questions on the
24 grounds that they were not timely and they should have
25 been filed at an earlier time. However, we have heard

1 that testimony. It is in the record. Objections of
2 that kind are no longer in order.

3 MR. ANDERSON: Well, at that time I didn't
4 have an opportunity to ask questions on whether it was
5 timely. It may in fact be timely. If he prepared this
6 laboratory report after the time for filing testimony,
7 the objection would not be raised unless I had the
8 opportunity to ask these questions first.

9 I have no basis to frame or decide whether to
10 make that objection, Mr. Chairman.

11 JUDGE BLOCH: But you always have the
12 opportunity to ask questions, if necessary, concerning
13 the relevance or timeliness of information to be
14 introduced. You would have stopped at that point and
15 said look, you have an obligation to file testimony by a
16 certain time. It looks like you haven't and I would
17 like to challenge whether it is timely.

18 The object of that is also to save the Board
19 the time from listening to stuff that should have been
20 filed earlier. We have already heard it. Timeliness
21 objection based on that is just irrelevant to us at this
22 point. We have already heard all the evidence. If it
23 is relevant, we will consider it. If it is not
24 relevant, we won't.

25 We won't save any time at all now by arguing

1 about whether it should have been filed earlier.

2 MR. ANDERSON: I think if it is inappropriate
3 to have it submitted, the Board should not consider it
4 as evidence.

5 JUDGE BLOCH: We will note your objection, but
6 we will consider your objection to be late and,
7 therefore, we would like you to proceed to matters of
8 substance.

9 BY MR. ANDERSON: (Resuming)

10 Q Mr. Fletcher, would you state when you
11 prepared this laboratory demonstration program -- when
12 it commenced?

13 A (WITNESS FLETCHER) Mr. Anderson, you will
14 have to excuse me. Would you state the last part of
15 your question?

16 Q Would you state when the laboratory program to
17 detect -- for IGA detectability commenced?

18 MR. CHURCHILL: Your Honor, I will object that
19 this is along the same lines or the same purpose that he
20 asked the last question.

21 MR. ANDERSON: No, it is not. Now I am trying
22 to determine the weight of the import of that testimony
23 and the reason for that is if it was not submitted
24 earlier and it was available earlier and it was only
25 submitted after the Staff produced contrary evidence, I

1 think that it would tend to show that the introduction
2 of that laboratory testing right now is premature and is
3 not based on any solid data, because it was, I think it
4 would have been clear that it would have been provided
5 at an earlier date.

6 JUDGE BLOCH: If the data is not solid, you
7 are free to ask on cross examination anything you want
8 about that data. You are able to argue in your findings
9 subsequently that there is something fishy about the way
10 it was presented. You may argue that in your findings
11 to the Board. I don't understand the point of asking at
12 this point.

13 Well, you want to ask when the testing program
14 on IGA began?

15 MR. ANDERSON: That is the question.

16 JUDGE BLOCH: And you think that is
17 irrelevant, Mr. Churchill?

18 MR. CHURCHILL: I think if he is getting at it
19 to try to attack or say that this testimony should not
20 have been admitted into evidence, we don't mind
21 explaining about the program or answering questions
22 about the program, but the when of it is what is
23 bothering me.

24 The only relevance of the when is that he
25 wants to somehow suggest that we were late.

1 MR. ANDERSON: The Board has overruled that
2 question and the objection behind it. That is not the
3 basis of this question.

4 JUDGE BLOCH: We'll allow the question only
5 for the purpose of obtaining information on how far the
6 program has progressed and its prospects for achieving a
7 solution sometime in the near future. I think the
8 question must be allowed for that purpose.

9 When did the testing program on IGA commence?

10 WITNESS FLETCHER: We began to attempt to
11 identify a means by which we could produce IGA in the
12 laboratory back in early 1980, in trying to achieve a
13 sample of tubing that would have intergranular attack
14 without the presence of stress corrosion cracking, so
15 that given that type of sample we could begin the
16 development work related to eddy current detectability.

17 JUDGE BLOCH: Just to see whether there is any
18 parallel research, some of the steam generators that
19 were built are no longer in operation. They have been
20 repaired or replaced in some way. Do you know if there
21 is any research being done on IGA that may have been
22 present in those generators?

23 WITNESS FLETCHER: I can't speak to whether or
24 not any IGA work is being done on the replaced steam
25 generators or not. I know that beyond Westinghouse

1 there are other activities that are addressing the
2 question of IGA detectability and they have been working
3 similarly, as I have described for Westinghouse, since
4 the 1980 time frame -- all aimed at trying to get a
5 sample that would be representative of the condition to
6 be used for eddy current development.

7 BY MR. ANDERSON: (Resuming)

8 Q Now you testified, did you not, that the
9 results you have indicated you can observe detection
10 down to 20 percent, that had been noticed as a drift in
11 the base line?

12 A (WITNESS FLETCHER) We have been able to
13 detect with these laboratory samples down to about 20
14 percent penetration.

15 Q When was that first noticed, sir?

16 A (WITNESS FLETCHER) Well, it has been during
17 the last several months that we have been acquiring this
18 type of data. First, the recognition -- first of all,
19 the provision of the sample that properly represents and
20 it analogous to IGA in the field samples was only
21 provided this year -- the middle part of this year --
22 from which we then proceeded to test with eddy current
23 and first to recognize the signal response and then are
24 proceeding on to calibrating in terms of depth of IGA.

25 And the depth of IGA work is ongoing. We are

1 not completed with that. We began that work in the last
2 month or two.

3 Q And did you inform the Licensee of that work
4 concurrently with its being performed?

5 A (WITNESS FLETCHER) I beg your pardon?

6 Q Did you inform the Licensee of the preliminary
7 results of that work concurrently with its being
8 performed?

9 JUDGE BLOCH: Mr. Anderson, there is no
10 objection, but that seems to me directly contrary to the
11 Board's ruling. We are pursuing this only to find out
12 how long the thing has been going on and what the
13 results might be. Why do you care when the Licensee was
14 informed?

15 MR. ANDERSON: One reason I care is that they
16 are under a continuing obligation under discovery to
17 alert us to these kinds of issues.

18 JUDGE BLOCH: Which question that you asked in
19 discovery would they have had to answer?

20 MR. ANDERSON: The reason I am not making any
21 specific statement is because I would have to go back
22 and look and it is going to take some research to find
23 that out, but I'm trying to find out while Mr. Fletcher
24 is on the stand what the facts and the circumstances
25 are.

1 MR. CHURCHILL: Your Honor, I would seriously
2 object to his trying to fish to fault us on discovery
3 and then say I don't even know what kinds of questions I
4 am going to fault you on and I have to go back and do
5 research. The purpose and object of cross examination
6 is to get facts about the subject matter of this
7 contention, not to look for reasons to fault any party
8 procedurally.

9 JUDGE BLOCH: Any comments from Staff?

10 MR. BACHMANN: The Staff agrees with Mr.
11 Churchill's characterization.

12 JUDGE BLOCH: Mr. Anderson, if there were any
13 questions you asked that were not kept up to date, that
14 is a very serious charge. I would suggest that you have
15 someone look into that. We would pursue it in this
16 hearing, but we cannot pursue it on the basis of the
17 fact that there may be a question you don't have.

18 MR. ANDERSON: You understand, Mr. Chairman,
19 this was not under direct testimony. This came by
20 supplemental five minutes ago. I have no staff here to
21 go look that up and I would hope that time would permit
22 before Mr. Fletcher is excused that that could occur.
23 But I think it should be clear that this occurred on a
24 surprise basis.

25 JUDGE BLOCH: We already ruled on the surprise

1 question, that you didn't move on it in a timely
2 fashion, that if there is a failure to pursue
3 interrogatories you are going to be able to pursue that,
4 providing you can get ahold of the interrogatories and
5 show us what wasn't answered.

6 Now you have come here without interrogatories
7 and that is why you are at a disadvantage. You could
8 search for them during the recess. It is not because
9 you are short of staff. I would like you to pursue the
10 questions that you are allowed.

11 MR. ANDERSON: So the ruling of the Chair is
12 that that question may or may not be timely at a later
13 date but not timely now?

14 JUDGE BLOCH: You will have to do it at the
15 hearing before the hearing recesses.

16 MR. ANDERSON: I'll have to see if my
17 interrogatories are with me.

18 JUDGE BLOCH: Would you prefer that we take a
19 break for lunch now, or would you prefer to continue
20 this line of questioning at this point?

21 MR. ANDERSON: I had planned for my office
22 that I would be calling in at 12:00 and 5:00 every day
23 and that time has passed, so for that purpose alone I
24 would prefer to have a lunch break now if we are going
25 to have it at some point.

1 JUDGE BLOCH: Off the record.

2 (A discussion was held off the record.)

3 JUDGE BLOCH: We will reconvene at 2:00. The
4 hearing is recessed.

5 (Whereupon, at 12:48 o'clock p.m., the hearing
6 recessed, to reconvene at 2:00 o'clock p.m., the same
7 day.)

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AFTERNOON SESSION

(2:00 p.m.)

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JUDGE BLOCH: The hearing will please come to order. We're ready to proceed.

Mr. Anderson?

MR. ANDERSON: I have a matter before we can resume cross-examination. I would like to stand corrected, or at least half-corrected. The federal law, the rules of civil procedure do, with respect to the cross-examination, provide that they can only go outside of direct testimony with lead of the presiding officer. The Wisconsin rules of civil procedure provide the exact opposite, that you have the right unless ruled otherwise to go outside direct testimony.

I don't know if this is a rule of law, but when in Rome do as the Romans.

JUDGE BLOCH: Well, we appreciate your support. We want very much to get at the important safety issues here. Let's see if we can do that.

MR. CHURCHILL: Your Honor, may I bring up one procedural matter that's caused me some concern over the noon hour? As you know, we have proprietary material in here and the parties have been given proprietary material by the Applicant. This material is owned by Applicant, by Westinghouse. The Applicant has the

1 responsibility of protecting that material, and it has
2 been given to the other parties or to the Intervenor
3 under a protective order of this Board.

4 Mr. Anderson returned to me at the end of this
5 morning's session his proprietary material. He
6 indicated that he was going to ask for it back after the
7 noon hour. Now, I do not want to bother the Board with
8 any petty little games that may be played here, but I am
9 seriously concerned with the seriousness with which Mr.
10 Anderson is going to treat the proprietary material and
11 take adequate care of it, which has been given to him
12 under Board order.

13 If he is going to continue to treat it this
14 way and play games like this, we are going to have to
15 insist that he return all the proprietary material, or
16 we are going to have to get some kind of reassurances
17 from him that the material he has been given he will
18 take adequate care of to ensure proprietariness and will
19 not cause us to join in his cute little games.

20 JUDGE BLOCH: I take it your principal
21 concern, Mr. Churchill, is you are not under obligation
22 to accept documents for custodial keeping during short
23 periods of time when Mr. Anderson wishes you to do
24 that?

25 MR. CHURCHILL: I'm not under that

1 obligation. He's under the obligation to take care of
2 the material that he was given.

3 JUDGE BLOCH: The important thing is you are
4 not under that obligation to take custodial care of
5 documents for a period of time at his convenience.

6 MR. CHURCHILL: That is true. But the more
7 important issue that I am concerned with is whether or
8 not Mr. Anderson, as a representative of an intervening
9 party here, is going to take seriously his obligations
10 to protect the proprietary information which has been
11 given to him under a protective order. And this little
12 episode gives me grave doubt that that is in fact his
13 intention.

14 JUDGE BLOCH: Mr. Anderson?

15 MR. ANDERSON: I have not heard anything from
16 Mr. Churchill to indicate that it's not being properly
17 taken care of.

18 JUDGE BLOCH: Okay, you do understand that Mr.
19 Churchill is under no obligation to take proprietary
20 material from you and safeguard it from time to time?

21 MR. ANDERSON: If that is the ruling of the
22 Board, that is the ruling I will abide by.

23 JUDGE BLOCH: It is only if he were willing to
24 do it voluntarily that he would be able to do that.
25 That means he is not going to accept custodial care of

1 those documents, and therefore under the ruling of the
2 Board you do continue to have responsibility to care for
3 that proprietary information.

4 I take it you intend to do that, don't you?

5 MR. ANDERSON: If that is the ruling by the
6 Board, I will certainly abide by it.

7 JUDGE BLOCH: Now, Mr. Anderson, let's see if
8 we can get to the substance of the material here.
9 Whereupon,

10 DOUGLAS FLETCHER,
11 the witness on the stand at the time of recess, resumed
12 the stand and, having previously been duly sworn by the
13 Chairman, was examined and testified further as follows:

14 CROSS- EXAMINATION -- RESUMED

15 BY COUNSEL FOR INTERVENOR

16 BY MR. ANDERSON:

17 Q Mr. Fletcher, this morning we were talking
18 about the laboratory tests on IGA detection. If I
19 recall, the earlier testimony you gave in your
20 supplemental testimony, you stated that the IGA down to
21 20 percent through-wall defect could be noticed as a
22 drift in the baseline; is that correct?

23 A (WITNESS FLETCHER) Yes, down to about 20
24 percent we noticed a drift in this baseline from the
25 eddy current test.

1 Q Now, this morning, if I recall correctly, we
2 heard of three types of ways that the eddy current test
3 data is compiled. One is the oscilloscope, the second
4 was the strip tape, and the third was the magnetic
5 tape.

6 A (WITNESS FLETCHER) That is correct.

7 Q And which of the three does the baseline refer
8 to?

9 A (WITNESS FLETCHER) The baseline that I am
10 referring to is visually indicated on the strip chart
11 recorder. That same information is also in the magnetic
12 tape as the source document or as the source record for
13 running your strip chart.

14 Q Could we look at Exhibit 2 for a moment,
15 please, sir. Would the depiction on the bottom of that
16 page be the strip chart kind of thing that we are
17 talking about?

18 MR. CHURCHILL: Which page of Exhibit 2 are
19 you referring to?

20 MR. ANDERSON: The front page, page number 1.

21 BY MR. ANDERSON: (Resuming)

22 Q Is the answer yes, Mr. Fletcher?

23 A (WITNESS FLETCHER) At the bottom of page 1,
24 the strip chart that is shown there is representative of
25 what I have made reference to.

1 Q Could you describe the baseline and the drift
2 that you have referred to with respect to Exhibit 2?

3 A (WITNESS FLETCHER) The baseline that I would
4 be referring to, for example, the part of the strip
5 chart, the left half of the strip chart that talks about
6 mix vertical. Now, the null point, the 2 null point or
7 the baseline, is represented by the straight vertical
8 line that is approximately in the middle of the grid of
9 that strip chart, running vertically.

10 Q Would you be able to describe the extent of
11 the drift from that line that you would believe might be
12 represented by a 20 percent IGA defect?

13 A (WITNESS FLETCHER) No, I'm really not
14 prepared to give you any idea of what the drift would be
15 with 20 percent. I have seen the strip charts that have
16 come from representative samples of IGA and there is
17 indeed a drift that occurs, depending upon the extent of
18 penetration. As I say, we are not able at this point to
19 place a quantitative value on the distance of drift as a
20 function of depth, since that is the point of our
21 present development.

22 JUDGE BLOCH: Mr. Fletcher, on this chart the
23 20 percent shown is not IGA.

24 WITNESS FLETCHER: That 20 percent is not
25 IGA. That is a drilled hole standard.

1 JUDGE BLOCH: Do you know the diameter of the
2 drilled hole?

3 WITNESS FLETCHER: I can look it up, sir. It
4 is approximately a sixteenth of an inch.

5 JUDGE BLOCH: Okay. If the one-sixteenth of
6 an inch proves wrong, after some other break in the
7 hearing you can come back and correct that testimony.

8 WITNESS FLETCHER: Indeed.

9 BY MR. ANDERSON: (Resuming)

10 Q In the strip chart shown on page 1 there's a
11 calibrated laboratory tube with calibrated holes in it.
12 It's not a tube from the field, is it, sir?

13 A (WITNESS FLETCHER) That's right, that is a
14 calibration standard shown on page 1 of this exhibit.

15 Q And just to leap ahead somewhat, perhaps, to
16 later on in this proceeding, do you know which page
17 would show an actual tube in the field?

18 A (WITNESS FLETCHER) Yes. Starting with page
19 number 3, and page number 4 and page number 5 and 6 and
20 7.

21 Q Turning back to page 1 for a moment, just so I
22 can get some idea of what the word "drift" means
23 pictorially, would you look at the left-hand strip and
24 the top three dark line boxes down. The line runs
25 slightly off the baseline at that point, does it not,

1 sir?

2 A (WITNESS FLETCHER) It runs off of the
3 baseline if you take the baseline as being that
4 established toward the lower part of that strip chart.
5 But it is almost identical with the lowest part of the
6 strip chart. In other words, there are vertical lines
7 that, if I start at the bottom, I see a displacement to
8 the left of what appears to be center of approximately
9 three divisions, and at the very top of the strip chart
10 I see a displacement of approximately three divisions
11 left of center.

12 Q Well, I understood your previous answer, I
13 thought the baseline is the immutable centerline of that
14 grid. Is that an incorrect assumption?

15 A (WITNESS FLETCHER) That is incorrect in that
16 that particular location can be placed, you know, near
17 the center by the operator of the equipment when he sets
18 up the equipment.

19 Q Does that complete your answer?

20 A (WITNESS FLETCHER) Yes, it does.

21 Q So the baseline is a moveable feast, depending
22 upon the operator settings?

23 A (WITNESS FLETCHER) It depends upon the
24 operator settings, yes.

25 Q And is that subject to interpretation or is

1 that a hard and fast setting?

2 A (WITNESS FLETCHER) Well, the operator takes a
3 standard and he balances his equipment and he places the
4 probe in a normal portion of the standard and
5 establishes a null point for the probe and the tube at
6 that location. And then he withdraws the probe or
7 translates the probe through the length of the standard
8 and he gets the signals, the smart, sharp demarcations
9 from an approximate centerline with the instrumentation
10 having been set up and left stable when he is performing
11 this translation of the probe.

12 Q Now, the inner diameter of the tube is
13 something like 73 hundredths -- I'm sorry -- about .73
14 inches, .72 inches?

15 A (WITNESS FLETCHER) The inner diameter of the
16 tube is approximately .775 inches.

17 Q And that is a nominal inner diameter, right?

18 A (WITNESS FLETCHER) That's right.

19 Q And there would be some variation around
20 that?

21 A (WITNESS FLETCHER) That is correct.

22 Q And that would mean for the probe not to get
23 stuck you would have to have a probe that was somewhat
24 smaller than .775 inches?

25 JUDGE BLOCH: Just a moment. We have to keep

1 straight. Judge Kline would like to know, are we
2 talking about the inner diameter of the tube or the
3 thickness of the tube wall?

4 MR. ANDERSON: I'm talking about the inner
5 diameter of the tube.

6 WITNESS FLETCHER: My answer was in response
7 to the inner diameter of the tube.

8 JUDGE BLOCH: All right, would you proceed
9 from that. Judge Kline wasn't sure whether you really
10 meant that.

11 MR. ANDERSON: That's correct.

12 JUDGE BLOCH: Please continue.

13 BY MR. ANDERSON: (Resuming)

14 Q So the probe in terms of its outer diameter
15 will be some measure less than .775 inches?

16 A (WITNESS FLETCHER) The probe body consists of
17 devices that center the coils and the probe body
18 principally. The probe consists of centering devices as
19 well as the electronic portion of the probe itself, so
20 that there is a touching of the centering device from
21 the probe to the inner surface of the tube wall, while
22 at the same time the electronic portion of the probe is
23 separated some distance from the inner surface of the
24 tube wall.

25 So while the probe proper touches the inner

1 surface of the tube, there is still clearance for the
2 probe body that contains the electronics to pass through
3 the inner diameter of the tube.

4 JUDGE BLOCH: Does it touch it at this one
5 point?

6 WITNESS FLETCHER: Two points, before and
7 after the electronic part.

8 JUDGE BLOCH: For centering purposes?

9 WITNESS FLETCHER: For centering purposes.

10 BY MR. ANDERSON: (Resuming)

11 Q Now, if the inner diameter has variation to
12 it, it would tend to imply to me that the distance from
13 the probe to the tube will not be constant throughout
14 the tube sample; is that correct?

15 A (WITNESS FLETCHER) There can be a finite
16 variation between the probe body and the tube wall,
17 which varies by usually just a few mils depending upon
18 the -- well, the tolerance to which the tube is
19 manufactured.

20 Q And would that variation cause the baseline to
21 shift at all on its strip chart for an eddy current
22 test?

23 A (WITNESS FLETCHER) It might, slightly.

24 Q Now, when you say "slightly," could we look at
25 again Exhibit 2, page 1, the bottom half. Would it be

1 one of those subdivisions? Would that be "slightly"?

2 A (WITNESS FLETCHER) That is my concept of what
3 the variation would be. As the probe came through the
4 tube, there might be this slight variation in distance
5 between the probe and the tube wall to give a signal of
6 perhaps one division or less.

7 Q Now, when you said there was a drift from the
8 baseline for a 20 percent defect, how many subdivisions
9 would that tend to be, if you know?

10 A (WITNESS FLETCHER) Well, I mentioned before,
11 Mr. Anderson, that I'm really not prepared to say that.
12 I know there is a perceptible drift and it is
13 significant with respect to one small division on this
14 chart. It is one small division of this chart,
15 depending upon the depth of penetration of IGA. And
16 again, we are not prepared to quantify that at this
17 point, since that is where we are taking into account
18 variations in the distance between the probe and the
19 tube wall and other factors that could introduce small
20 changes in that baseline.

21 Q Now, when you said somewhat bigger than one
22 subdivision being the possible drift for a 20 percent
23 defect, would that be an order of magnitude more than
24 one or a percentage deviation more than one?

25 A (WITNESS FLETCHER) Well, perhaps I've given

1 you a misimpression. I did not want to imply that 20
2 percent penetration by IGA would give one division of
3 drift. I am saying that what I have seen, that is not
4 limited to just 20 percent. 20 percent penetration by
5 IGA has been a significant change from the baseline,
6 "significant" being greater than one division.

7 But I'm speaking of all samples that we have
8 looked at, that would range from 50 percent or 70
9 percent downward.

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1 Q Now, could we look at Page 3, for example?

2 JUDGE BLOCH: I would like to say that if that
3 deviation's significance becomes important in the case,
4 I would have difficulty accepting the amount of drift
5 based upon your recollections of that document. It
6 would be very hard for me to accept on that basis. That
7 is for counsel to note.

8 BY MR. ANDERSON: (Resuming)

9 Q I am looking, if we may, at Page 3 of Exhibit
10 2, sir.

11 A (WITNESS FLETCHER) Yes, I have Page 3.

12 Q And this would be a tube without any
13 noticeable defects. Is that what we have here?

14 A (WITNESS FLETCHER) Sir, I am not an eddy
15 current interpreter. The interpretation of these
16 signals falls to those who are qualified to read that,
17 that type of information, and I do not have that
18 qualification.

19 JUDGE BLOCH: Mr. Anderson, you moved to Page
20 3. I would like to ask whether you are qualified on
21 Page 1 to tell me what might have produced the three
22 unit movement to the right at the bottom of the chart.
23 We are talking about those vertical lines. If you are
24 not qualified, just say so, and we will get to it with
25 the other witnesses.

1 WITNESS FLETCHER: I am not qualified to
2 explain that shift.

3 MR. ANDERSON: I think maybe I should withhold
4 for the other witnesses as well, sir.

5 BY MR. ANDERSON: (Resuming)

6 Q Turning to Page 3 of your prepared testimony,
7 Mr. Fletcher, your first full answer has a phrase which
8 is in response to a question about the sensitivity of
9 eddy current testing to detect IGA and SCC at the 40
10 percent limit. You use the words "may not" and
11 "generally." Am I correct in inferring from your answer
12 that you are not testifying that the sensitivity of the
13 eddy current test at that parameter is perfect?

14 A (WITNESS FLETCHER) Mr. Anderson, I believe
15 your interpretation is correct. It may not in all cases
16 be detected, but on the other hand, we can generally
17 expect to detect IGA and stress corrosion cracking
18 having progressed to 40 percent of the through wall
19 thickness.

20 Q Looking at the next answer --

21 JUDGE BLOCH: One second, Mr. Anderson.

22 Can we place any error bounds around that at
23 all? Do we know when there is 40 percent in the sample,
24 with what percentage we would detect that it was 40
25 percent?

1 WITNESS FLETCHER: I don't think I can place
2 any error band on that, Judge Bloch. So much depends
3 upon the volume of the affected material. As we
4 discussed earlier, very short length penetrations with a
5 penetration of 40 percent may not be detected.

6 JUDGE BLOCH: Well, can you actually place
7 error bands around it if it is longer, depending on the
8 size or the length?

9 WITNESS FLETCHER: I believe I stated earlier
10 that when we get on the order of something up to a
11 quarter of an inch, that we would expect to be able to
12 see that.

13 JUDGE BLOCH: We are talking about an in field
14 test now by a trained operator. The results have been
15 sent for interpretation to Westinghouse. You say we
16 would be able to detect it, but with what reliability.
17 Ninety percent of the time, 50 percent of the time?
18 What is the data on which we can test this reliability?
19 Do we really have any data so that we know the
20 reliability?

21 WITNESS FLETCHER: I don't believe we have
22 looked at it in that regard. These are judgments that I
23 am making relative to our experience on having found
24 stress corrosion cracking, for example, in the field --
25 before it was pulled, and to confirm its presence

1 through the use of metallography.

2 BY MR. ANDERSON: (Resuming)

3 Q Has anyone at Westinghouse to your knowledge
4 engaged in any kind of numerical analysis that could be
5 derived to infer error bands?

6 A (WITNESS FLETCHER) Not to my knowledge.

7 Q Looking at the last answer on Page 3, you talk
8 about the ability to detect IGA and SCC in the portion
9 of the sleeve between the upper and lower joints, do you
10 not?

11 A (WITNESS FLETCHER) Yes, I do.

12 Q Now, let us, if we may, let's look at the area
13 above the upper drawings, and let me ask a question with
14 respect to that area. Is it correct to say that the
15 probe used in a sleeved tube would not be as wide as the
16 probe used in an unsleeved tube?

17 MR. CHURCHILL: I would like to interpose an
18 objection to this, because I am not sure that it is
19 relevant to this testimony.

20 JUDGE BLOCH: I would like to allow it. I
21 will see whether it becomes relevant.

22 WITNESS FLETCHER: The probe used to examine
23 the sleeve portion can be used to examine the unsleeved
24 portion. More than that, a probe of a larger diameter
25 can be used on the opposite end of the sleeve into the

1 tube to probe the tube as well.

2 BY MR. ANDERSON: (Resuming)

3 Q Put aside that last thing for a moment. I
4 understand it could come from the other side, but if you
5 come from the hot leg side and you actually test it in
6 the field, and you are comparing a test in a steam
7 generator to a sleeve to a test which is -- in a steam
8 generator which is not probed, would you use a smaller
9 probe?

10 A (WITNESS FLETCHER) Yes, you would use a
11 smaller probe to examine the sleeve portion of the
12 tube.

13 Q Now, crossing the probe is a test for
14 inventing.

15 A (WITNESS FLETCHER) It has been used for
16 that.

17 Q And that was used at Point Beach?

18 A (WITNESS FLETCHER) Yes, I believe it has.

19 MR. CHURCHILL: Your Honor, I would like to
20 object to this line of questioning. He hasn't said
21 where he is going, but it has to do with the
22 inspectability of the tube out beyond the sleeve. That
23 is no longer an issue in this case, having been disposed
24 of on summary disposition. If I am wrong, I would like
25 clarification from Mr. Anderson.

1 MR. ANDERSON: I didn't understand it was
2 disposed of. Can I have a moment to review the motion?

3 If you look, for example, at Page 8 for the
4 motion concerning litigable issues, you will see a basis
5 citation, which is Appendix 3E, which is a letter or a
6 memorandum from the licensee's, one of the licensee's
7 plant operators, and we stated in there -- this is under
8 Contention 3A, which has been admitted, Mr. Chairman.

9 It says, and I quote from Mr. Schwencher's
10 letter, "First of all, the sleeves will require the use
11 of a smaller eddy current probe which will reduce the
12 defect detection capability in the tube above the
13 sleeve." And I think this is exactly what I'm trying to
14 ascertain from this witness, and 3A, as I understand it,
15 has been admitted into evidence. I am sorry. I
16 misspoke. I mean admitted as a contention.

17 JUDGE BLOCH: We admitted a specific statement
18 of what we thought were genuine issues. We did refer to
19 3A. Your referral to our decision would be more
20 appropriate. We had to cope with the motion in which
21 you stated that certain things are genuine issues, and
22 then you attached certain documents. We examined what
23 you stated to be genuine issues and tried to find if
24 there were genuine issues there.

25 We had to do a lot of work to relate those

1 issues to the documents. Now, the fact that there is a
2 genuine issue in the document which was not in the
3 statement of genuine issues, we may not have identified
4 it for hearing, but it is what we identified in the
5 summary disposition decision that is controlling.

6 MR. CHURCHILL: Your Honor, I might also add
7 that during the course of this there was some confusion
8 as to what was meant by the free standing region, and
9 Mr. Anderson himself clarified that when he was talking
10 about inspectability of the free standing region he was
11 talking about that portion of the sleeve that extended
12 out beyond the tube sheet.

13 Clearly we are not into inspectability of the
14 tubes up above the sleeve. That is well beyond the
15 bounds of the issues that we are dealing with here
16 today.

17 JUDGE BLOCH: The contention itself as worded
18 by us seems to support Mr. Churchill's statement. It is
19 the ability to detect serious stress corrosion cracking
20 or intergranular attack in excess of the technical
21 specification prohibiting more than 40 percent
22 degradation of the sleeve wall. So it is the sleeve
23 wall, the testing of the sleeve wall that is at issue.

24 MR. ANDERSON: If that is the ruling of the
25 board, I would then move that we be allowed to address

1 the issue apart from that October 1 board order. I
2 think it is important to know, as was indicated in the
3 documents supplied to the board earlier -- I am sorry
4 there was confusion -- as to whether a smaller diameter
5 probe would be able to determine whether denting was
6 going on because denting has been observed -- denting
7 determined by the probe has been found in Unit 1's
8 licensing reports, and also, if it is a smaller probe,
9 the ability to detect dents in the U-bends would also be
10 impaired.

11 JUDGE BLOCH: To determine that issue, you
12 would have to file a motion to reopen the record. You
13 would have to meet the criteria established by the
14 Commission to reopen the record. I am not sure at this
15 point whether that would still be in order, because you
16 could also have moved to reconsider the decision on
17 summary disposition, and you didn't do that.

18 No, that issue is not in at this point. There
19 may be procedural mechanisms for raising it or for
20 persuading us that it is so important that we must raise
21 it as a sui sponte issue, but it is not in the case
22 now.

23 MR. ANDERSON: Let me ask if the board would
24 raise it as a sui sponte issue, we would request that it
25 do so at this time. I don't think it is going to be a

1 practical matter to come back at another date.

2 JUDGE BLOCH: I think I prefer to have you
3 persuade us in writing that it is appropriate for a sui
4 sponte issue. As a practical matter, we are going to
5 try to conclude this hearing and not go into extraneous
6 issues.

7 Mr. Churchill?

8 MR. CHURCHILL: Your Honor, on a point of
9 clarification, I think if he were to persuade you to
10 raise it as a sui sponte issue, that wouldn't strictly
11 speaking be sui sponte. Sui sponte means that you would
12 be raising it on your own motion.

13 I would object to anything that suggests that
14 he would be persuading you to do that. I think what he
15 has to do at this point, after over a year of prehearing
16 activities and discovery and extensive and intensive
17 motions on litigable issues and summary disposition, he
18 would have to show good cause if he himself wanted to
19 raise that issue at this stage.

20 JUDGE BLOCH: Two possible approaches. We are
21 not going to rule on that now since you haven't filed
22 the motions. But it is not in the case now. If we are
23 persuaded it is necessary to protect public safety to
24 reopen the case for that purpose, we will come back to
25 Milwaukee, but you are going to have to persuade us of

1 that in writing. And we have not seen any reason to do
2 that at this point.

3 Right now we are trying the issues that were
4 admitted after summary disposition.

5 BY MR. ANDERSON: (Resuming)

6 Q We previously talked, Mr. Fletcher, about the
7 variability in the inner diameter of the tube. Could
8 you define what kind of variation is seen in the actual
9 tubes in place in Point Beach?

10 JUDGE BLOCH: Mr. Anderson, do you mean the
11 sleeve or the tube?

12 MR. ANDERSON: The tube.

13 WITNESS FLETCHER: Mr. Anderson, I am not sure
14 I understand what variations you are speaking of.

15 BY MR. ANDERSON: (Resuming)

16 Q The inner diameter has a nominal size of .775
17 inches. What variation around that nominal extent would
18 you say is the variation?

19 MR. CHURCHILL: Your Honor, I would like to
20 object to that question unless a foundation can first be
21 established that a variation in diameter of the tubes
22 has anything to do with the inspectability of the
23 sleeves.

24 MR. ANDERSON: On Page 4, Line 4, Mr. Fletcher
25 makes a statement about uneven characteristics of the

1 surface of the tube sheet hole causing signals which can
2 interfere with the interpretation of eddy current
3 indications. Now, the space between the tube sheet and
4 the tube is a little narrower than between the tube and
5 the sleeve, but it is nonetheless an analogous
6 situation.

7 MR. CHURCHILL: Your Honor, if that is the
8 basis for the question, then I think that can be easily
9 explained. Well, actually, I shouldn't explain it. I
10 should say that that has no bearing and no relevance at
11 all on the variations of diameter in the tube itself and
12 the inspectability of the sleeves. That is there for an
13 entirely different reason which I think Mr. Anderson can
14 perceive.

15 JUDGE BLOCH: It is relevant to a portion of
16 our decision, however, in which we did talk about the
17 space between the outer diameter of the sleeve and the
18 inner diameter of the tube, and the possibility of
19 sludge forming in there and the pressures that might
20 exist on the sleeve, so I will allow that question.

21 WITNESS FLETCHER: Mr. Anderson, the
22 unevenness that is referred to in my testimony on Page
23 4, the uneven characteristics of the surface of the tube
24 sheet hole refer to drill marks that are present when
25 the tube sheet hole is drilled, so that gives you

1 something like a spiral mark, evenly spaced, variation
2 in the surface characteristics of the tube sheet hole.

3 Now, this repetitive unevenness in the tube
4 sheet hole provides a signal that is picked up during
5 the inspection of the tube itself.

6 BY MR. ANDERSON: (Resuming)

7 Q Well, let me ask with respect to the
8 possibility of there being points at which the sleeve
9 and the tube might touch. There is a space of 75 mils
10 on a nominal basis between the two. Is that correct?

11 A (WITNESS FLETCHER) That is correct.

12 Q And what is the variation of the inner
13 diameter of the sleeve in the field?

14 A (WITNESS FLETCHER) The variation in the inner
15 diameter of the sleeve, the sleeve outer diameter is
16 . That is the outer diameter, and it has a --

17 Q Excuse me. You said for the outer
18 diameter. For the tube or the sleeve?

19 A (WITNESS FLETCHER) For the sleeve.

20 Q Okay.

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1 JUDGE BLOCH: Plus or minus what?

2 WITNESS FLETCHER: , plus or minus -- I am
3 not prepared to answer that without looking it up.

4 JUDGE BLOCH: Do we have that in one of these
5 documents for Mr. Fletcher to refer to?

6 WITNESS FLETCHER: That should be readily
7 available.

8 I recall it to be a few mils, a few being less
9 than five, but for preciseness I would have to look that
10 up.

11 MR. BACHMANN: Judge Bloch, I would like a
12 clarification. Mr. Fletcher stated the added diameter
13 of the sleeve was . I didn't think that is
14 what he meant to say.

15 WITNESS FLETCHER: Excuse me. .

16 JUDGE BLOCH: Is there a document Mr. Fletcher
17 can refer that would help us on what the actual
18 tolerances are?

19 MR. CHURCHILL: We are looking now to see if
20 it's in the sleeving report.

21 BY MR. ANDERSON: (Resuming)

22 Q While that is being done, could we get back to
23 the other question, if we may, Mr. Fletcher, which is
24 the variation in the inner diameter of the tube itself
25 in the field?

1 A (WITNESS FLETCHER) I was approaching that
2 starting from the outer diameter in the tube wall. I am
3 sorry, the sleeve wall thickness is nominal, so
4 that gives me an inner diameter for the sleeve of ,
5 if my arithmetic is correct -- inches.

6 Q The question I would like to have addressed,
7 if I may, is the variation in the tube from the nominal
8 .775 inches. Is that plus or minus five mils, plus or
9 minus ten mils?

10 A (WITNESS FLETCHER) It would be on the order
11 of probably less than five mils. I'll say plus or minus
12 five mils.

13 Q Is that a factor estimate or is that an
14 observation from the field?

15 A (WITNESS FLETCHER) That is my recollection.
16 Again, I believe that number can be provided for
17 accuracy. My recollection is it is approximately five
18 mils. I would have to confirm that if you want it
19 precisely.

20 Q Now there is a sludge pile at Point Beach, is
21 there not, sir?

22 JUDGE BLOCH: Mr. Anderson, just one moment.
23 Are you going to clarify from that document what the
24 tolerances are? I was also confused by some of the
25 subtraction I tried to do.

1 MR. ANDERSON: Shall we go off the record?

2 JUDGE BLOCH: No, I think we ought to do this
3 on the record. I thought that you said that the sleeve
4 outer diameter was .

5 MR. ANDERSON: No,

6 JUDGE BLOCH: That's the same as and
7 that the sleeve thickness was .

8 WITNESS FLETCHER: That is correct.

9 JUDGE BLOCH: And I thought you said that the
10 inner diameter would be 701 mils, but you give me a much
11 lower number.

12 WITNESS FLETCHER: I did say you have to count
13 both sides of the tubes, so the wall thickness is
14 multiplied by two before subtraction from .

15 MR. CHURCHILL: Your Honor, I wonder if we
16 could go off the record for a second. I would like to
17 consult with some Westinghouse people to find out if we
18 are getting into the area of proprietary information.

19 JUDGE BLOCH: A brief recess. Please stay in
20 place while this takes place. It won't take long, I
21 believe.

22 (A brief recess was taken.)

23 JUDGE BLOCH: On the record.

24 MR. CHURCHILL: The situation is this. That
25 information is bracketed as proprietary in the sleeving

1 report. We think that Westinghouse may have very
2 recently unproprietaryized that information, but we have
3 no way of knowing that right at the moment and I think
4 we would have to locate somebody else from Westinghouse
5 or call back to Pittsburgh to find out. If that would
6 be the case, that would simplify it.

7 If it was proprietary, I think we would have
8 to go into an in-camera session if Mr. Anderson needed
9 to pursue a line of questioning that would require
10 putting on the record the exact dimensions and
11 tolerances of the sleeves. I don't think we have the
12 dimensions and tolerances of the tubes themselves in
13 there, so I have no way of knowing whether that would be
14 proprietary.

15 MR. ANDERSON: The question was only as for
16 the tube. Why don't we just go forward with the tube.

17 MR. CHURCHILL: As to the tube? We do not
18 know whether that is proprietary or not. We already
19 have information on the record that Mr. Fletcher has
20 said. He has given us a guess on the tolerances on his
21 estimate of what it probably is, but he does not have
22 that specific information either.

23 JUDGE BLOCH: I think the guesses so far were
24 on the sleeve, not on the tube.

25 MR. ANDERSON: He was even vaguer with the

1 tube than with the sleeve, I think.

2 MR. CHURCHILL: I can refer the parties -- as
3 far as the sleeve goes, I can show the parties where in
4 the sleeving report that is. The problem would be
5 putting that out on the record. We could do it, but we
6 would have to go into an in-camera session, and I wonder
7 if we could switch to another line of questioning
8 temporarily until we find out for sure whether this is
9 proprietary or whether we should go in camera.

10 JUDGE BLOCH: Mr. Anderson, for your purposes,
11 would it be sufficient at this time, subject to our
12 ruling on whether this is proprietary as we become
13 informed, that we just have the parties informed as to
14 the page reference in the document?

15 MR. ANDERSON: That is a good starting point.

16 JUDGE BLOCH: We shall adjourn briefly for
17 that purpose. The Board would like to come and look at
18 it also.

19 (A brief recess was taken.)

20 JUDGE BLOCH: Mr. Churchill, would you just
21 clarify for the record the source of the information
22 that the parties were looking at?

23 MR. CHURCHILL: Yes, sir. In the sleeving
24 report, which is Applicant's Exhibit 1, page 3.3,
25 section 3.2, the first paragraph gives the proprietary

1 information on the outer diameter of the sleeve along
2 with the tolerances.

3 JUDGE BLOCH: Mr. Anderson?

4 BY MR. ANDERSON: (Resuming)

5 Q Now the Point Beach steam generators have a
6 sludge pile at the bottom, is that correct, sir?

7 A (WITNESS FLETCHER) There is sludge that is on
8 top of the tube sheet.

9 Q And in Unit 1, do you know about how high it
10 is from the top of the tube sheet?

11 A (WITNESS FLETCHER) No, I don't know offhand.

12 Q And for Unit 2 do you know?

13 A (WITNESS FLETCHER) No, I don't know that
14 fffhand.

15 Q Would you look with me at Exhibit 1, page
16 6.7?

17 JUDGE BLOCH: Off the record.

18 (A discussion was held off the record.)

19 BY MR. ANDERSON: (Resuming)

20 Q The first sentence of the third paragraph
21 states as follows, does it not: "The behavior of the
22 annulus between the tube and the sleeve with respect to
23 the capability to concentrate secondary side bulk water
24 impurities is judged to be similar to that of the
25 original tube sheet crevice," does it not, sir?

1 A (WITNESS FLETCHER) Yes, it does, sir.

2 MR. ANDERSON: Could I have marked the
3 document previously provided to the Board and the
4 parties, which is the Niles' letter from NSP to the
5 Wisconsin Electric Power Company's Vice President?

6 JUDGE BLOCH: Any objection? We will have it
7 marked as Intervenor's Exhibit 1 for identification.

8 (The document referred to
9 was marked Intervenor's
10 Exhibit Number 1 for
11 identification.)

12 BY MR. ANDERSON: (Resuming)

13 Q Do you have a copy of that, Mr. Fletcher?

14 A (WITNESS FLETCHER) I'm looking for it.
15 (Pause.)

16 MR. CHURCHILL: Mr. Anderson, how is that
17 marked in your motion on litigable issues? 3-D. We've
18 got it. Thank you.

19 BY MR. ANDERSON: (Resuming)

20 Q Would you read for the record the third whole
21 paragraph, starting with the word "Inconel"?

22 MR. CHURCHILL: May I have a moment, please?
23 (Pause.)

24 MR. CHURCHILL: I'm going to object to this
25 question as beyond the scope of the contention and I

1 will refer right now to your memorandum and order
2 defining the issue in this hearing.

3 MR. ANDERSON: Well, I guess that gets back to
4 the point earlier. Do you want to hear argument on
5 that?

6 JUDGE BLOCH: I'd like to hear argument in
7 response to what Mr. Churchill has just said.

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1 MR. CHURCHILL: I haven't finished my
2 objection.

3 Page 16 of the Board's memorandum and order of
4 October 1, 1982, as I recall Mr. Anderson specifically
5 raised the contention of the environment within the
6 annulus, the tube sleeve annulus. That was contention
7 3.B. That contention was not allowed and the Board
8 specifically pointed out at page 16, second paragraph,
9 there is no reason to believe there will be a
10 concentration -- that there will be "concentration
11 effects on the tube sleeve annulus, see Colburn
12 affidavit at 6," that sleeving "increases the
13 probability of tube failures generally, or that other
14 conductive impurities from the feedwater train will
15 further degrade and confuse the eddy current signal.
16 Consequently, we find that these are not genuine issues
17 of fact and exclude them from consideration at the
18 hearing."

19 I would just like to remind Mr. Anderson that
20 the motion for litigable issues, which was in the form
21 of motions for summary disposition, was a very long and
22 involved substantive part of this hearing, in which
23 long, carefully prepared affidavits by both the Staff
24 and the Applicant were prepared on the issue of whether
25 or not there was a genuine issue of fact. And this was

1 carefully considered by the Board after over a year's
2 discovery by Mr. Anderson.

3 Clearly, that has disposed of these issues.
4 They cannot be raised again now.

5 JUDGE BLOCH: Before you answer, Mr.
6 Churchill, are you contending that corrosion cannot take
7 place in that area or merely that it doesn't take place
8 any more rapidly than in the crevice?

9 MR. CHURCHILL: Your Honor, our motion for
10 summary disposition in this case included an affidavit
11 by Mr. Fletcher that said that there was no mechanism by
12 which the environment in the tube sleeve annulus could
13 be any worse than the environment that was already
14 taking place in the tube-tube sheet crevice.

15 JUDGE BLOCH: And it was in particular on that
16 that we ruled that there was no special issue. But my
17 concern is that we said, in the context of testing there
18 could be an issue of how rapidly corrosion might occur
19 within that annulus, so that if we found there were
20 problems with the testing we might find there was a
21 period of safety anyway, and the question was whether
22 you really want to foreclose any discussion of the speed
23 with which corrosion may occur within the annulus.

24 MR. CHURCHILL: When you say corrosion within
25 the annulus, you mean corrosion of the sleeve?

1 JUDGE BLOCH: Corrosion of the sleeve.

2 MR. CHURCHILL: I believe that our testimony
3 suggests that it's very unlikely that you would have as
4 caustic or as hostile conditions in the crevice, but
5 that even if you did have within the crevice the
6 testimony goes to show the significantly increased
7 resistance of the thermally treated Inconel 600 of the
8 sleeve as compared to that of the tube.

9 It has been established on summary disposition
10 that you are not going to get a worse environment in
11 there. It has also been established on summary
12 disposition that you have the increased resistance to
13 corrosion of the sleeve. Therefore, it seems obvious to
14 me that what Mr. Anderson is trying to do is to
15 relitigate issues that it has already been established
16 that there were no genuine issues of fact.

17 JUDGE BLOCH: Is the laboratory rate of
18 corrosion to which Mr. Fletcher testified earlier in the
19 position of the Applicant is the upper rate of corrosion
20 the amplitude in the sleeve?

21 MR. CHURCHILL: No, sir. When Mr. Fletcher
22 was talking about those rates being consistent with what
23 was found in the field in the other plant, obviously he
24 was talking about the mill-annealed, which is the tube
25 material, rather than the thermally-treated, which is

1 the sleeve material, which would be considerably
2 slower.

3 JUDGE BLOCH: Mr. Anderson, what is the
4 relevance of this question?

5 MR. ANDERSON: Before I get to the specifics
6 of its propriety in view of the litigable issues and
7 motion part of the proceeding, the overriding issue
8 which I think Mr. Churchill refuses to acknowledge is
9 the fact that crevice-type corrosion above the tube
10 sheet by virtue of the annulus is extremely more serious
11 than crevice-type corrosion in the tube sheet areas,
12 something which is acknowledged in the Board's order.

13 And accepting for the moment for the purpose
14 of this contention that the crevice corrosion in the
15 annulus will not be worse than the crevice corrosion in
16 the tube sheet, that doesn't make it go away. That
17 means you have a very substantial problem, because it is
18 unconstrained in terms of end leakage. That is the
19 overarching issue.

20 In terms of specific responses, if that is
21 appropriate at this point, to his statement, page 13 of
22 the Board's order states the opposite. It states that
23 -- and I read it before and I won't repeat it in detail
24 again. It says -- it talks about the accumulation of
25 corrosion in the annulus.

1 Our litigable issue in 3.A talks about scaling
2 and copper in the annulus. 3.A and 3.B are interrelated
3 in that context.

4 JUDGE BLOCH: You've already established that
5 page 6.7 of the sleeving report states that there could
6 be some corrosion in the annulus. But what is the
7 purpose of this line of questions, once it's established
8 in the sleeving report?

9 MR. ANDERSON: The line of questions that led
10 to the objection was the Niles letter, which also had a
11 statement that Inconel is particularly sensitive to
12 crevice corrosion.

13 MR. CHURCHILL: Your Honor, the contention has
14 to do with the ability to eddy current test the sleeve.
15 That is all it has to do with.

16 MR. ANDERSON: That isn't quite it. It's the
17 ability to test it and assure the Board and the
18 Commission and the public that there will not be an
19 incipient failure in the period of time between
20 inspections. That is the overriding issue. It is not
21 the technical testing issue; it's the end result we're
22 looking at.

23 JUDGE BLOCH: My concern is, if we find there
24 are reliability problems in the testing, what we're
25 going to conclude about the safety of returning to power

1 with sleeved tubes and for what period of time it might
2 be safe, even if there are problems in testing.

3 MR. CHURCHILL: Your Honor, the issue -- the
4 bound of any issue that this Board could consider has to
5 do with the actual sleeving of the tubes. If it can be
6 demonstrated that sleeving the tubes gives you an equal
7 or better pressure boundary, with equal or better
8 inspectability, that would be enough prima facie to
9 carry the Applicant's burden in this case.

10 If it turns out we are trying to make a repair
11 which actually improved the pressure boundary integrity,
12 then there would be no way that the Board could legally,
13 within the constraints or the scope of this hearing,
14 deny the right to sleeve to improve it. The issue of
15 the integrity of the pressure boundary as it stands
16 without sleeving and the inspectability of the pressure
17 boundary without sleeving I would respectfully submit is
18 not before the Board.

19 If we can show that sleeving actually improves
20 integrity as well as improves inspectability, that, sir,
21 would carry our burden of proof in this proceeding.

22 JUDGE BLOCH: Of course, if the integrity is
23 about the same and the inspectability is about the same,
24 but the location is somewhat more dangerous, then we
25 would have to consider questions about corrosion,

1 wouldn't we?

2 MR. CHURCHILL: Well, no, sir, I don't believe
3 you would, because we have both in the testimony here
4 and in the affidavits in support of summary disposition
5 testimony that shows that by no means does this plant or
6 any other plant rely on the sensitivity or the accuracy
7 of eddy current testing alone. Eddy current testing is
8 a help. It is an aid, it is an assist in, if you will,
9 perhaps minimizing the amount of leakage that would
10 cause us to shut down to make repairs if the amount of
11 leakage exceeded tech specs.

12 There is nothing to suggest there is anything
13 unsafe about eddy current testing not detecting all
14 through-wall defects. Indeed, the mere fact that the
15 Commission's technical specifications allow some
16 operation with leakage means that a fortiori there has
17 been some through-wall penetration and the plant still
18 can continue to operate with some penetration.

19 It has never been established or asserted, and
20 in fact, although the past Commission practice in this
21 area, that one has to be able to detect all potential
22 leaks with an eddy current test, we cannot do that. Our
23 testimony does not do that, does not say that we can
24 guarantee absolutely that we're going to catch all
25 leaks.

1 Therefore, one wonders why it would be
2 necessary to go into the question of what the rate would
3 be.

4 JUDGE BLOCH: Let me ask you, is Applicant
5 going to attempt to show anything about the rate of
6 corrosion of the sleeve?

7 MR. CHURCHILL: We do have testimony about the
8 rate of corrosion of the sleeve.

9 JUDGE BLOCH: If there is testimony by
10 Applicant to that effect, then isn't the question about
11 the rate of corrosion in the crevice relevant?

12 MR. CHURCHILL: We're kind of in a dilemma
13 about that one, Your Honor. The reason we have
14 testimony in there is because, in spite of the fact that
15 you constrained -- that the Board defined the contention
16 the way it did, it also asked specific questions, and
17 our testimony is stated so that the first two or three
18 questions get to what we think the issue is, and then we
19 have one or two final questions that start out, "The
20 Board has also asked for certain information on certain
21 subjects."

22 So yes, we have provided information on that
23 in response to the Board's question.

24 JUDGE BLOCH: If you want to stipulate that
25 it's your position that that's entirely irrelevant, that

1 you will not rely on the rate of corrosion of the
2 sleeve, then I suppose we could rule that this question
3 is irrelevant. But if you are going to in any way in
4 your findings rely on the rate of corrosion in the
5 sleeve, I would have to consider this question
6 relevant.

7 MR. CHURCHILL: Could we have the question
8 read back?

9 JUDGE BLOCH: He's going to ask a question
10 about the paragraph beginning -- he was asking that the
11 paragraph be read, but he hadn't framed the question
12 yet.

13 MR. ANDERSON: I'd be glad to say what the
14 question would be. It is, do you agree or disagree with
15 the statement of Mr. Niles?

16 (Pause.)

17 MR. CHURCHILL: Your Honor, I do object to
18 this line of questioning, but I object because I believe
19 it is outside the scope of the issue as framed by the
20 Board in this hearing.

21 JUDGE BLOCH: Are you willing to agree that
22 you will not submit any findings regarding the rate of
23 corrosion in the sleeve?

24 MR. CHURCHILL: I don't know that he has asked
25 any questions yet, Your Honor, about the rate of

1 corrosion in the sleeve. I don't know if he's asked any
2 questions yet that pertain to a particular aspect of Mr.
3 Fletcher's testimony.

4 JUDGE BLOCH: Well, let's hear the question.
5 The question is, do you agree with this paragraph?

6 MR. ANDERSON: That's correct.

7 JUDGE BLOCH: It is directly related to the
8 question that was just asked and answered about 6.7. It
9 is already in the hearing. I would direct that there be
10 an answer to that question.

11 BY MR. ANDERSON: (Resuming)

12 Q So the record is clear, perhaps I could ask
13 the witness to first read the paragraph and then respond
14 to the question.

15 A (WITNESS FLETCHER) All right. I'll be
16 reading the third paragraph in the letter addressed to
17 Mr. Saul Bernstein from Mr. G.H. Niles, dated February
18 2, 1982. The third paragraph reads:

19 "Inconel is particularly sensitive to crevice
20 corrosion, corrosion of the crevice between tube and
21 sleeve. Any secondary corrosion of that type that
22 penetrates the original tube then makes the sleeve
23 vulnerable to secondary site crevice corrosion attack.
24 If the tube to sleeve joint is not leak tight at both
25 ends of the sleeve, both the tube ID and the sleeve OD

1 are subject to crevice corrosion attack from primary
2 chemistry. Areas most vulnerable to attack should be
3 residual tensile stress areas, sleeve or tube-rolled
4 transition zones." End of paragraph.

5 MR. CHURCHILL: Your Honor, now that has been
6 read, I would like to point out that from the very
7 beginning the contention and all contentions advanced by
8 this Intervenor have had to do with corrosion from
9 secondary side chemistry, not primary side.

10 MR. ANDERSON: If I could interrupt, I'll ask
11 the question without respect to that parenthetical
12 phrase in the paragraph, to solve that objection.

13 MR. CHURCHILL: Precisely which part of that
14 would you delete when you ask Mr. Fletcher whether he
15 agrees with this?

16 JUDGE BLOCH: This objection is well taken.
17 The question must relate to secondary --

18 MR. ANDERSON: The only reason I asked him to
19 read the whole paragraph was I was afraid there would be
20 an objection on a partial citation. I got caught
21 between the devil and a hard place.

22 JUDGE BLOCH: You may ask your question.

23 BY MR. ANDERSON: (Resuming)

24 Q Would you agree with the first and second
25 sections of that paragraph, Mr. Fletcher?

1 JUDGE BLOCH: Please delay answering.

2 (Pause.)

3 JUDGE BLOCH: Do I hear any objections? Are
4 there any objections?

5 MR. CHURCHILL: Your Honor, I had objected to
6 this and you overruled the objection.

7 JUDGE BLOCH: Well, I wonder if there is
8 something new since you did come up with something new
9 just a moment ago.

10 MR. CHURCHILL: No. Eliminating the last
11 sentence eliminates my new objection. My old objection,
12 overruled as it is, remains as it was.

13 JUDGE BLOCH: Mr. Fletcher, you may answer
14 fully the extent to which you agree or disagree with the
15 three sentences.

16 WITNESS FLETCHER: All right. The first
17 sentence in that paragraph, I do not agree with the
18 first sentence. The second sentence I do agree with;
19 and the third sentence, somewhat speculative, I would
20 agree in terms of the speculation that is being made
21 there.

22 BY MR. ANDERSON: (Resuming)

23 Q If the first sentence is limited to
24 mill-annealed Inconel 600, would you agree or disagree?

25 A (WITNESS FLETCHER) I would disagree.

1 Q Would you state the reason why you disagree.

2 A (WITNESS FLETCHER) Inconel is not
3 particularly sensitive to crevice corrosion. I
4 interpreted that to mean, whenever Inconel is within a
5 crevice that it is particularly sensitive to corrosion
6 just because there is a crevice.

7 Crevice corrosion refers really to a different
8 process than what we have seen in terms of concentration
9 principles. Crevice corrosion usually refers to the
10 formation of an oxygen cell that attacks the material in
11 the crevice region. We have not observed that to happen
12 with Inconel.

13 JUDGE BLOCH: Would you say Inconel is
14 sensitive to corrosion caused by sludge that accumulates
15 in steam generator crevices?

16 WITNESS FLETCHER: Inconel can be corroded by
17 impurities and accumulated sludge that are concentrated
18 in crevices.

19 BY MR. ANDERSON: (Resuming)

20 Q Now, when you did the test of the thermally
21 annealed, thermally treated Inconel 600, was that in a
22 crevice environment with corrosion?

23 A (WITNESS FLETCHER) We have done both of
24 those, both in the crevice and outside of the crevice.

25 Q And would you summarize the difference again,

1 please, the difference in the results of the two?

2 A (WITNESS FLETCHER) The difference was
3 nonexistent. The material behaved in the same fashion.
4 The environments placed around Inconel tube, be it in a
5 crevice or not in a crevice, the Inconel would behave
6 the same way.

7 JUDGE BLOCH: The key variable is the presence
8 of caustic?

9 WITNESS FLETCHER: That is correct.

10 MR. ANDERSON: I'd like to make a limited
11 offer of Intervenor's Exhibit 1, a limited offer to
12 establish the fact that the author of the letter
13 expressed those opinions to the recipient of the letter
14 and not as to the truth of the statements made in that
15 letter.

16 MR. CHURCHILL: I would object to that, Your
17 Honor. He has already established that by the questions
18 he has asked. He identified the letter, he had the
19 witness read out the opinion expressed by the author of
20 the letter, and he asked Mr. Fletcher to give his
21 opinion on whether he agreed.

22 That establishes the fact that there is
23 somebody by the name of Mr. Niles who in fact expressed
24 that opinion, and I think that is the only possible
25 reason that Mr. Anderson could be asking for the

1 introduction of this letter, which by the way contains a
2 lot of other information beyond the realm of this
3 hearing.

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1 MR. ANDERSON: Well, the letter had a lot of
2 other information about inspectability, too, and so does
3 it have a lot of information apart from the specific
4 contention. The letter, I would add, has been accepted
5 for its authenticity in the record already in this
6 proceeding.

7 We would like to not go through having the
8 witness read every single paragraph and have it accepted
9 for that limited purpose we just stated.

10 MR. CHURCHILL: Your Honor, if he wants to ask
11 questions based on that letter, I think we established
12 earlier on that he could use it as a basis of cross
13 examination. The proper way to do that is to point out
14 portions of the document after having properly
15 identified the document.

16 There is absolutely no reason to introduce
17 into evidence a letter which is not sponsored and which
18 the author is not here.

19 JUDGE BLOCH: Is the principal problem we
20 don't know the expertise of Mr. Niles?

21 MR. CHURCHILL: That is correct.

22 MR. ANDERSON: I think my making a limited
23 offer takes that into account or it is person's position
24 with the Northern States Power Company, not with his
25 expertise.

1 MR. CHURCHILL: This would add absolutely
2 nothing to the record. If he wants to use it as a cross
3 examination tool, he is free to use it. We have already
4 established that at the beginning of the hearing today.
5 It cannot possibly have any meaning in the record. We
6 strongly object to its being placed in the record.

7 JUDGE BLOCH: Mr. Bachmann, have you a
8 comment?

9 MR. BACHMANN: We support Mr. Churchill. The
10 admission of this into evidence, particularly in view of
11 the statements made by the Board on page 11, at the
12 bottom of page 11, of your October order I believe would
13 also support Mr. Churchill's position.

14 JUDGE BLOCH: We don't find there is any
15 particular evidentiary value to this document.
16 Therefore, it shall not be allowed in evidence.

17 Mr. Churchill has said you may continue to use
18 it for cross examination purposes. Please continue.

19 JUDGE BLOCH: Off the record.

20 (A discussion was held off the record.)

21 JUDGE BLOCH: Back on the record. We have
22 decided we will continue meeting until 4:00 this
23 evening. Please continue.

24 BY MR. ANDERSON: (Resuming)

25 Q The sludge that surrounds the tubes on top of

1 the tube sheet above the tube sheet, will that have any
2 effect on pressing in on the steam generator tubes?

3 A (WITNESS FLETCHER) Effect a pressing in on
4 the steam generator tubes?

5 Q Such as to affect the inner diameter
6 variation?

7 A (WITNESS FLETCHER) No, I would not expect
8 that.

9 Q Is it possible?

10 A (WITNESS FLETCHER) I don't believe so.

11 JUDGE BLOCH: Is there an empirical basis for
12 not believing or believing that the sludge does not
13 pinch the tubes in?

14 WITNESS FLETCHER: The sludge accumulates by a
15 process of very small particles settling in place, and
16 the particles are mobile. They can be sludge-lanced
17 out, for the most part. But even if they are not, they
18 settle around the tubes and there is no recognized force
19 or there is no recognized interaction that would cause
20 the sludge to sufficiently press against the tube to
21 cause either a plastic or elastic deformation of the
22 tube.

23 JUDGE BLOCH: We know it presses hard enough
24 to keep the grate boundaries in contact with each other,
25 even when cracking occurs, isn't that right?

1 WITNESS FLETCHER: That is in a confined
2 space. Within the tube sheet hole itself, where the
3 tube sheet hole backs up, any deposit within that
4 location, the sludge itself, the sludge accumulation,
5 would be a slow process where each of the particles
6 finds its own location and it can become like a hardened
7 material in a location such as that on top of the tube
8 sheet.

9 You have many areas where the expansion could
10 take place, many paths. The sludge is not backed up by
11 any rigid member like the tube sheet hole.

12 BY MR. ANDERSON: (Resuming)

13 Q How about the first half inch on the top of
14 the tube sheet? Would there be any possibility of
15 expanding -- of the sludge expanding to pinch the tube
16 in that region?

17 A (WITNESS FLETCHER) As I said, Mr. Anderson, I
18 don't believe the sludge expands at all. It will settle
19 in place and it can form quite a hard, compacted region,
20 but it is not going to grow. In my opinion, it's not
21 going to grow in such a fashion as to press inward or to
22 plastically or elastically deform the tube.

23 It can settle in place and be a backing ring,
24 if you will, for the tube.

25 Q Do you have any knowledge about the extent of

1 copper found in the steam generators at Point Beach?

2 A (WITNESS FLETCHER) I know there is copper or
3 copper compounds in the sludge that has been analyzed
4 from Point Beach plants. I don't have handy those
5 analyses. I look at so many sludge analyses that there
6 is a range, and I couldn't give you a specific.

7 Q Would you agree or disagree that Point Beach
8 has rather more than the normal amounts of copper than
9 other equivalent plants?

10 MR. CHURCHILL: Your Honor, may I ask where
11 this line of questioning is going, because I do think
12 that something like this has been excluded by the
13 Board's order.

14 JUDGE BLOCH: Where are we going with the
15 copper?

16 MR. ANDERSON: It is in the same direction as
17 the statement about magnetite in the direct testimony
18 affecting the eddy current test signal.

19 MR. CHURCHILL: Sir, what we have said is that
20 the impurities that have caused noise to affect the eddy
21 current signal are now going to be further removed from
22 the tube.

23 JUDGE BLOCH: Are what?

24 MR. CHURCHILL: Are now going to be further
25 removed from the sleeve and that is why the sleeve is

1 going to have greater inspectability. That is the only
2 possible reference we could have had to that. If that
3 was his line of questioning, that would be permissible.

4 BY MR. ANDERSON: (Resuming)

5 Q The question is whether the impurities get
6 between the sleeve and the tube in the annulus.

7 MR. CHURCHILL: I'm not quite sure I heard the
8 question related to that.

9 MR. ANDERSON: Well, I can't give all thirteen
10 questions at once, Mr. Chairman.

11 JUDGE BLOCH: Let's continue.

12 MR. ANDERSON: There is a question outstanding.

13 MR. CHURCHILL: Could we have it read back?

14 MR. ANDERSON: Why don't I just reread it?

15 BY MR. ANDERSON: (Resuming)

16 Q Would you have any knowledge as to whether
17 Point Beach has more or less copper found in the steam
18 generators than other plants of equivalent design?

19 MR. CHURCHILL: I'm going to have to object to
20 that. I don't want to be in the position of always
21 having to object, but that has nothing to do with the
22 fact of whether you are going to have more or less
23 before or after sleeving or whether it's going to go in
24 there or not. What we have, we have.

25 The amount relative to any other plant is

1 totally irrelevant.

2 JUDGE BLOCH: Off the record.

3 (A discussion was held off the record.)

4 JUDGE BLOCH: On the record.

5 BY MR. ANDERSON: (Resuming)

6 Q Would copper on the surface of the outer
7 diameter of the sleeve cause confusion in the eddy
8 current test signal?

9 A (WITNESS FLETCHER) Copper on the outer
10 surface of the sleeve would be detectable by eddy
11 current but it is not expected to cause an interference
12 with nor detract from the sensitivity or the ability of
13 eddy current because of multi-frequency-mixing
14 techniques. That signal can be disposed of.

15 Q Before we get to the techniques of
16 multi-frequency eddy current tests utilized, does copper
17 appear on the test?

18 A (WITNESS FLETCHER) Copper appears as a signal
19 because it is a conductive material on the eddy
20 current.

21 Q So if there is a -- apart from the copper, if
22 there is a loss of volume due to corrosion, the presence
23 of copper would appear to create a presence of a metal
24 volume, would it not?

25 A (WITNESS FLETCHER) I'm not sure I understand

1 your question.

2 Q It would tend to counteract the appearance of
3 a signal in the area where a defect exists.

4 JUDGE BLOCH: Mr. Anderson, you established
5 there would be some signal coming from the copper. The
6 answer was yes, there would be a signal but it would be
7 differentiated.

8 MR. ANDERSON: I understand that, but I'm
9 trying to get to the point before he reached that.

10 JUDGE BLOCH: I don't understand where you are
11 going. I hope I will soon. What is the question now?

12 BY MR. ANDERSON: (Resuming)

13 Q The question is would the presence of copper
14 in an area where there was a lot of copper in the
15 original tube, would the signal of one counteract the
16 signal of the other so it would appear to be a normal
17 tube?

18 A (WITNESS FLETCHER) It is not expected it
19 would be because of the mixing technique. It would null
20 out the presence of copper.

21 Q Now if the operator or the reader was not
22 alerted to the presence of copper, would the answer to
23 my previous question be yes?

24 A (WITNESS FLETCHER) It is my understanding
25 that copper presents a very distinctive signal that the

1 operator would be aware of, and if he were not to
2 initially try and mix out the signal he could certainly
3 do so once he recognized the characteristic signal.

4 Q And are there any blind box tests to verify
5 that?

6 A (WITNESS FLETCHER) Blind box test? I can't
7 speak of blind box tests per se, but I know that copper
8 and copper deposits on the outside of tubes or, you
9 know, sleeve type materials have been conducted in the
10 laboratory in order to establish the characteristics of
11 the copper signal and how it can be controlled or
12 otherwise handled with multi-frequency techniques.

13 JUDGE BLOCH: I don't believe that was
14 directly responsive. The question was has there been a
15 an effort through testing to find out how reliable
16 actual operators can be in discriminating between
17 defects and copper, and it is how they tried to do
18 reliability tests where the operator didn't know which
19 things they were looking at. I think that's what you
20 meant by "blind".

21 WITNESS FLETCHER: I am not aware of any blind
22 box test. The remainder of my answer characterized the
23 type of testing that is ordinarily done in the
24 laboratory where a tube with a known indication in it, a
25 notch, for example, with a copper deposit then is

1 resolved and the technique is established for that.

2 But blind box in terms of measuring
3 reliability, I am not aware of any.

4 BY MR. ANDERSON: (Resuming)

5 Q So what you are saying is in a laboratory test
6 type condition you feel confident that you can
7 distinguish copper from a defect and separate the two
8 signals?

9 A (WITNESS FLETCHER) Yes, Mr. Anderson. We
10 feel confident about the handling of copper signals in
11 the laboratory, but it has also been applied in the
12 field.

13 Q But you say you don't have any way to verify
14 the effectiveness of that field testing, do you?

15 A (WITNESS FLETCHER) Tubes have been pulled
16 from the field to verify the presence indications. The
17 indication of copper or copper signals were noticed in
18 the field.

19 Q Then were the leaders or evaluators alerted to
20 look for the presence of copper in those cases?

21 A (WITNESS FLETCHER) It is my understanding,
22 and I was not directly involved in this, but the
23 information that I had have fed back to me is that the
24 appearance of the copper signal is quite distinct so
25 that when one looks at the eddy current tapes they

1 detect the presence of copper and the operators, to the
2 extent necessary, are alerted to this fact, and the
3 readers of the information.

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1 Q If one wanted to get a general understanding,
2 are we going to have to talk to the next witness, Mr.
3 Denton, about the details of how that is done?

4 A (WITNESS FLETCHER) Yes. I cannot speak for
5 Mr. Denton, to his particular knowledge in this area,
6 but I should think he would be.

7 Q And has any copper been found on the outer
8 diameter of the tubes at Point Beach to your knowledge
9 as well as the sludge?

10 A (WITNESS FLETCHER) Deposits have been removed
11 from the tube surface of tubes removed from Point Beach,
12 and copper has been found in that deposit.

13 I might further add that when the tubes are
14 removed from a steam generator, they usually have a
15 deposit on them of sludge-like components. So that in
16 the laboratory scrapings are made from the tube
17 surface. You would find copper there, the same as you
18 would find copper in a sludge sample removed directly
19 from a sludge pile.

20 Q And is the source of this copper in the steam
21 generators and on the wall of the generator tubes at
22 Point Beach from the copper alloys in the feedwater
23 train?

24 A (WITNESS FLETCHER) That is our conclusion.
25 It is from the feedwater train materials.

1 Q And that source of copper into the steam
2 generator will continue in the plant with the sleeve
3 tubes if this application is approved?

4 A (WITNESS FLETCHER) Not necessarily, Mr.
5 Anderson. The presence of copper or the transport of
6 copper from the condensate feedwater train materials is
7 a function of the chemistry and especially the presence
8 of oxygen and minimization of oxygen minimizes the
9 extent to which copper would be transported from these
10 materials to the steam generator.

11 Q Well, hasn't minimization of oxygen always
12 been that goal?

13 MR. CHURCHILL: Excuse me, Your Honor. The
14 feedwater as source of copper and the chemistry
15 treatment is well beyond the scope of sleeving. What is
16 done there will be done irrespective of whether or not
17 the plant is sleeved.

18 MR. ANDERSON: We are talking about the
19 potential for continuing impurities or corrodence in the
20 annulus between the slaeve and the tube.

21 JUDGE BLOCH: Mr. Fletcher testified there was
22 less likely to be copper after the sleeving because
23 there were going to be things done to the chemistry.
24 That seems relevant.

25 MR. CHURCHILL: No, sir. He did not testify

1 to that.

2 JUDGE BLOCH: Did you or did you not say the
3 amount of copper would probably be reduced?

4 WITNESS FLETCHER: No, I said the amount of
5 copper transported is dependent upon the chemistry
6 control and more especially the control of oxygen. The
7 minimization of oxygen would minimize transport of
8 copper.

9 JUDGE BLOCH: And is that going to be done in
10 any different way in the future than it is now?

11 WITNESS FLETCHER: I really can't speak to
12 that. The objective, of course, is to improve as time
13 goes, but this is a plant operating characteristic.

14 BY MR. ANDERSON: (Resuming)

15 Q Looking at Page 4 of your prepared testimony,
16 Mr. Fletcher, the first whole paragraph, and you talk
17 about the noise that is created in the tube sheet from
18 the impurities. Is that right, sir?

19 A (WITNESS FLETCHER) About midway in that
20 paragraph I talk about signals can also be caused by the
21 -- in the sludge surrounding the tube in the vicinity of
22 the tube sheets.

23 Q No, I was looking at the next paragraph,
24 beginning, "Significantly."

25 A (WITNESS FLETCHER) I beg your pardon.

1 Q And the question was, you are making a
2 statement that noise is created in the tube sheet by the
3 surrounding corrosion and impurities, and the sleeve
4 will be further away from that noise.

5 A (WITNESS FLETCHER) Just to make certain that
6 we are talking about the same sentence, about midway in
7 the second paragraph on Page 4 it says, "The noise from
8 these three sources is significantly reduced by the
9 greater distance."

10 Q That's correct. Now, if the original tube has
11 a defect and as you say in Exhibit 1 in the steam
12 generator report you have concentrations there,
13 impurities collect and concentrate there, you would have
14 a situation where the sludge would be right next to the
15 sludge which has the noise signal right against the
16 sleeve, would you not, sir?

17 A (WITNESS FLETCHER) Well, of course, it
18 depends upon the type of defect that one assumes in the
19 outer tube. If it is a stress corrosion crack, that is
20 a fairly tight annulus, and to expect that sludge would
21 suddenly move in and fill the crevice between the tube
22 and the sleeve is doubtful. If you were to go on to
23 assume that there were a large opening in the tube, then
24 you could permit some sludge to go into the annular
25 region between the tube and the sleeve.

1 Q And if that were to happen above the tube
2 sheet, you have a situation where the sludge created
3 difficulties in eddy current test reading that now is
4 limited to the tube sheet region would be moved to the
5 area above the tube sheet. Is that not true?

6 A (WITNESS FLETCHER) Mr. Anderson, I believe
7 you lost me on that one. I believe you said that if the
8 sludge enters the annular region above the tube sheet,
9 would that be different --

10 Q Let me repeat the question, if that would
11 facilitate things, Mr. Fletcher.

12 A (WITNESS FLETCHER) Please.

13 Q If we assume that one of the defects that is,
14 say, two inches above the tube sheet in Unit 2 is a
15 through wall defect, it's an opening, and sludge gets in
16 through there into that annulus, that would cause a
17 reduction in inspectability because of a noise from that
18 impurity, would it not?

19 A (WITNESS FLETCHER) With the sludge adjacent
20 to the sleeve outer diameter, there is additional noise
21 that would be picked up by the eddy current test.

22 Q And that would reduce detectability of
23 defects?

24 A (WITNESS FLETCHER) Not really. That is a
25 small effect. It is an effect, and it does show up in

1 the so-called noise background during inspection, but it
2 does not interfere with the detection of degradation in
3 the sleeve, the same as it does not interfere with a
4 detection of degradation in the tube where the sludge is
5 known to be packed around the outside of it.

6 Q Well, could one draw a conclusion from that,
7 then, that the reliability of the detection in the tube
8 sheet in the past has been very good?

9 A (WITNESS FLETCHER) The reliability of
10 detection is good in spite of the noises that do arise
11 from the tube sheet itself, the inner bore of the tube
12 sheet hole and the presence of sludge, still
13 acceptable.

14 JUDGE BLOCH: Mr. Fletcher, if the testing
15 detected that it wasn't just stress corrosion cracking
16 in the tube, but a piece of the outer tube actually fell
17 off, and so there was no direct contact between the
18 secondary feedwater and the sleeve, would you think that
19 under those circumstances you would continue operating
20 anyway?

21 WITNESS FLETCHER: Oh, yes. The sleeve is the
22 pressure boundary.

23 JUDGE BLOCH: But under those circumstances,
24 you would expect an accumulation of sludge in the
25 annulus?

1 WITNESS FLETCHER: I would think one would
2 expect there to be a filling of sludge over time into
3 the annular region between the sleeve.

4 JUDGE BLOCH: Are you saying because the
5 annulus is thinner that sludge in that area would be
6 less of a problem for eddy current testing than sludge
7 in the present crevice?

8 WITNESS FLETCHER: No, I am saying that with
9 the presence of the sludge in the tube sleeve annulus,
10 although that might increase the noise signal, it would
11 not significantly affect or interfere with the
12 detectability by the eddy current test of the sleeve.

13 JUDGE BLOCH: The detectability of what?

14 WITNESS FLETCHER: Of degradation, of IGA, of
15 intergranular attack, or of the stress crack.

16 JUDGE BLOCH: IGA also. Now we have the
17 possibility of a buildup of the separation along IGA.
18 Isn't that correct?

19 WITNESS FLETCHER: Well, that's all right.
20 The technique that is being developed now is independent
21 of the formation of stress corrosion cracking.

22 JUDGE BLOCH: So if the technique is to the
23 operational stage then it would be a problem, but at
24 present, the presently available techniques, there would
25 still be a problem.

1 WITNESS FLETCHER: Well, that is within the
2 context that there is no expansion of the region
3 affected by IGA because it is being backed up by
4 something so rigid such as a tube sheet hole that would
5 not permit expansion.

6 JUDGE BLOCH: Well, under the hypothetical I
7 gave you where a piece actually came out of the sleeve,
8 wouldn't you expect over a period of time that you
9 wouldn't have that happen? That you would have a
10 similar kind of hard crevice deposit as you now have in
11 the tube sheet crevice?

12 WITNESS FLETCHER: I guess one could
13 reasonably expect it to infill and over a period of time
14 it could become hard, and then it depends on the
15 resistivity -- I'm sorry, the rigidity of the member
16 surrounding that hard deposit. Now, in the tube sheet
17 region, that is surrounded by a very rigid member,
18 namely the tube sheet hole. Outside of the tube sheet
19 then would be resisted by the surrounding tube, but if
20 the surrounding tube is missing in part, then it is not
21 a rigid body.

22 JUDGE BLOCH: And if the specific region next
23 to that area was solid enough to compress the sludge.

24 WITNESS FLETCHER: That is correct.

25 BY MR. ANDERSON: (Resuming)

1 Q Do any of those detectability statements you
2 made rely on using a pancake probe?

3 A (WITNESS FLETCHER) No, the techniques that I
4 referring to use standard conventional probes and
5 frequencies that are being employed today, subject to
6 some modest modification perhaps in frequency after the
7 development work has been shown to optimize the
8 detection of IGA

9 Q Now, in addition to the problem of noise
10 created by conductive impurities, are they also
11 corrosive?

12 A (WITNESS FLETCHER) The conductive impurities
13 need not be corrosive.

14 Q May they be?

15 A (WITNESS FLETCHER) They could be, or they
16 could participate in corrosion reactions.

17 Q Would you describe very briefly how they would
18 do so?

19 A (WITNESS FLETCHER) Well, in the case of
20 magnetite, that is not considered to be corrosive, but
21 it is conductive. In the case of copper deposits
22 through electric deposits, the electrochemical
23 reactions, they can participate mostly if the copper is
24 brought to the site as a copper oxide. It in effect
25 becomes reduced, releasing its oxygen from the copper

1 oxide and oxygen accelerates or participates in
2 corrosion processes.

3 Q And have you found copper oxides in the steam
4 generators at Point Beach?

5 A (WITNESS FLETCHER) Some copper oxide has been
6 present in all sludge samples, as I best recall also
7 from Point Beach, a mixture of copper and copper oxide.

8 Q Now, moving on to Page 5, you talk about the
9 detectability in the sleeve. Let me just verify
10 whatever I said before. The sleeve tube will not be
11 able to have any defects in the tube itself detecting
12 the eddy current test. Is that right?

13 A (WITNESS FLETCHER) By the standard technique
14 that is now established for inspecting a sleeve, the
15 presence of degradation in the outer tube would show up
16 at best as a weak signal, so it would not be generally a
17 large signal needed to interfere with the inspection of
18 any sleeve per se.

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1 Q So you would not be putting any warning in any
2 eddy current test as to the possibility of openings in
3 the tube, openings into the annulus?

4 A (WITNESS FLETCHER) Well, the inspection is
5 designed for inspecting the integrity of the sleeve and
6 is not directed at inspecting the integrity of the
7 tube.

8 Q Now, Mr. Churchill this morning indicated that
9 the recent inspection results at Unit 1 indicated some
10 anomaly in one of the signals in the sleeve tube. Do
11 you have any information with respect to that?

12 A (WITNESS FLETCHER) No. That information is
13 being generated. I think it is a part of the seven-page
14 handout or the seven-page item that was previously
15 offered. That is to be discussed later, it's my
16 understanding.

17 Q Okay, I'll wait.

18 Now, you make representations on the middle of
19 page 5 with respect to various lines of defense against
20 any problem occurring, do you not, sir, due to tube
21 corrosion in the sleeves?

22 A (WITNESS FLETCHER) I am not sure where you
23 are. Can you give me the sentence you are referring to,
24 Mr. Anderson?

25 Q Sure. "A number of other factors are present,

1 including," and so on and so forth.

2 A (WITNESS FLETCHER) Yes.

3 Q Now, you worked with Westinghouse since 1970;
4 is that correct?

5 A (WITNESS FLETCHER) I have worked in the area
6 of steam generators since 1970.

7 Q But you are making a representation here that
8 you feel confident that the additional layers of
9 protection, the leak before break, the hydrostatic
10 testing, the leak rate limitation, the conservatism of
11 NRC's "plugging limit," provide protection against undue
12 risk to the public?

13 A (WITNESS FLETCHER) Yes, that is the basis for
14 my statement, all of these items put together.

15 Q Now, Westinghouse used to recommend a
16 phosphate treatment, is that not correct, sir?

17 A (WITNESS FLETCHER) That's right.

18 Q And the first type was a coordinated phosphate
19 treatment?

20 A (WITNESS FLETCHER) The first type was a
21 coordinated phosphate treatment, yes.

22 MR. CHURCHILL: Your Honor, excuse me. May I
23 ask where this line of questioning is going? I don't
24 see it's relevance to the testimony.

25 MR. ANDERSON: It's going to the weight that

1 the Board should give to the value of these
2 representations in the testimony of Mr. Fletcher, as to
3 whether they are conclusive as to there being no safety
4 risks or whether it is one more promise that is not
5 worth more than previous promises.

6 MR. CHURCHILL: I think the chance for voir
7 dire is over, if that's what you're getting at.

8 MR. ANDERSON: It's going to weight, not to
9 admissibility.

10 MR. CHURCHILL: Isn't that what we're talking
11 about? If he wants to cross-examine Mr. Fletcher about
12 the specific aspects that he has testified to, that is
13 fine. If he's trying to somehow impeach this witness by
14 statements made by somebody else at Westinghouse at some
15 other time, that should have been done on voir dire.

16 JUDGE BLOCH: Mr. Anderson, do you have
17 specific statements that this person has made that were
18 particularly untrustworthy or unreliable?

19 MR. ANDERSON: Well, Westinghouse is a
20 corporation. I don't know who is the author of it. All
21 I know is Mr. Fletcher was an employee of Westinghouse
22 Electric Corporation since 1970, when these statements
23 began to be made.

24 JUDGE BLOCH: We will take official notice
25 that there was an official view in the industry that a

1 different type of chemistry was the best way of treating
2 steam generators and that that view has changed. And
3 you may use that if it would be helpful.

4 MR. ANDERSON: Could the official notice
5 extend to the fact that the previous view was that these
6 various improvements would eliminate corrosion when
7 made, and subsequently changed?

8 MR. CHURCHILL: I would object to that.

9 JUDGE BLOCH: That it would eliminate
10 corrosion?

11 MR. ANDERSON: For example, in 1972
12 Westinghouse said changes, coordinating congruent
13 phosphate -- they said, maintenance of proper level of
14 congruent phosphate would eliminate the source of free
15 caustic and thereby eliminate new intergranular attack.
16 That was in 1972.

17 Now, you are allowed to ask a witness what his
18 opinion is as to reputable documents in the field.

19 MR. CHURCHILL: He is allowed to cross-examine
20 the witness on his testimony. It seems to me I was
21 wildly criticized for drawing out this hearing because I
22 objected --

23 JUDGE BLOCH: Mr. Anderson, I think this is
24 too weakly related to the credibility of this witness.
25 I prefer you prefer questions about his specific

1 conduct.

2 MR. ANDERSON: Is that preference a ruling?

3 JUDGE BLOCH: Yes, it is. I would expect when
4 I made rulings of that sort without the Staff comments
5 that if it disagrees the Staff will speak up.

6 MR. BACHMANN: Yes, sir.

7 BY MR. ANDERSON: (Resuming)

8 Q Now, one of the protections that you make
9 reference to on page 5, Mr. Fletcher, is the leak before
10 break characteristic; is that correct?

11 A (WITNESS FLETCHER) That is correct, Mr.
12 Anderson.

13 Q Is it your testimony that you can always rely
14 on leak before break?

15 A (WITNESS FLETCHER) Leak before break is a
16 characteristic that describes the behavior of the
17 material and describes the behavior of field-related
18 stress corrosion cracking for the majority of the
19 events.

20 Q Could you answer my question. I'll repeat the
21 question if you'd like.

22 MR. CHURCHILL: May we have the question read
23 back if he alleges that that is not a proper answer?

24 (The reporter read the record as requested.)

25 JUDGE BLOCH: The question is, can you always

1 rely on leak before breaks?

2 WITNESS FLETCHER: No, I would hesitate to say
3 always. I think that the leak before break
4 characteristic does represent the majority of the data
5 available, and more especially represents the situation
6 with regard to stress corrosion cracking of the type
7 that we have seen of Inconel tubing in caustic
8 solutions.

9 JUDGE BLOCH: As a scientist, you would rarely
10 say "always" about anything, wouldn't you?

11 WITNESS FLETCHER: You're quite correct,
12 Judge.

13 BY MR. ANDERSON: (Resuming)

14 Q Now, the leak before break did not occur in
15 1975 at the Point Beach tube accident, did it, sir?

16 A (WITNESS FLETCHER) There was no recorded
17 prenotice of the presence of a leak in Point Beach Unit
18 No. 1 in 1975.

19 Q And the Surry Unit 2 leak?

20 A (WITNESS FLETCHER) Surry Unit No. 2 leak?
21 Can you be more specific?

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1 Q I think it was 375 gallons per minute, wasn't
2 it?

3 A (WITNESS FLETCHER) I am speaking of the
4 time.

5 Q It is the one referenced in NUREG-0654, the
6 evaluation of steam generator tube events.

7 JUDGE BLOCH: Mr. Fletcher, do you recall any
8 information about the particular leak that Mr. Anderson
9 is talking about?

10 WITNESS FLETCHER: There have been several
11 leaks at the Surrey plants, Judge Bloch. I just wanted
12 to make sure that we were talking about the same one.

13 JUDGE BLOCH: I just wanted to make sure that
14 we weren't waiting for you to answer about something
15 that you didn't know.

16 BY MR. ANDERSON: (Resuming)

17 Q September 15, 1976.

18 A (WITNESS FLETCHER) That was a large leak
19 event?

20 Q Yes.

21 A (WITNESS FLETCHER) A Surrey Unit Number 2,
22 associated with the U-bend?

23 Q That's the one.

24 A (WITNESS FLETCHER) Yes, I'm familiar with
25 it.

1 Q Did the leak before break apply in that event?

2 A (WITNESS FLETCHER) Again, in that particular
3 case there is no report of any prenotification of
4 leakage before the large leak event occurred.

5 Q And the Prairie Island October 2, 1979 large
6 leak event, did that have a precedent leak before
7 break?

8 A (WITNESS FLETCHER) I believe not. It was
9 certainly not reported or not available.

10 Q And the January 28, 1982, tube event at Ginna
11 Nuclear Power Plant, did that have a leak before break?

12 A (WITNESS FLETCHER) I believe not.

13 Q Turning to page six of your prepared
14 testimony --

15 JUDGE BLOCH: Off the record.

16 (A discussion was held off the record.)

17 JUDGE BLOCH: Back on the record.

18 MR. CHURCHILL: Your Honor, I have a motion I
19 would like to move before the close of the hearing.

20 JUDGE BLOCH: Mr. Churchill, we would like to
21 hear your motion now.

22 MR. CHURCHILL: I am just operating from a
23 note here. I have not had a chance to talk to the
24 Westinghouse people yet, but it is my understanding that
25 all dimensions of the sleeves, including the tolerances,

1 are proprietary and the nominal dimensions of the tube
2 are not proprietary, and I think we gave those, so we
3 don't have to worry about those.

4 We didn't give the tolerances of the tube,
5 which are proprietary, so that is not a problem, but the
6 dimensions of the sleeve we did give, although we did
7 not give the tolerances. We pointed out, for the
8 tolerances, what the tolerances were, but I believe Mr.
9 Fletcher stated on the record the dimension of the
10 sleeve -- the outer diameter of the sleeve -- and I
11 would like to request that the Board allow us to keep
12 those portions of the transcript which contain that
13 number proprietary.

14 I'm not sure whether it appears on more than
15 one page of the transcript or not.

16 JUDGE BLOCH: May I ask what effect, the
17 possible effect of members of the public in the
18 courtroom today have on whether or not we should
19 continue to keep this information proprietary?

20 MR. CHURCHILL: The effect of the presence of
21 members of the public does complicate my motion.
22 However, there is a difference between assuming that
23 anybody here would be particularly in or maybe remember
24 that. Looking around, I think most of the people are,
25 in fact, associated with the company of Westinghouse in

1 some way or another. There is a difference between that
2 and having the entire transcript back in Washington in
3 the public document room for all of the world to see.

4 This was inadvertent. The witness did not
5 intend to state on the record this proprietary number.
6 Sometimes this happens in cases like this and I think it
7 could be easily cured if we could keep that particular
8 page or pages -- it may not be more than one page --
9 proprietary. Or another way to do it is perhaps, I
10 think, if it is only that number, if we could for the
11 time being at least delete that number from the
12 transcript so that the entire transcript would be bound
13 and then perhaps handle this by post-hearing briefing.

14 MR. ANDERSON: Could we have an explanation of
15 why it is proprietary?

16 MR. CHURCHILL: Of why it should be
17 proprietary? That is already on the record. It is
18 already established. It was requested by the Applicant,
19 with affidavits and so on, and ruled on by the Staff,
20 allowing it to be held as proprietary.

21 JUDGE BLOCH: We'll have to rule on this as a
22 separate matter as a part of a brief that might have to
23 filed after the hearing, but I agree with the Applicant
24 that at this stage we should delete the number or
25 numbers dealing with the dimensions of the unit sleeve

1 from the public copies of the transcript. That is the
2 ruling you requested, is it not?

3 Mr. Reporter, you will be able to accomplish
4 that, please?

5 THE REPORTER: Yes.

6 JUDGE BLOCH: Mr. Churchill, do we need to see
7 any members of the public who were here? I know there
8 were some who are not affiliated with Westinghouse or
9 Point Beach.

10 MR. KARMAN: Or the Staff.

11 MR. CHURCHILL: Yes, sir. Could you ask them
12 to forget that number?

13 JUDGE BLOCH: I would urge the members of the
14 public who are present not to communicate this
15 information, which was inadvertently released concerning
16 a Westinghouse proprietary piece of information which is
17 allegedly proprietary in Westinghouse.

18 Mr. Anderson, it is now 4:00. Would you like
19 to ask a few more question, or would you prefer for us
20 to break to 9:00 in the morning?

21 MR. ANDERSON: Well, at this point I get into
22 a long, protracted discussion on the LERs. It is not a
23 straight question.

24 JUDGE BLOCH: Well, we will adjourn until 9:00
25 in the morning tomorrow. I regret to say the optimism

1 of the Board about this schedule, which is going to
2 conclude easily, has not dissipated entirely. I now
3 anticipate the likelihood of a Thursday evening session.

4 The hearing is recessed.

5 (Whereupon, at 4:01 o'clock p.m., the hearing
6 recessed, to reconvene at 9:00 o'clock a.m., Thursday,
7 November 18, 1982.)

8
9 [Testimony for the November 17, 1982, Limited
10 Appearance Statements, from 8:00 p.m. to 10:00 p.m. in
11 Two Rivers, Wisconsin, will begin with page 10,000.]

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NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the
Nuclear Regulatory Commission

in the matter of: Wisconsin Electric Power Company

(Point Beach Power Plant Units 1 and 2)

Date of Proceeding: November 17, 1982

Docket Number: 50-266-OLA and 50-301-OLA

Place of Proceeding: Milwaukee, Wisconsin

were held as herein appears, and that this is the original transcript thereof for the file of the Commission.

ALFRED H. WARD

Official Reporter (Typed)



Official Reporter (Signature)