ORIGINAL

OFFICIAL TRANSCRIPT OF PROCEEDINGS

Agency: Nuclear Regulatory Commis. .on

Title: Alabama Power Company (Joseph M. Farley Nuclear Plant, Units 1 and 2)

Docket No. 50-348-CivP, 50-364-CivP
ASLBP No. 91-626-02-Civ1

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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In the Matter of: : Docket No. 50-348-CivP

ALABAMA POWER COMPANY : 50-364-CivP

[Joseph M. Farley Nuclear Plant, : ASLBP No. 91-626-02-Civl

Units 1 and 2] :

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Nuclear Regulatory Commission

5th Floor Hearing Room

East-West Towers

4350 East West Highway

Bethesda, Maryland

Tuesday, February 18, 1992

The above-entitled matter came on for hearing, pursuant to notice, at 9:00 o'clock a.m.

BEFORE: THE HONORABLE G. PAUL BOLLWERK III, Chairman of Atomic Safety and Licensing Board

THE HONORABLE DR. JAMES H. CARPENTER, Member of Atomic Safety and Licensing Board

THE HONORABLE DR. PETER A. MORRIS, Member of the Atomic Safety and Licensing Board

APPEARANCES:

On behalf of the Alabama Power Company:

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NUCLEAR REGULATORY COMMISSION, OFFICE OF THE EXECUTIVE LEGAL DIRECTOR
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ROBERT M. WEISMANN, ESQUIRE
Nuclear Regulatory Commission
Washington, D.C. 20555

[continued next page]

On behalf of Bechtel Corporation:

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I N D E X

Witness	Direct	Cross	Redirect	Recross	Board
Mark J. Jacobus	670	674	744	751	756
Norman Merriweather	670	674	744	751	756
James G. Luehman	670	674	744	751	756
Paul C. Shemanski	670	674	744	751	756

E X H I B I T S

Exhibit Number	Description	Identified	Received
Staff 59	Copies of Materials Made Available to Licensee in Preparation for EQ Inspections	669	669
Staff 47			779
Staff 48			779
Staff 49			779
Staff 50			779
Staff 51			779

PROCEEDINGS

(9:00 a.m.)

JUDGE BOLLWERK: On the record. Good morning.

Before we begin with the next panel for terminal blocks, I'd like to pick up a couple of procedural matters.

First, with regard to the Berryhill testimony, I just want to put on the record that in response to Mr. Miller's request about bringing Mr. Berryhill in from California, the Board on Friday looked at the testimony. I indicated to Mr. Repka over the phone, we didn't have any questions. And if Mr. Berryhill's testimony was supported by a proper affidavit, we would have no trouble with admitting it at that point.

I understand, and Mr. Holler and Mr. Bachmann can tell me if I'm wrong, that the staff has no objection to that procedure?

MR. BACHMANN: That's correct, Your Honor, the staff has no objection.

JUDGE BOLLWERK: All right, then we'll go ahead and do it that way, subject of course, if we decide we need to talk to Mr. Berryhill at some point, you would make him available?

MR. MILLER: Yes, sir.

JUDGE BOLLWERK: All right. Thank you. I'm sorry, do you have something else?

MR. MILLER: I was going to pursue the same issue with Dr. Bolt, if the Board is ready to hear our discussions on that issue.

JUDGE BOLLWERK: Okay. Why don't we go ahead and listen to it right now. And again, we may have to look at the testimony, but --

MR. MILLER: We have had a resolution, with the staff at least, about Dr. Bolt. And the parties have agreed that if we introduce into the record four pages from Dr. Bolt's deposition, pages 112 through 115 inclusive, and certify that if asked those questions under cross-examination his answers would be as previously recorded, then the staff has no objection to Dr. Bolt staying in California, or at least not being brought here to testify live.

And I made to them the same offer, or the same approach, which is if at some later time they have a question, to say so, and we'll get it answered for them. And we would like to propose that to the Board, also. We are under something of a little time pressure. We called Dr. Bolt and told him to stay where he was. But that's good for about another couple of hours. And then if he's going to testify live, we had probably better put him on an airplane in two or three hours.

JUDGE BOLLWERK: So, you need to know something

before noontime, I take it?

MR. MILLER: I think it would help. He was on a plane that was leaving the west coast at 9:00 a.m. that time, which is -- and they're three hours behind us. And we told him just to hold off. Given the time difference, we thought we could have some answer for him.

JUDGE BOLLWERK: If we, at our morning break, took a slightly longer break, looked at the testimony, we could then make a determination if we need to see him. And if we told you by 11:00 a.m., is that acceptable?

MR. MILLER: I think so. We've asked him to get a backup reservation, and I suppose it's always possible we'll call out there and find out that he's left. But then the worst thing that happens is that he shows up here live, and we can stand that.

If anybody wants -- let me restate again. If the Board wants him up, we'll bring him up. That's not part of it. It's just that, you know, the staff has it down to these four pages of previously asked and answered questions. If there's an accommodation, we'd like to pursue it.

JUDGE BOLLWERK: Okay.

[Board members conferring off the record.]

JUDGE MORRIS: Could I ask, not having seen the deposition, is there anything different in the deposition than in his prefiled testimony?

MR. MILLER: I think, and I guess the staff can explain why these pages are particularly important to them, but there's something about a timing issue as I -- it's kind of hard for me sometimes to see it through their eyes. Maybe I'd better let them explain the significance of these four pages to them.

But while he's looking at it, Jim Sundergill who is, and will be live, has also testified on grease. So in that sense there's at least one person that any lubricant questions can be asked to. And if they're not satisfied, again, we will bring Dr. Bolt if it turns out that's what it requires.

MR. BACHMANN: Judge Morris, I can explain the significance of this. In the question-answer 11 to Dr. Bolt's testimony, there is a discussion of the mixing of greases. And it's not clear from his testimony on when he made this determination. In the deposition he was asked about the mixing of greases. And this deposition, which I believe is not dated -- I think we're going to need a date on this.

I believe it was June of '91. Well, we'll append a date on this, I guess.

MR. MILLER: That's fine.

MR. BACHMANN: He was asked when he was making his analysis, making his determination on the viability of

mixing the greases, and he stated a couple of months ago. So this puts it in a timeframe, and that was essentially all we wanted to pin down. And this only refers, essentially, to question-answer 11.

JUDGE BOLLWERK: All right. Why don't you go ahead and tell Dr. Bolt that we will not need to see him at this point, then.

MR. MILLER: Thank you, Your Honor.

JUDGE BOLLWERK: Again, subject to the same -- an affidavit that supports his testimony adequately in terms of its truthfulness, and subject to being called if the Board needs it.

MR. MILLER: Yes, sir. And that is absolutely understood and clear, if the Board decides they would like to see Dr. Bolt or Mr. Sundergill, we'll get them here. But, candidly, I think this is the most efficient resolution of the issue.

JUDGE BOLLWERK: All right.

MR. MILLER: And we have one copy of this. And if the Board wishes, I'll have additional copies made at a break, or maybe at the noontime recess.

JUDGE BOLLWERK: I don't --

I think you can go ahead and provide it to us when the testimony is put in.

MR. MILLER: That's fine. Thank you, sir.

JUDGE BOLLWERK: Two other brief procedural matters. I think the staff was preparing some documentation on the Sandia Seminar to be introduced as an exhibit. I just wanted to check on the status of that.

MR. HOLLER: That's correct. In fact, we do have that in the hearing room this morning, if you would like us to provide there copies and introduce that, we can do that.

JUDGE BOLLWERK: Why don't we go ahead and take care of that now. And I guess I'm going to ask Mr. Miller also about the status of the APCo timeline which was marked as Exhibit -- APCo Exhibit, I think it was 92.

MR. MILLER: On the issue of the timeline, we have sent back and had a reduced version made up. And our challenge now is to take the one from which there has been some testimony and make the markings on the reduced version so it looks like the one that we have here in the hearing room.

But, I might just inquire, is that -- is this what we have in mind -- if we're going to fit it into the transcript, itself, we may have to trim it so that it looks like a page, and just have -- it looks like maybe three or four pages, one right after each other.

[Board members conferring off the record.]

JUDGE BOLLWERK: I think since when we're going to use it as an exhibit, that should be perfectly acceptable.

I don't think we will actually bind it into the transcript.

MR. MILLER: All right.

JUDGE BOLLWERK: We'll keep it a an exhibit.

MR. MILLER: What we'll do, since we now have the reduced versions and the discussed version in the same room with us, then we'll proceed to mark these up so they true up with what we have.

JUDGE BOLLWERK: Okay. Maybe later today or tomorrow, we can go ahead and take care of it and get it into evidence.

MR. MILLER: Yes, sir. And I haven't forgotten, Judge Carpenter, the horizontal, I'm sorry, the vertical version of the timeline. And we're proceeding on that also for you, sir.

JUDGE CARPENTER: Thank you.

JUDGE BOLLWERK: Okay. Mr. Holler, I believe you were going to --

MR. HOLLER: Yes, sir, if it please the Board. The staff has marked for identification as the Staff Exhibit 59, copies of those materials that were made available to the licensee in response to any -- requests for any and all inspector training manuals or seminar materials provided to NRC inspectors, in preparation for conducting EQ inspections. There are, in fact, 14 documents within staff Exhibit 59 that are sub-labeled, items 39-A through N.

At this time I will move that Staff Exhibit 59, at the request of the Board be introduced into evidence.

MR. REPKA: No objection.

JUDGE BOLLWERK: We'll mark it Staff Exhibit 59, as identified and received into evidence.

[Staff Exhibit No. 59 marked for identification and received into evidence.]

JUDGE BOLLWERK: Are there any other procedural matters that either of the parties have at this point?

MR. REPKA: We have none at this time.

JUDGE BOLLWERK: Nothing from the staff?

MR. HOLLER: Nothing from the staff.

JUDGE BOLLWERK: All right. Why don't we go ahead then and proceed with the panel on terminal blocks?

MR. HOLLER: The panel that gave testimony on behalf of the NRC staff concerning terminal blocks has been seated. I will note, for the record, that the members of the panel have been sworn in, with the exception of Dr. Mark J. Jacobus. I ask, at this time that Dr. Jacobus be sworn in.

[Witness sworn.]

JUDGE BOLLWERK: Thank you sir, you are under oath. And, as Mr. Holler indicated the other members of the panel have been sworn and remain under oath.

Whereupon,

MARK J. JACOBUS,

PAUL C. SHEMANSKI,

NORMAN MERRIWEATHER,

JAMES G. LUEHMAN,

were called as witnesses for examination on behalf of the NRC staff concerning terminal blocks, and having been previously duly sworn, were examined and testified as follows:

DIRECT EXAMINATION

BY MR. HOLLER:

Q Because this is a new panel, I will ask, for the record, that if each of the members of the panel, in turn, will please state their name and present position.

A [Witness Shemanski] Paul Shemanski, Senior Electrical Engineer, License Renewal Project Director.

A [Witness Merriweather] Norman Merriweather, Reactor Inspector.

A [Witness Jacobus] Mark Jacobus, Senior Member of the Technical Staff at Sandia National Laboratories.

A [Witness Luehman] James G. Luehman, Senior Enforcement Specialist, Office of Enforcement.

Q I would now ask the panel if they have before them a document that is entitled Testimony of Mark J. Jacobus, Norman Merriweather, James G. Luehman and Paul C. Shemanski,

on behalf of the NRC staff concerning terminal blocks?

A [Witness Shemanski] I do.

A [Witness Merriweather] I do.

A [Witness Jacobus] I do.

A [Witness Luehman] I do.

Q I will ask each member of the panel if he has participated in the preparation of this document?

A [Witness Shemanski] Yes.

A [Witness Merriweather] I did.

A [Witness Jacobus] I did.

A [Witness Luehman] Yes, I did.

Q I will now ask the panel, are there any corrections to be made to the testimony on behalf of the NRC concerning terminal blocks?

A [Witness Shemanski] I have no corrections.

A [Witness Merriweather] No correction.

A [Witness Jacobus] I have three corrections. The first one is on page 13. The full paragraph on that page, which is the bottom half of the page, the fifth line of that paragraph. It begins with "insulation resistance and temperature is not linear." That should be added, in parenthesis, "on a semi-log scale."

JUDGE CARPENTER: Are you saying it is not linear on a semi-log scale?

WITNESS JACOBUS: Right. On a semi-log plot, the

plot is not a straight line.

JUDGE CARPENTER: Just to be sure I understand you, are you saying it's not exponential?

WITNESS JACOBUS: Yes. That's correct.

JUDGE CARPENTER: Thank you.

MR. JACOBUS: On Page 15, the full paragraph on that page, fourth line of that paragraph, begins with Document (Staff Exhibit 47, Attachment 2) -- the third word from the end says "position" and that should be "portion".

The final correction is on Page 21, Line 5 on that page, in Answer 18 after the words "Conax Report" add IPS-307.

And in the previous line, the last word in that line is "the", that should be removed.

That is all the corrections that I have.

WITNESS LUEHMAN: I have no corrections.

MR. HOLLER: I would note that corrected copies of the testimony have been provided to the court reporter.

JUDGE BOLLWERK: Thank you.

BY MR. HOLLER:

Q I would now ask each member of the panel if the testimony of Mark J. Jacobus, Norman Merriweather, James G. Luehman and Paul C. Shemanski on behalf of the NRC Staff concerning terminal blocks is true and correct to the best of your individual knowledge and belief.

A [Witness Shemanski] Yes, it is.

A [Witness Merriweather] Yes, it is.

A [Witness Jacobus] Yes, it is.

A [Witness Luehman] Yes, it is.

MR. HOLLER: I will now move to bind into the record as is read the testimony of Mark J. Jacobus, Norman Merriweather, James J. Luehman and Paul C. Shemanski on behalf of the NRC Staff concerning terminal blocks.

JUDGE BOLLWERK: Any objection?

MR. REPKA: No objection.

JUDGE BOLLWERK: Let the testimony then be bound into the record.

[The direct testimony of Mark J. Jacobus, Paul C. Shemanski, Norman Merriweather and James J. Luehman concerning terminal blocks follows:]

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	Docket Nos. 50-348-CivP
ALABAMA POWER COMPANY	)	50-364-CivP
	)	
(Joseph M. Farley Nuclear Plant, Units 1 and 2)	)	
	)	(ASLBP NO. 91-626-02-CivP)

TESTIMONY OF MARK J. JACOBUS, NORMAN MERRIWEATHER, JAMES G. LUEHMAN AND PAUL C. SHEMANSKI ON BEHALF OF THE NRC STAFF CONCERNING TERMINAL BLOCKS

Q1. State your full name and current position with the NRC.

A1. Mark J. Jacobus, Senior Member of Technical Staff, Sandia National Laboratories.

Paul C. Shemanski, Senior Electrical Engineer, License Renewal Project Directorate, Office of Nuclear Reactor Regulation.

Norman Merriweather, Reactor Inspector (Electrical), Region II.

James G. Luehman, Senior Enforcement Specialist, Office of Enforcement.

Q2. Have you prepared a copy of your Professional Qualifications?

A2. (All) A copy of each of our Professional Qualifications is included in Staff Exh. 1.

Q3. What is the purpose of your testimony?

A3. (All) The purpose of our testimony is to support the Staff's position regarding the violations of the environmental qualification (EQ) requirements for the States terminal blocks (Model Nos. NT and ZWM) and the General Electric (Model No. CR151)

terminal blocks at the Farley nuclear plant as set forth in the Notice of Violation (NOV), dated August 15, 1988 (Staff Exh. 2), and the Order Imposing a Civil Penalty, dated August 21, 1990 (Staff Exh. 3).

Q4. What are the EQ requirements that the Staff alleges were violated?

A4. (All) The EQ requirements and the nature of the violations are stated in the NOV (Staff Exh. 2), page 2, under the heading "Violations Assessed A Civil Penalty" (Violation I.B.1) as follows:

> 10 CFR 50.49 (f) and (k), respectively, require in part that (1) each item of electric equipment important to safety shall be qualified by testing of, or experience with, identical or similar equipment, and that such qualification shall include a supporting analysis to show that the equipment to be qualified is acceptable; or (2) electric equipment important to safety which was previously required to be qualified in accordance with NUREG-0588 (for comment version), Category II, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment" need not be requalified to 10 CFR 50.49. NUREG-0588, Category II, Section 5.1(1), states in part that, "the qualification documentation shall verify that each type of electrical equipment is qualified for its application and meets its specified performance requirements, and data used to demonstrate the qualification of the equipment shall be pertinent to the application and organized in an auditable form."
>
> Contrary to the above, from November 30, 1985 until the time of the inspection which was completed on November 20, 1987:
>
> 1. The documentation in [Alabama Power Company] APC's FNP qualification file did not demonstrate by testing, supporting analysis, or verification that States terminal blocks (Model Nos. NT and ZWM) would maintain acceptable instrument accuracy, a performance requirement, during design basis accidents. In addition, APC did not have adequate documentation to demonstrate General Electric (Model No. CR151) terminal blocks would

maintain acceptable instrument accuracy during design basis accident [illegible] that a qualification file for these components did not exist.

Q5. What was your role, if any, in the November 1987 inspection referenced in the NOV (Staff Exh. 2)?

A5. (Jacobus) My participation in the inspection began on Wednesday, November 18, 1987 and continued through the end of the inspection. I briefly reviewed qualification files for several cables, including Raychem Stilan cables. My primary emphasis was on the review of General Electric and States terminal blocks.

(Merriweather) During the November 1987 inspection I served as team leader. My primary responsibility was to coordinate and plan the inspection scope and to make individual team assignments. I was the primary spokesman for the team during entrance and exit meetings with the licensee and provided daily briefings with the licensee regarding the inspection findings. The detail technical discussion regarding specific file concerns, walkdown issues and maintenance issues would have been discussed by me in general terms. However, in the daily meetings the file reviewers were present to discuss any issue.

Q6. What do you recall regarding the information you reviewed to support qualification of General Electric terminal blocks (model No. CR151) and the States terminal blocks (Models NT and ZWM) used at Farley?

A6. (Jacobus) No file was ever found for GE terminal blocks. Alabama Power Company

(APCo) agreed that no file existed for the GE terminal blocks. Near the end of the inspection, I discovered a qualification report from GE in a purchasing file. As I was thoroughly familiar with that report, a GE test report dated November 6, 1973, I only reviewed it briefly. The report did not have a number.

The States terminal blocks had a complete documentation package that relied primarily on a test report from Wyle (44354-1) to qualify the blocks for control circuit applications. For instrumentation circuit applications with either GE or States blocks, APCo cited insulation resistance values from Conax report IPS-307. This report was a test on Connectron terminal blocks.

Q7. What were the Staff findings regarding qualification of States and GE terminal blocks?

A7. (Jacobus) The GE blocks did not have a qualification file at all. Thus, APCo had not performed an evaluation of the GE test report. It was evident that the Farley personnel associated with the inspection did not even know that they had the test report before I found it in the purchasing documents.

Use of the Conax test report to establish the insulation resistance of the GE and States terminal blocks was not adequate for two reasons. First, the similarity analysis between the GE and States blocks and the tested Connectron blocks was not adequate, in part because the design of the blocks was significantly different. Second, the data that was taken from the Conax report was taken at temperatures of 150°F or less. Farley needed data at considerably higher temperatures. Although data was taken at higher temperatures during the Conax test, that data was not included in the test report. The

test report explained that the data was "invalid for analysis due to instrumentation difficulties." Thus, even if the similarity analysis were considered acceptable, the Conax test report did not contain the data that was necessary to qualify the Farley blocks.

It should be further noted at this point that the GE test report that was discovered in the purchasing documentation had insulation resistance data for GE and States terminal blocks. This test report indicated actual insulation resistance data of the GE and States blocks during peak LOCA conditions that were about 3 orders of magnitude lower than the value APCo selected from the Conax test.

Q8. Describe why leakage currents during peak LOCA conditions must be known for the terminal blocks to be qualified.

A8. (Jacobus) Because the terminal block performance is generally poorest at the peak LOCA conditions. To verify that the blocks will perform their required function, data must be obtained at the worst case conditions. The only exception to this would be if the utility could clearly demonstrate that the equipment was not required to function during the peak LOCA conditions and that any inaccurate readings during the peak conditions would not mislead the operators nor cause any undesired automatic operations.

Q9. At the time of the inspection, what did the Staff find in APCo's files regarding the necessity to measure or not measure current leakage during the peak LOCA conditions to establish qualification of the terminal blocks?

A9. (Jacobus) At the time of the inspection, APCo had the documentation associated with Conax Report IPS-307. As explained in the response to Question 7 above, this documentation was inadequate to demonstrate qualification of the blocks during accident conditions. By presenting the Conax report, it is my opinion that APCo was, in effect, acknowledging the necessity of the data.

Q10. Did APCo proffer any analysis to you during the inspection to show that measurement of leakage current during LOCA conditions, as well as after was not necessary to demonstrate qualification?

A10. (Jacobus) I do not know of any analysis presented by APCo to me or to anyone else at any time during the inspection that indicated that measurement of leakage currents was not necessary for qualification. It was apparent to me that they in fact knew that this information was necessary. The point of contention is that they did not correctly determine what the leakage currents would be.

Q11. What was your role in the preparation of the Inspection Report?

A11. (Jacobus) I prepared, among other things, input for Section 6.i.(15) of Inspection Report 50-348, 364/87-30 (Staff Exh. 12). The Staff findings, as modified below, which I adopt as part of my testimony, are as follows:

(15) States and General Electric Terminal Blocks, File 34 and No File.

The inspectors reviewed the file for States terminal blocks used inside containment in instrumentation and control circuits. The qualification basis was NUREG-0588, Category II. Plant personnel indicated that the General Electric terminal blocks were included in the General Electric penetration file, but the reviewer could not find any evidence that terminal blocks were included in the steam testing of the penetrations, and the licensee later agreed with this position. The only reference to General Electric terminal blocks was in the licensee's response to E.Q. Action Items 018 and 067 pertaining to terminal blocks and loop accuracy requirements associated with IEN 84-47. The action items were identified by the licensee on October 27, 1987, and resolved to the licensee's satisfaction on November 15, 1987. The licensee had performed a type test of the installed States blocks to qualify them for use in control circuits, but no insulation resistance (IR) information was obtained in the test.

To qualify the blocks for instrumentation circuits (relative to E.Q. Action Items 018 and 067), the licensee chose to cite a Conax test report on Connectron NSS3 terminal blocks and qualify both the States and General Electric blocks by similarity. The similarity analysis was based on center-to-center spacing of terminal block poles, whether a barrier existed between poles, the height of the block with the barrier, and the width of the block with the barrier. The analysis stated that "all of the installed instrument loop terminal blocks have superior significant characteristics to the NSS3." A minimum IR of [3 x 10^7] ohms was quoted from the Conax test as a basis for providing a value of [1 x 10^7] to Westinghouse for use in instrument loop accuracy calculations. The inspectors did not agree that the similarity analysis was sufficient and felt that the quoted IRs were totally unrealistic. Consequently, the NRC requested that the licensee provide a Justification for Continued Operation (JCO) for the operating unit. On November 25, 1987, a meeting was held at the NRC offices in Atlanta to discuss Farley EQ issues. The meeting summary is included in a letter to the licensee dated January 22, 1988. The inspectors reviewed the Conax report and found that the single data point for insulation resistance above 150°F (taken at 300°F) was very clearly stated in the test report as being invalid due to instrumentation difficulties and the value was not plotted on the data plots provided by Conax. [ ]

[ ]

> Section 2.2(2) of NUREG-0588, Category II states in part that "test results should demonstrate that the equipment can perform its required function. . ." Information Notice 84-47 clearly stated the terminal block issues and suggested actions by licensees and further stated that consideration of leakage currents was already part of the EQ final rule, 10 C.F.R. 50.49.
>
> Contrary to the above, the licensee did not have data to demonstrate that both States and General Electric terminal blocks would maintain acceptable instrument accuracy during design basis accidents. The cited test data for Connectron terminal blocks was considered invalid by the testing organization and similarity between the Connectron and States terminal blocks was not established. [Similarity also was not established between the Connectron and GE terminal blocks.] It should also be noted that the only evidence of licensee response to IEN 84-47 was dated November 15, 1987. This is considered as Violation 348, 364/87-30-11.

(Merriweather) I did not review the files but based on the deficiencies as described in Section 6.i.(15) of Inspection Report 50-348, 364/87-30 (Staff Exh. 12), as modified above, which I reviewed, I determined that the file did not adequately support qualification.

Q12. What NRC regulation or regulations provide the basis for the Staff to determine that the deficiencies described were an EQ violation?

A12. (Shemanski) Nuclear power plant equipment important to safety must be able to perform its safety functions throughout its installed life. This requirement is embodied in General Design Criteria 1, 2, 4, and 23 of Appendix A, "General Design Criteria for Nuclear Power Plants," and Sections III and XI of Appendix B to 10 C.F.R. Part 50. This requirement is applicable to equipment located inside as well as outside the containment. The NRC has used a variety of methods to ensure that these

general requirements are met for electrical equipment important to safety. Prior to 1971, qualification was based on the fact that the electrical components were of high industrial quality.

By its Memorandum and Order CLI 80-21 dated May 23, 1980, the Commission directed the staff to proceed with a rulemaking on environmental qualification (EQ). The EQ rule, 10 C.F.R. § 50.49, became effective on February 22, 1983, and was based on the Division of Operating Reactors (DOR) Guidelines and NUREG-0588 (Staff Exh. 23). The rule provided that requalification of electrical equipment would not be required for nuclear power plants previously required to qualify equipment in accordance with DOR Guidelines (Staff Exh. 24) or NUREG-0588 (Category I or II). Category I requirements apply to equipment qualified to IEEE Std. 323-1974, and Category II requirements apply to equipment qualified to IEEE Std. 323-1971. In CLI-80-21, the Commission stated that unless there were sound reasons to the contrary, replacement parts should be qualified to the standards set forth in Category I of NUREG-0588 (IEEE Std. 323-1974). This requirement was intended to promote a policy of upgrading the qualification and reliability of installed electric equipment. The qualification criteria for nuclear power plants licensed to operate after 1971, are contained in IEEE Std. 323-1971. For nuclear power plants whose construction permits were issued after July 1, 1974, Regulatory Guide 1.89 which endorsed IEEE Std. 323-1974 contains qualification criteria.

(Jacobus) The qualification requirement is 10 C.F.R. § 50.49. 10 C.F.R. § 50.49(k) allows "grandfathering" of qualification to previous requirements in certain

circumstances. According to the qualification package, the States terminal blocks were required to be qualified to NUREG-0588 (Staff Exh. 23), Category II requirements. Since no file existed, the basis for qualification of the GE terminal blocks was not documented.

In addition to the lack of a file for the GE terminal blocks, the lack of adequate performance data, for both the GE and the States terminal blocks, during accident testing violates Section 2.2.(2) of the NUREG-0588, Category II requirements. That section states in part that "test results should demonstrate that the equipment can perform its required function."

Q13. Why should APCo have been aware that the deficiencies the Staff has identified were a concern for the qualification of the States and GE terminal blocks used at Farley?

A13. (Jacobus) The major reason that APCo should have been aware that leakage currents were a concern for terminal blocks is IE Information Notice (IEIN) 84-47, "Environmental Qualification Tests of Electrical Terminal Blocks" (June 15, 1984) (Staff Exh. 48). This notice clearly delineated the concerns with leakage currents. Further, since APCo had performed analysis using the leakage current data (or insulation resistance data) from IPS-307, it was evident that they were actually aware of the concern, not merely that they clearly should have been.

It should be noted that this violation involves an actual equipment deficiency, not merely a documentation question. APCo actually had documentation in their purchasing files that, if properly evaluated, would have clearly indicated that a

problem existed.

(Shemanski) Leakage current and the terminal block concern for instrumentation circuits inside containment were high visibility issues with the staff, the Commission, testing laboratories, and the nuclear industry. The Staff issued several Information Notices on these issues. This was common knowledge in the EQ arena.

Q14. Did APCo proffer any analysis to the Staff after the inspection to attempt to show that the States and General Electric terminal blocks were "qualifiable?"

A14. (Luehman) Yes. By letter dated January 8, 1988 (Staff Exh. 47), APCo forwarded an assessment of terminal blocks used in nuclear power plants, prepared by DiBenedetto Associates, Inc. (Staff Exh. 47, Attachment 2), sometime subsequent to November 25, 1987, for the purpose of supporting the qualification of the GE CR151B and States ZWM terminal blocks at Farley.

Q15 Describe the results of your review, if any, of the assessment forwarded by APCo's January 8, 1988 letter.

A15. (Jacobus) I reviewed the DiBenedetto analysis (Staff Exh. 47, Attachment 2) shortly after it was submitted in January, 1988. In addition to being submitted too late, there were a number of significant technical inadequacies with the document.

First, the document (Staff Exh. 47, Attachment 2) claims that with regard to the Wyle test of the States blocks and the GE test of 100 Series Electrical Penetrations

that, "Although failure of the terminal blocks to perform their intended function was not evident from the GE and Wyle tests performed, performance characteristics such as insulation resistance or leakage current were not monitored during these tests." In fact, the GE Qualification Test Summary Report, dated March 27, 1975 clearly states in Section 4.16 that "...qualification tests...were conducted on General Electric CR 151 and States Co. Type N.T. and recorded a minimum insulation resistance 2 x 10^4 ohms @ 500 VDC." Thus, although the detailed test results were not included in that report, the minimum value of insulation resistance was.

In the same paragraph, the document (Staff Exh. 47, Attachment 2) discusses the Connectron terminal block test and implies that APCo has performed an adequate similarity analysis and that the data in the Connectron test was sufficient to qualify the blocks, but that the Staff refused to accept the APCo analysis. The reasons for the Staff not accepting the analysis were clearly delineated to APCo. The major reason was the fact that the quoted insulation resistance of 10^7 ohms was recorded at a temperature of 150°F. According to the test report, insulation resistance data taken at higher temperatures was invalid due to instrumentation difficulties. In addition, the similarity analysis itself was flawed in that the geometry of the Connectron blocks was not fully considered in performing the analysis. APCo could not resolve either of these problems. Either of these two points alone would be sufficient to cause the Staff to not accept the analysis.

The DiBenedetto document (Staff Exh. 47, Attachment 2) goes on to discuss the Justification for Continued Operation (JCO) that was presented to the NRC and

discussed at the November 25, 1987 meeting in Atlanta. Once again, it is implied that APCo had performed a correct analysis, but that the NRC would not accept it. The foundation of the JCO was that the terminal blocks did not have to function at temperatures above 296°F and that, based on the Sandia test report data, the terminal blocks would have IRs greater than 5 x 10^5 ohms when they needed to function at 296°F. APCo's conclusion was based on a plot that they made using only two insulation resistance data points from the Sandia tests (at 347°F and 203°F) for a GE EB-25 terminal block. They then drew a straight line between these two endpoints and interpolated to determine that the insulation resistance of the EB-25 at 296°F was 5 x 10^5 ohms. This data was then used to support an insulation resistance of 5 x 10^5 ohms for both the GE and the States blocks.

The fundamental problem with the APCo analysis is that they assumed a linear relationship (on a semi-log scale) of insulation resistance with temperature. Staff Exh. 49 is the original APCo figure, showing the assumed linear relationship. At the meeting in Atlanta, the Staff clearly demonstrated that the relationship between insulation resistance and temperature is not linear (ON A SEMI-LOG SCALE). APCo had apparently chosen to ignore this more detailed insulation resistance data in the Sandia report. This additional data indicates that the insulation resistance for both the GE and the States blocks would be in the vicinity of 6 x 10^4-1 x 10^5 ohms at 296°F, almost an order of magnitude lower than the APCo value of 5 x 10^5 ohms. Staff Exhs. 50 and 51 are enhanced versions of the original APCo figure. The original figure submitted by APCo at the meeting in Atlanta included only the plot labelled "APCo Data-EB25

Endpoints." Also included on Staff Exhs. 50 and 51 are several other plots that demonstrate that insulation resistance is not linear between the endpoints as shown on Staff Exh. 49. Staff Exh. 50 is for the GE blocks and Staff Exh. 51 is for the States blocks. I note that APCo applied the data for the GE EB-25 blocks to both the GE CR 151 and the States ZWM blocks.

In addition to the above problem with the JCO, APCo did not address the question of whether erroneous indications during higher temperature periods might mislead the operator into incorrect actions. I have not been provided the information necessary to judge the answers to questions regarding the potential effects of erroneous indications.

On page 3 of the DiBenedetto document (Staff Exhs. 47, Attachment 2), usage of the data from the GE test report dated November 6, 1973 is dismissed because "the installation is not representative of the Farley Nuclear Plant installation." This conclusion is apparently based on the fact that the terminal blocks were not tested in an enclosure. Staff Exhs. 50 and 51 do show that insulation resistance data from the GE test report is lower than similar data taken in the Sandia tests. However, since the GE test did not use chemical spray, the existence of an enclosure is relatively less important than if sprays were used. Thus, the GE test specimens are, in fact, somewhat representative of the installed Farley blocks, which are installed in enclosures. Likely reasons for the insulation resistance during the GE tests being lower than the insulation resistance during the Sandia tests are a) the measurements were performed at 500 Vdc during the GE tests as compared to 45 Vdc during the

Sandia tests and b) the blocks in GE tests were not continuously powered, allowing thicker moisture films to form on the blocks, resulting in higher leakage currents (lower insulation resistances) when power was applied for the insulation resistance tests.

In the next paragraph on page 3, the DiBenedetto document (Staff Exh. 47, Attachment 2) cites Wyle test report 48842-1 on States ZWM terminal blocks. I have reviewed a copy of this test report. The critical results reported in the DiBenedetto document (Staff Exh. 47, Attachment 2) are that "During the LOCA PORTION ~~position~~ of the test the leakage current values were on the order of 50 to 790 microamps. Additionally, the transmitter output was monitored with an acceptance criteria of ±10% established. The data recorded indicated that the transmitters operated within ±5%". In actual fact, Notice of Anomaly 3B in the test report states that "Between the 5-minute and 37-minute points of the Accident Simulation Test, the current measured in the positive lead from the power supply in the Terminal Board/Wyle provided pressure transmitter exceeded the transmitter output current by a maximum of 2.6 milliamperes which exceeds the ±10% acceptance criteria tolerance and indicates that there was current leakage between terminals or between the positive lead terminal and ground...Leakage current between the terminals energized with 24 VDC or between the terminal connected to the positive side of the 24 VDC power supply and ground reached 172 microamperes during the pre-accident period at 190°F and exceeded 2 milliamperes causing the 2 milliampere fuse in the monitoring circuit to open approximately 21 minutes into the accident period. After the fuse was

replaced at approximately the 30-minute point of the test, the leakage current was 790 microamperes. The leakage current gradually decreased during the remainder of the accident period..."

It should be noted that a leakage current of 2.6 milliamperes at 24 VDC corresponds to an insulation resistance of approximately 10,000 ohms. This worst case insulation resistance is therefore actually lower than the worst case insulation resistances measured in either the Sandia tests or the GE tests. Even a leakage current of 790 microamperes at 24 Vdc, which is the worst value acknowledged in the text of the DiBenedetto document (Staff Exh. 47, Attachment 2), corresponds to an insulation resistance of about 30,000 ohms, still well below the value of 5×10^5 ohms that APCo requires. The 30,000 ohms is also very close to the insulation resistances measured in the GE test and lower than the insulation resistances measured in the Sandia tests. This clearly refutes the statement in the DiBenedetto document (Staff Exh. 47, Attachment 2) that states "The values recorded for leakage current during this test relate to values in excess of the 5E05 Ohms minimum acceptance criteria for insulation resistance..."

In summary, the Wyle test supports insulation resistance values in the same range that were reported in the GE test report. The Sandia test data actually has worst case insulation resistance values that are higher than either the Wyle or GE test reports. Thus, the conclusion in the DiBenedetto document (Staff Exh. 47, Attachment 2) relative to test report 48842-1 is clearly not supported by the test report.

Most of the rest of the DiBenedetto document (Staff Exh. 47, Attachment 2) discusses the GE CR151B terminal blocks, including arguments that the CR151B blocks are similar to GE EB-5 blocks. The document then references four test reports, two for EB-5 and two for CR151B blocks. I have not had an opportunity to verify whether I agree that the EB-5 and CR151B blocks are similar. There is insufficient information in the DiBenedetto document (Staff Exh. 47, Attachment 2) for me to make such a determination. However, for the rest of this answer, I will make the assumption that the two types of blocks are similar.

The DiBenedetto document (Staff Exh. 47, Attachment 2) first references Limitorque test report B0019 and indicates that "the performance [of the EB-5 blocks] during the first transient demonstrated insulation resistance values on the order of 1-2E05 Ohms." Though the DiBenedetto document does not point i out, insulation resistances later in that test fell to values lower than 1,000 ohms at 250°F. Also, I believe that an inspection at Limitorque called the insulation resistance data in report B0019 into some question. In any case, the data does not support the required insulation resistance value for the Farley application.

The next report cited is Wyle Report 17775-1. The DiBenedetto document (Staff Exh. 47, Attachment 2) states that "A more representative test demonstrated that the EB-5 terminal block exhibited leakage currents ranging from 0.0 to 0.06 mA during a simulated LOCA test that reached peak temperatures of 309°F, the test duration was three days, three hours, and forty-four minutes. The data presented additionally supports the conclusion that insulation resistance as well as leakage

current values recover as the transient parameters diminish." Since I do not have a copy of this test report, I am not able to verify anything in the DiBenedetto document (Staff Exh. 47, Attachment 2) relative to this report, nor am I able to provide a detailed assessment of the report. However, I can say that it is very unclear why this test is "more representative." The peak temperature in this Wyle test was more than 40°F lower than the peak conditions for the Farley plant. Thus, this test does not even envelop the required temperature profile.

The next paragraph of the DiBenedetto document (Staff Exh. 47, Attachment 2) references the GE test report dated November 6, 1973, which tested CR151 terminal blocks identical to those used in the Farley plant. The only apparent reason for citing this report is to show that insulation resistance values recover to reasonably high values once the test conditions return to ambient conditions. The Staff has always conceded this point. Otherwise, the IR data in this report that was taken during LOCA conditions indicates that the IR for this block (about 2 x 10^4 ohms) is well below the APCo acceptance criterion of 5 X 10^5ohms.

Finally, the DiBenedetto document (Staff Exh. 47, Attachment 2) references Wyle test report 48365-01, which also tested GE CR151 blocks. The peak temperature was only 222°F during the test. The peak temperature in the Farley plant profile is in excess of 350°F. The peak temperature in this Wyle test was therefore more than 130°F lower than the peak conditions for the Farley plant. Thus, this test does not even come close to enveloping the required temperature profile.

In summary, none of the test reports cited in the DiBenedetto document (Staff

Exh. 47, Attachment 2) supports the conclusion that the blocks would have performed as required during accident conditions. On the other hand, the DiBenedetto document has provided a number of references that clearly indicate that the insulation resistance during accident conditions will be lower than 5×10^5 ohms. The conclusion that the IR will be considerably lower than 5×10^5 ohms during accident conditions is further supported by the Sandia test data.

(Luehman) In addition to the technical reasons discussed by Dr. Jacobus, the staff did not consider the DiBenedetto assessment (Staff Exh. 47, Attachment 2), when the Staff cited APCo for a violation regarding the terminal blocks because of the direction in the Commission's Modified Enforcement Policy For EQ Requirements (GL 88-07) (Staff Exh. 4). That policy directs that the NRC will assume, for escalated enforcement cases, that the unqualified equipment could affect operability of the associated system. The NRC will not consider refinements on the operability arguments such as the actual time the equipment is required to be operable or the degree to which the operability of a system is affected or the results of a licensee's after-the-fact testing for mitigation where the licensee clearly should have known that its documentation was not sufficient.

Q16. In your opinion, how long had the deficiencies the Staff allege existed? How did you determine this?

A16. (Jacobus and Merriweather) The actual equipment deficiency would have existed from the time that the terminal blocks were installed in the affected circuits until the time

that they were removed from the affected circuits. This is because the deficiency is related to the actual equipment as it was installed, not simply the documentation associated with qualification. Farley plant records indicate that the terminal blocks were installed prior to November 30, 1985.

Q17. Describe the components or systems affected by the States and GE terminal blocks used at Farley that you determined had a deficient qualification file.

A17. (Jacobus) Although I never had full details of all the components or systems affected by these terminal blocks, APCo personnel did indicate that they were used in 4-20 mA pressure transmitter circuits. These are the circuits generally believed to be the most vulnerable to adverse effects of terminal block leakage currents.

(Merriweather) The terminal blocks are used inside containment in instrumentation circuits that provide indication of plant conditions for, among other things, the safe shutdown of the reactor after a design basis event. Among the instruments affected, and the minimum necessary for a safe shutdown of the Farley Nuclear Plant after a design basis event, are reactor coolant system subcooling, wide range reactor coolant system pressure, and narrow range steam generator water level. Failed terminal blocks associated with other instrument circuits, while perhaps not essential for safe shutdown from design basis events, have the potential for inaccurate instrument readings which could cause operators to take inappropriate actions after a design basis event.

Q18. Describe your participation in any enforcement conferences or other meetings with APCo regarding this violation.

A18. (Jacobus) I participated in a meeting at the Region II offices in Atlanta on November 25, 1987. At that meeting, APCo continued to rely on the data in ~~the~~ Conax report IPS-307. APCo presented a plot of the results of insulation resistance data taken during the Conax test. The plot included the data that was taken at temperatures above 150°F, even though this data had not been included in the test report. The reason that the data had not been included in the test report was clearly stated in the test report as noted in the response to Question 7 above. However, APCo attempted to rely on this data for qualification at temperatures above 150°F despite the test report's clear acknowledgement that the data was invalid.

(Merriweather) I was team leader for the November inspection so I presented the inspection findings at the exit meeting. I participated in a meeting at the Region II offices in Atlanta on November 25, 1987. I also put the inspection report together and attended the enforcement conference.

Q19. Describe how you determined that this violation, under the provisions of the Commission's Modified Enforcement Policy, was sufficiently significant, standing alone, to be considered for escalated enforcement?

A19. (Luehman) APCo, after the inspection, had to do significant analysis to attempt to assess the qualification status of the terminal blocks. Because this was more than a minor documentation issue or file deficiency, the violation meets the criteria for

escalated enforcement under the modified policy.

Q20. Does this complete your testimony regarding this matter?

A20. (All) Yes.

MR. HOLLER: During this testimony the Staff will introduce exhibits that have been marked as 47, 48, 49, 50 and 51. If it please the Board I will identify these in detail when they are moved into the record at the conclusion of the testimony.

JUDGE BOLLWERK: That's fine.

MR. HOLLER: At this point I would like to present the panel on terminal blocks ready for cross examination.

JUDGE BOLLWERK. Mr. Repka.

MR. REPKA: Thank you.

CROSS EXAMINATION

BY MR. REPKA:

Q Good morning, gentlemen.

Mr. Merriweather, you were the team leader on this inspection; correct?

A [Witness Merriweather] Yes.

Q And the terminal block issue, was that a September issue or a November issue?

A [Witness Merriweather] It was a November issue.

Q Okay, so that means it was something addressed during the November, 1987 portion of the inspection?

A [Witness Merriweather] Yes, it was.

Q And Dr. Jacobus, you were there during the November inspection; is that correct?

A [Witness Jacobus] Yes, I was.

Q And you were the person that identified this issue?

A [Witness Jacobus] The issue was initially looked at by Doug Brosseau who attended the first part of the inspection. It was passed along to me when I arrived, I believe, on Wednesday of the inspection.

Q Would that be Wednesday of the walk-down week or Wednesday of the file review week?

A [Witness Jacobus]" That would be the file review week.

Q And you did not participate in the walk-down portion of the inspection?

A [Witness Jacobus] No, I did not.

Q Mr. Merriweather, did you participate at all in the drafting of Information Notice 84-47?

A [Witness Merriweather] I did not.

Q Did you attend a meeting between the NRC Staff and the Alabama Power Company concerning qualification issues on January 11, 1984?

A [Witness Merriweather] I did not.

Q Prior to the inspection at Farley in November of 1987, did you ever review correspondence from the Alabama Power Company concerning qualification issues at that January 11th meeting, correspondence dated February 29, 1984?

A [Witness Merriweather] I reviewed -- I believe I reviewed that document. I also reviewed the SER which was issued, I think, in response to that one-day meeting that they had.

Q Okay. And you performed that review before the November, 1987 inspection?

A [Witness Merriweather] Yes, I did.

Q Okay. Did you happen to review the Franklin TER on Farley qualification before the inspection?

A [Witness Merriweather] I believe I reviewed the Franklin TER before the inspection, yes.

Q Were you aware that the Franklin TER had found terminal blocks at Farley to be qualified?

A [Witness Merriweather] I was aware that the test report that they reviewed they said it was qualified, yes.

Q Okay. And were you aware that the Franklin TER had specifically called out that the terminal blocks were in instrument circuits as well as power and control circuits?

A [Witness Merriweather] I don't remember all of the details of what was in the TER. I do remember, I think, the voltage level they tested on that was 135.7 volts DC, or something like that.

Q Okay, so you were aware of that factor before the inspection?

A [Witness Merriweather] Right.

Q You mentioned that you had reviewed the February 29, 1984 APCo correspondence. Let me call your attention to that document. That has been previously marked as APCo Exhibit 20. I don't believe there is a Staff number on that one.

Is that the February 29, 1984 correspondence from APCo to the NRC?

A [Witness Merriweather] Yes, it is.

Q Okay. Let me call your attention to Attachment 2, Page 4, I believe it is.

A [Witness Merriweather] Okay.

Q And it bears the Bates number or Unified No. 0057662.

A [Witness Merriweather] Yes, it does.

Q Now, do you see Paragraph 4 down there, NRC Comments?

A [Witness Merriweather] Yes, I do.

Q And the APCo response?

A [Witness Merriweather] Yes, I do.

Q Now, is that something you focused on before you went to the inspection at Farley?

A [Witness Merriweather] I believe I saw this paragraph, yes.

Q I have highlighted some language here, about the fourth sentence down. Can you read that sentence for me?

A [Witness Merriweather] Okay. It reads, "Instrumentation was attached to the terminal blocks at the conclusion of the LOCA test and leakage current values were recorded."

Q And then the following paragraph, can you also read that paragraph?

A [Witness Merriweather] Okay. It says, "The tests of leakage current values are being used in the development of the revised FMPEOP operating procedures presently being prepared by Westinghouse/APCo".

Q And you are familiar with that?

A [Witness Merriweather] Yes.

Q So, before you went to the inspection, you were aware that in 1984 APCo had discussed the instrument accuracy issue with the NRC; is that correct?

A [Witness Merriweather]" I was aware of that, yes.

Q And you also said that you had reviewed the SER of December, 1984 before you went to the inspection.

A [Witness Merriweather] Yes, I had.

Q Okay. Are you aware of what the December, 1984 SER concluded regarding APCO's resolutions of the EQ deficiencies from the TER's?

A [Witness Merriweather] Ask the question again, please.

Q Are you aware of the conclusion of the SER?

A [Witness Merriweather] I can't paraphrase it exactly, but I believe they indicated that they agreed with their approach or corrective action or whatever.

Q Okay. In fact, the SER found APCo's EQ program to be in compliance with 50.49, did it not?

A [Witness Merriweather] I believe it made that conclusion, yes.

Q And in fact, the SER -- the cover letter to the SER referenced the February 29, 1984, correspondence from APCo, did it not?

A [Witness Merriweather] Yes, it did reference that.

Q Mr. Shemanski, you have testified in your testimony on this issue that instrument accuracy in terminal blocks was a "high-visibility issue" with the NRC.

A [Witness Shemanski] Yes, I did.

Q Okay. When you said that in your testimony, when are you referring to this being -- at what time was this a high-visibility issue?

A [Witness Shemanski] Initially, it began to become a high-visibility issue in the 1983 timeframe.

There was a Commission meeting, if I recall the date correctly, January 6, 1984, in which Sandia identified a number of deficiencies within the EQ arena, and specifically, they discussed the terminal block issue at a

Commission meeting on January 6, 1984.

However, in the '83 timeframe, the staff at NRC did have terminal blocks -- particularly leakage currents on terminal blocks for instrumentation circuits inside containment.

So, I would say the '83 timeframe is when it began to become a high-visibility issue.

Q So, this was an issue well-known to the staff in 1984.

A [Witness Shemanski] It was known to the staff in '83 and also '84, yes.

Q And did you attend the January 11, 1984, meeting with APCo?

A [Witness Shemanski] Yes. As a matter of fact, I conducted the meeting.

Q Okay. And do you recall the instrument accuracy issue being addressed at that time?

A [Witness Shemanski] I don't recall specifically, but I am quite sure it was discussed, because one of the items in each meeting was to discuss the Franklin TER, Reg Guide 197, and other specific issues, one of which was terminal blocks inside containment, and the fact that we had the meeting with the Commission five days prior to the -- or five days following the -- let me correct that.

The meeting with the Commission was held

approximately five days before the Farley meeting. I'm quite certain we did discuss the terminal block issue with Farley.

Basically, we told Farley and other utilities to consider replacing terminal blocks inside containment with qualified splices. Again, the main problem was the deficiency of proper -- or test reports that show the terminal blocks to be qualified.

Q Okay. Did Farley tell you they were replacing their terminal blocks?

A [Witness Shemanski] I don't recall specifically. I don't believe they did. I think their position was they felt that the terminal blocks were qualified.

Q And did Farley outline their approach to providing data to Westinghouse on instrument accuracy for those terminal blocks?

A [Witness Shemanski] I don't recall that specifically.

Q Okay. Do you recall the letter of February 29, 1984?

A [Witness Shemanski] Yes, I do. That was the letter that supported the safety evaluation report.

Q Okay. Do you recall whether or not Farley outlined their approach in that letter?

A [Witness Shemanski] I don't recall specifically.

Q This was a high-visibility issue before that meeting. You said four or five days, the Commission -- four or five days prior to that meeting, the Commission had held some kind of meeting with the staff regarding this issue.

So, clearly, you were attuned, at that time, to this issue. Is that correct?

A [Witness Shemanski] Yes, I was, very much so.

Q Okay. And so, you were not surprised when it was discussed at the meeting.

A [Witness Shemanski] Absolutely not.

Q And did the staff -- did the staff articulate any concern to Alabama Power Company regarding its approach to the issue?

A [Witness Shemanski] Yes, we did, as a matter of fact. It was a caution, basically.

We told them that the majority of utilities, at that point, were considering or actually replacing terminal blocks inside containment -- that is, terminal blocks for instrumentation circuits inside containment -- because of the concern of leak currents and also the lack of qualification test reports.

It was their option as to whether or not they wanted to keep the terminal blocks installed inside containment, but we did tell them, from what I recall, that it was a high-risk venture.

Q Did the staff ever document that conclusion?

A [Witness Shemanski] We did not, as a rule, generate meeting minutes.

I conducted 52 meetings in approximately a one-year timeframe, and we simply did not have the resources or time available to document that type of detail in these particular meetings. So, the answer is no.

Q In the Safety Evaluation Report issued in December 1984 to Alabama Power Company, did the staff ever articulate a problem regarding terminal blocks?

A [Witness Shemanski] Not specifically in the SER, no.

Q Information Notice 84-47 was issued by the staff subsequent to the January 11, 1984, meeting. Isn't that correct?

A [Witness Shemanski] Yes, that's correct. It was issued, I believe, in the June '84 timeframe.

Q Okay. But in fact, by the time of this meeting, the staff was already aware of the -- the issues that were subsequently addressed in the June '84 Information Notice.

A [Witness Shemanski] Yes, they were.

Q Is it fair to say that Alabama Power Company was also aware of those concerns at that meeting?

A [Witness Shemanski] Which meeting are you referring to again?

Q January 11, 1984, meeting.

A [Witness Shemanski] Yes. It's fair to assume that, because I am quite certain that was discussed with them during the meeting.

Q Did Information Notice 84-47 require that licensees change out their terminal blocks and replace them with qualified splices?

A [Witness Shemanski] I don't believe so, no.

Q In fact, in the Information Notice, wasn't one of the options available to licensees that they could perform a qualification test or perform an analysis to demonstrate that acceptable loop accuracy and associated response time for instrument circuits utilizing terminal blocks are being maintained throughout their operating conditions?

A [Witness Shemanski] Yes, the licensee certainly had that option.

Q Was this issue definitively resolved by information on 84-47?

A [Witness Jacobus] I think 84-47 went a long way to providing guidance to the licensees as to how they should resolve this particular issue. Overall -- and I'm referring here to the plants that were involved in multiplan action B-60, there were 71 operating reactors involved -- to my knowledge, the large majority resolved this particular issue by replacing terminal blocks inside containment, associated

with instrumentation circuits.

The terminal blocks were replaced with qualified splices, generally Raychem splices. So the resolution generally involved replacing the terminal blocks.

Q But you've already stated that that was not the only possible resolution?

A [Witness Jacobus] No, that was not the only possible resolution.

Q In fact, didn't this issue evolve along with loop accuracy issues?

A [Witness Jacobus] Yes. It's tied in with loop accuracy issues, that's correct.

Q And those issues were being addressed generically by the industry as late as 1987?

A [Witness Jacobus] I believe they were, yes.

Q In fact, is it fair to say that loop accuracy issues and calculation methodology issues -- that those issues are still continuing to be addressed today?

A [Witness Jacobus] Yes, they are. They occasionally come up in tech. spec. changes.

Q Mr. Merriweather, did you attend the training for NRC inspectors put on by Sandia National Lab in 1987?

A [Witness Merriweather] Yes, I did.

Q And do you recall the discussion of terminal blocks at that training session?

A [Witness Merriweather] I believe there was some discussion. I can't tell you what we talked about, or what was discussed. But I think it was discussed -- terminal blocks.

Q Do you remember who presented that topic?

A [Witness Merriweather] It may have been Mark Jacobus

Q On page 8 of your testimony you state: I did review the files -- referring, apparently, to the files at Farley. Do you recall that testimony?

A [Witness Merriweather] Right.

Q Then two sentences later in the testimony, or approximately two sentences later, you state that: I determined that the file did not adequately support qualification. Do you see that testimony?

A [Witness Merriweather] Yes.

Q But you did not review the files?

A [Witness Merriweather] No, I did not.

Q So, you determined that the file did not adequately support qualification, based on what?

A [Witness Merriweather] Based on the details that were given to me in the inspection report.

Q Based on what Dr. Jacobus told you?

A [Witness Merriweather] Yes.

Q Dr. Jacobus, before you attended the 1987

inspection, did you review the Franklin TER for Farley?

A [Witness Jacobus] No, I did not.

Q Did you attend the January 11, 1984 meeting between Alabama Power Company and the NRC staff?

A [Witness Jacobus] No, I did not.

Q Did you ever review the February 29, 1984 meeting minutes as documented by Alabama Power Company?

A [Witness Jacobus] Did I ever review them?

Q Did you review it prior to the November 1987 inspection?

A [Witness Jacobus] No, I did not.

Q When did you become an NRC contractor?

A [Witness Jacobus] As part of the inspection program, or --

Q Let's focus on EQ inspections first.

A [Witness Jacobus] My first inspection, I believe, was in '84 or '85. I believe in '84.

Q And then you were subsequently contracted with the NRC to participate in the so-called first-round EQ inspections, is that correct?

A [Witness Jacobus] That was all part of the same program. The program began at Sandia in, I believe, 1982. That was during the time when the NRC was performing inspections at test laboratories, vendors, architect engineers -- people like that.

Q Farley was not your first EQ inspection, was it?

A [Witness Jacobus] No, it was not.

Q And when you went to these inspections, what types of issues did you look at? Was it terminal blocks in all cases?

A [Witness Jacobus] Generally, if terminal blocks were used at the plant, I would be looking at terminal blocks. I would frequently look in a fair amount of detail at cables. And then a whole host of other peripheral issues, of other kinds of instrumentation that might be looked at.

Q Okay. So when you looked at cables, you were looking for instrument accuracy effects, is that correct?

A [Witness Jacobus] We would consider that. But in general, cables do not contribute real adversely to instrument accuracy the way that terminal blocks might.

Q And you said that you looked at other peripheral issues -- were those your words?

A [Witness Jacobus] Other peripheral equipment.

Q Other peripheral equipment. Now you are referring again to the instrument loop, the other equipment in instrument loops?

A [Witness Jacobus] Typically it would be in instrument loops. It might be in control loops. It might be solenoid valves. It might be post-accident radiation

monitors. It might be pressure transmitters, level transmitters, RTDs, thermal couples -- almost any kind of instrumentation and control. Anything subject to EQ, basically.

Q Okay. When you looked at this equipment, was the focus of what you were looking at, was that instrument accuracy effects again, or leakage currents?

A [Witness Jacobus] Not necessarily. If that was relevant to the piece of equipment we were looking at, we would take a look at it. If it was not relevant, of course, we would not look at it.

Q Prior to your participation in the first-round EQ inspections, were you given any EQ inspector training yourself?

A [Witness Jacobus] Yes, I was.

Q And who gave you that training?

A [Witness Jacobus] The training was primarily given by Larry Bustard and Beth Richards.

Q And what are their positions?

A [Witness Jacobus] They both have the same positions I do. At the time, it was Member of Technical Staff. Now it is Senior Member of Technical Staff at Sandia National Laboratories.

Q Okay. So your inspector training came from senior individuals at Sandia?

A [Witness Jacobus] Yes, that is true.

Q Do you recall ever being given any training by anybody regarding what is known as the clearly should have known standard?

A [Witness Jacobus] There was, in the seminars that we had, in particular probably more than any the 1987 seminar, I believe Otis Potapovs discussed that in some amount of detail. I don't recall exactly what he said.

That would be the only formal presentation of that type of material that I can recall.

Q When you wrote the inspection report for Farley, do recall addressing the "clearly should have known" standard?

A [Witness Jacobus] I did not write the inspection report; I wrote input to the inspection report. Is that what you're referring to?

Q Correct.

A [Witness Jacobus] The only way that would have been addressed in there is with regard to Information Notice 84-47. I was not asked to specifically address that question. That would be dealt with by the NRC.

Q And would that specifically be dealt with by the Office of Enforcement, or is that something you don't know?

A [Witness Jacobus] I'm not certain who would exactly have dealt with that.

Q Dr. Jacobus, you were an instructor at the Sandia Training for NRC inspectors; is that true?

A [Witness Jacobus] At the 1987 training, that is correct.

Q Let me refer you to what has been previously marked as APCo Exhibit 1, and you may or may not have this in front of you.

A [Witness Jacobus] I don't, but I can see it.

Q Is this a document you're familiar with?

A [Witness Jacobus] Yes, it is.

Q Okay, is this the agenda for the 1987 Sandia Training, as you recall it?

A [Witness Jacobus] It appears to be part of it. I don't believe everything's there.

Q Will it help if I show you the next two pages?

A [Witness Jacobus] Yes, that would help.

Q This is -- what I'm referring to has been previously marked as APCo Exhibit 1, and it bears Bates or Unified Numbers 0101546 through 548. On --

JUDGE BOLLWERK: What you're showing are blowups of those pages, correct?

MR. REPKA: What I'm showing are blowups of those pages; that's correct.

BY MR. REPKA:

Q I'm looking at the second page. Item 3 says

Technical Issues, Staff Positions and I see the initials, M.J. next to it.

A [Witness Jacobus] Okay.

Q Is that you?

A [Witness Jacobus] That is me.

Q And further down under Item IV, I see an entry there that says Terminal Blocks, and it bears the initials MJ/SA. MJ would be you?

A [Witness Jacobus] Yes, it would.

Q Okay, on the Terminal Block Issue 1987, do you recall anything of your presentation at that time?

A [Witness Jacobus] Yes, I do.

Q And is it fair to say that during that presentation you discussed instrument accuracy issues related to terminal blocks?

A [Witness Jacobus] That is very fair.

Q Have you turned over your presentation materials on that presentation to the NRC or during discovery in this proceeding?

A [Witness Jacobus] Yes, I have.

Q And do those materials fairly and accurately convey what was discussed at the Sandia Training, as you recall it?

A [Witness Jacobus] With regard to terminal blocks, that's correct.

JUDGE BOLLWERK: Just an informational question; are those materials part of what we just received into evidence as Staff Exhibit 59?

MR. HOLLER: If I may refer to the list, I can verify that.

JUDGE BOLLWERK: Can we take two seconds just to make sure we're talking about the same information?

[Pause.]

MR. HOLLER: If the Board would allow, if I could have Dr. Jacobus just quickly review the items that are listed, that might be helpful.

JUDGE BOLLWERK: All right.

[Document proffered to witness.]

[Witness reviewing document off the record.]

WITNESS JACOBUS: It would be either in 39-B or 39-F. I'm not certain which one of those two it would be under.

MR. HOLLER: For the information of the Board, both Document 39-B and 39-F are among the materials that have been identified as Staff Exhibit 59.

JUDGE BOLLWERK: All right, thank you.

BY MR. REPKA:

Q Dr. Jacobus, when you gave that seminar in 1987, is it fair to say that you explained the latest thinking on instrument accuracy and terminal block -- as it relates to

terminal block?

A [Witness Jacobus] Terminal blocks and terminal block issues; the information that was presented was primarily based on Charlie Craft's terminal block Reports which were prepared in 1984.

Q And when did those terminal block Reports become available to the public at large?

A [Witness Jacobus] They were formally published, I believe, approximately August of 1984.

Q Were you aware of the developments in instrument accuracy related to loop accuracy and calculational methodology?

A [Witness Jacobus] Yes, I was.

Q And that's an issue you were familiar with in the 1987 timeframe?

A [Witness Jacobus] Yes, it was.

Q Now, is it fair to say that that's an issue that evolved significantly between 1984 and 1987?

A [Witness Jacobus] That is true for the issue of loop accuracy, in particular. Now, the issue of terminal blocks and instrumentation circuits, the issue we're discussing here, was an issue that was pretty much stagnant from 1984 on.

Q When you say that the issue of terminal blocks was stagnant, was it recognized in 1984, what the cause of --

strike that. In 1984, based on testing at Sandia, Sandia concluded that terminal blocks may provide a contribution to the instrument loop accuracy -- or instrument loop inaccuracy; is that correct?

A [Witness Jacobus] That is correct.

Q And the -- at that point, do you believe the phenomenon had been definitively resolved?

A [Witness Jacobus] I'm not sure I understand your question.

Q Let me try it this way: You -- there was a number of tests at Sandia on terminal blocks; is that correct, or just one test?

A [Witness Jacobus] There were more than one, yes.

Q How many more than one?

A [Witness Jacobus] I believe, in the 1982 timeframe, prior to me being at Sandia, there were -- there was a test on the States sliding link terminal blocks, which are the same type as what are used in Farley, for a different issue.

That had to do with thermal shock, and the issue was decided -- it was decided that there was no significant issue involved with thermal shock on the terminal block in terms of its integrity of the block, cracking and things like that.

In addition, then, Charlie Craft did two different

tests which are reported in the same test reports, the two test reports that have been provided previously, and in addition, Sandia contracted with Dr. Solomon of Temple University to perform some terminal block tests of a much more limited nature than what Sandia was doing.

Q And when was this?

A [Witness Jacobus] This was all -- this was all reported in the same two test reports that Charlie Craft prepared.

Q Okay. But the only significant issue for Farley, as you understand it, is the instrument accuracy issue. Is that correct?

A [Witness Jacobus] The issue is the use of terminal blocks in instrumentation circuits and its contribution to the accuracy of the end device, yes.

Q Okay. The qualification is only an issue because of instrument accuracy, its contribution to instrument accuracy of the end device. We're not concerned here about cracking and thermal shock.

A [Witness Jacobus] That is correct. We are not concerned with those.

Q Now, basically, in 1984, Sandia released its test reports showing this instrument accuracy phenomenon related to terminal blocks.

A [Witness Jacobus] That's correct.

Q Okay. Prior to that time, had terminal block accuracy -- had terminal blocks been considered to be an important contributor to total instrument loop accuracy?

A [Witness Jacobus] To the best of my knowledge, it was not.

Q So, what you had in the Sandia tests of '84 was, for the first time, a conclusion that terminal blocks may make an appreciable contribution to loop accuracy.

A [Witness Jacobus] That is correct.

Q Now, those test reports, was that the final word on that issue?

A [Witness Jacobus] In what sense?

Q Was there any room for further testing to determine whether or not that phenomenon was really -- was really significant? Was any subsequent testing done?

A [Witness Jacobus] No, not by Sandia. There were tests done by the industry. There's always room to do more tests if somebody wishes to do more tests, of course.

Q And based on the Sandia tests in '84, Sandia postulated that the reason why terminal blocks were displaying this accuracy effect was a moisture film on the exterior of the block. Is that correct?

A [Witness Jacobus] That is correct.

Q Now, was that the first time that hypothesis had ever been raised?

A [Witness Jacobus] I am not aware of the answer to that. It may have been previously, but I don't know.

Q Was that your hypothesis or Charlie Craft? Is that the name you referred to?

A [Witness Jacobus] Yes, that's the name I referred to, and it was essentially a collective conclusion that we came to.

Q Now, has that hypothesis been definitively proven?

A [Witness Jacobus] I don't know if you would call it definitively. The fact of the matter is it really doesn't matter what the mechanism is. It's the result that we're concerned with.

Q Mr. Luehman, you became involved in this issue when?

A [Witness Luehman] This particular issue, 1988.

Q And that was in your capacity at the Office of Enforcement.

A [Witness Luehman] That's correct.

Q And so, you were doing your consistency review as part of the EQ enforcement panel. Is that correct?

A [Witness Luehman] And also in my role as just the person assigned to the individual cases in the Office of Enforcement, evaluating the individual case prior to the EQ review panel.

Q Okay. And is it fair to say that you had some

input into the "clearly should have known" determination?

A [Witness Luehman] Yes.

Q In you deposition in this proceeding, you told me that the "clearly should have known" was a particular area in which the Office of Enforcement found that regions were -- did not understand or apply it. Do you remember that testimony?

A [Witness Luehman] In some cases, that's true.

Q And do you recall telling me that the "clearly should have known" standard was something unique to the enforcement process? It was new to the -- "clearly should have known" under the modified policy is a kind of finding that didn't exist under the normal enforcement policy.

A [Witness Luehman] That's correct.

Q Do you have a copy of your deposition in front of you by any chance?

A [Witness Luehman] No, I don't.

MR. REPKA: Is that something that, Mr. Holler, you have?

MR. HOLLER: If you'll bear with me, I'll check.

BY MR. REPKA:

Q Let me refer you to pages 27 and 28.

MR. REPKA: I am handing Mr. Luehman a copy of his deposition in this proceeding. The deposition was taken April 25, 1991.

[Document proffered to witness.]

BY MR. REPKA:

Q Mr. Luehman, do you have page 27 in front of you?

A [Witness Luehman] Yes, I do.

Q Could you read for me into the record lines 2 through 10?

A [Witness Luehman] "But I would say that, in the 'clearly should have known' area, there was -- probably some of the enforcement actions were proposed by the regions -- purposely were short . . ." -- I don't -- ". . . purposely were short on 'clearly should have known' type information, and then they asked us to help them fill in the blanks, because they didn't know exactly, you know, how they -- how we wanted it format to detail it -- to what detail it needed to be in, things to that extent."

Q Okay.

And then I asked you, and I quote, "Is that a drafting function that there was a deficiency in the regions, or was that an evaluation function, the region -- that is, are you saying that the regions just didn't understand how to apply the test or were looking to you for guidance or they just didn't understand how to write it up?", and could you read the first sentence of your answer to that question?

A [Witness Luehman] "Well, I think that -- I think

it's more the -- it's more the latter than the former. I think what -- that we have standard formats for enforcement actions, and therefore, it's pretty evident to what level of detail you have to discuss a particular area."

Q Okay. Thank you. And then, over on page 28, could you read the continued answer to that question, lines 8 through 13?

A [Witness Luehman] "But I guess, to be honest, there is -- there -- there was some confusion as to exactly what the standard was, because -- on the part of the enforcement coordinators who were primarily assigned to review and draft these things, because they weren't technical people."

Q Okay. Thank you.

Dr. Jacobus, you said you had input into the inspection report. Is that correct?

A [Witness Jacobus] That is correct.

Q Now, we have at issue here GE terminal blocks and States terminal blocks. Is that correct?

A [Witness Jacobus] That is correct.

Q Just to address -- with States terminal blocks, your concern was instrument accuracy contribution.

A [Witness Jacobus] The contribution of degraded insulation resistance to the loop accuracy. That is correct.

Q With respect to GE, the GE terminal block, you have the same concern.

A [Witness Jacobus] The same concern but, in addition, the fact that there was no file at all for plant Farley that we ever saw.

Q Right. It's that latter concern here I want to address right now.

You said, at page three of your testimony, no file was ever found. Is that correct?

A [Witness Jacobus] That is correct.

Q But, in fact, an environmental qualification report was available at Farley in the procurement file for the penetration assembly, was it not?

A [Witness Jacobus] Yes.

Q And you found it there?

A [Witness Jacobus] And I further stated that, and I did find it there.

Q And that's a report that you say you were thoroughly familiar with?

A [Witness Jacobus] Yes, it is.

Q And you knew that that report existed? You knew from your experience at other facilities?

A [Witness Jacobus] Yes, I did.

Q So, you knew, with respect to the report, itself, that, at least as far as it goes, the qualification data did

exist?

A [Witness Jacobus] Yes, it did.

Q Is it your habit, Dr. Jacobus, to write up violations because a well-known document is in one file instead of the other?

A [Witness Jacobus] No, it is not. I do not write up violations. Keep in mind that that is the NRC's function. And also keep in mind that that report did not qualify the blocks for its --

Q That's an inaccuracy?

A [Witness Jacobus] That's is a very important -- that is correct.

Q Let's turn to the instrument accuracy issue. Now, I want to make sure I've got this straight. In your testimony, you basically take the position -- back up.

The issue is, as you just said, degraded insulation resistance and the resulting contribution of the terminal block to the instrument loop accuracy?

A [Witness Jacobus] That is correct.

Q Okay. And basically, it's your position that you need insulation or IR data for accident conditions?

A [Witness Jacobus] If the terminal blocks are required to be environmentally qualified to those conditions, that's correct.

Q And you knew back in 1987 that the inspection --

that Alabama Power Company had attempted to qualify, at both the GE and the States terminal blocks, based on IR data from IPS-107?

A [Witness Jacobus] Yes, I knew that. It's IPS-307, not 107. I believe you said 107.

Q Either way.

A [Witness Jacobus] Okay.

MR. REPKA: I'll let the record reflect that, in our direct testimony, we've labeled it IPS-107. And the test report in front of me is labeled IPS-107, it's a Conax test report on electrical termination subject to design basis accident environment conditions. So, if I say 107, you'll forgive me?

I am loathed to mark this for identification because I don't have extra copies of it. But, let me try this instead.

BY MR. REPKA:

Q Dr. Jacobus, is that the test report you're familiar with?

A [Witness Jacobus] No, it is not.

Q Okay. So, you were looking at something different than this?

A [Witness Jacobus] Yes, I was. What I was given by Alabama Power is what I was looking at. I believe it was IPS-307. I have a copy in my blue notebook here, if you

wish to look at that.

As far as I know, IPS-107 was never given to us at any time for any reason.

Q But you were aware that Alabama Power Company had taken the position that it had data from IPS-307, IPS 107, whichever, and was attempting to show that it had instrument accuracy data for these terminal blocks?

A [Witness Jacobus] I'm aware that they were attempting to do so, yes.

Q Okay. And that data was being input by Alabama Power Company to Westinghouse for inclusion in emergency operating procedures?

A [Witness Jacobus] That is correct.

Q Now, did Alabama Power Company ever tell you or ever take the position, as far as you are aware, that these terminal blocks were not qualified?

A [Witness Jacobus] As far as I know, they never took that position, no.

Q Okay. Are you aware or -- as far as you know -- that Alabama Power Company ever took the position that the instrument circuits impacted by these terminal blocks would not be able to perform their safety function?

A [Witness Jacobus] I'm not aware that they ever did.

Q In fact, they tried to tell you that all of the

instruments would perform their safety functions, did they not?

A [Witness Jacobus] That's correct.

Q In your testimony, you referred to the IPS-107 or 307 and we'll resolve that in a minute. You basically, let me try to distill this down. You have two problems with the data Alabama Power Company provided. One was the lack of a similarity analysis between the terminal blocks tested by Conax and the States and GE terminal blocks installed. Is that the first concern?

A [Witness Jacobus] Not the lack of having one, the lack of an adequate one.

Q So, you didn't agree with the one that was provided?

A [Witness Jacobus] That is correct.

Q But you do agree you were provided with a similarity analysis?

A [Witness Jacobus] I do agree to that.

Q Okay. And the second thing is you don't agree with the insulation resistance data extracted from that test report by Alabama Power Company because you believe it was at too low a temperature?

A [Witness Jacobus] That is correct.

Q In fact, Alabama Power Company used data, according to you, for temperatures of about 150 degrees

Fahrenheit; is that correct?

A [Witness Jacobus] That is correct.

Q And you believe that you needed -- Alabama needed instrumentation, IR data for significantly higher temperature?

A [Witness Jacobus] That is correct.

Q Peak LOCA temperatures?

A [Witness Jacobus] Probably.

Q You say probably. In what circumstances would you not need peak LOCA data?

A [Witness Jacobus] That's where we begin to get into effectively two different issues, the technical and the regulatory. From a purely technical standpoint is the way I will discuss it. If you wish to pursue it on a regulatory basis, you'll have to ask somebody from the NRC. From a technical standpoint, I would tend to accept an argument that demonstrated that the terminal blocks were not needed to function at peak LOCA conditions, or at LOCA conditions -- at any conditions above a certain temperature.

Now, such an argument would need to consider a number of factors. One of those would be they would need to consider a range of possible accidents. For example, a small break LOCA may result in higher temperatures, where a terminal block or a connected instrument is needed to function than a large break LOCA.

So, you would need to consider a wide range of accidents. You would need to ensure that no automatic operations would occur in an undesirable way in any of those range of accidents. You would need to show that the operators would not be misled into performing any undesired actions under any of those range of accident conditions. And you would probably need to have something in the emergency operating procedures warning the operators if there was any chance of these things occurring.

Q When you say you need to show that the operators would not be misled, are we again there referring to because of the accuracy effects?

A [Witness Jacobus] That is correct.

Q So basically we have to be in a situation that if the instruments are not required to operate during the time and temperatures involved, they don't need to be qualified for those times and temperatures?

A [Witness Jacobus] That's correct but we have to be very careful of how we determine that the equipment does not have to function.

Q From a technical standpoint, did you make any attempt during the inspection to determine when the equipment that these terminal blocks were in when that equipment would be required to function?

A [Witness Jacobus] I had no need to determine that

because I was given information that said the terminal blocks need to be qualified to a certain temperature and I determined that they were not qualified to that temperature and to the best of my recollection there was never anything presented that said they did not have to be qualified to that temperature.

Q When you said you were given that information that they need to be qualified to a certain temperature, is that based on the checklist --

A [Witness Jacobus] The SCEW sheet?

Q The SCEW sheet?

A [Witness Jacobus] Yes.

Q Do you recall ever being given an evaluation by Alabama Power Company that tried to show that the terminal blocks did not need to operate at peak LOCA temperatures?

A [Witness Jacobus] The only information in that regard that I am aware of was during the Atlanta meeting approximately a week after the inspection, I believe it was early December of 1987, the Alabama Power did not explicitly state but implied that the terminal blocks were not needed at temperatures above 296 degrees F.

However, the detailed basis for that conclusion was not presented.

Q And this was at the meeting in November, did you say?

A [Witness Jacobus] I believe it was early December of 1987.

Q That's the first you heard of the position?

A [Witness Jacobus] Maybe it was late in November of '87. Yes, that's the first time I recall hearing anything about that position.

Q Were you familiar with or did you ever see the October, 1987 evaluation of the terminal block issue prepared by Bechtel for Alabama Power Company?

A [Witness Jacobus] I'm not sure which document you are referring to.

Do you have a copy of that?

Q I'm referring to a document that has been previously marked in this proceeding as APCo Exhibit 52.

Do you have that exhibit in front of you?

A [Witness Jacobus] Is that the response to EQ Items 18 and 67?

Q You've got it. That's it.

A [Witness Jacobus] Yes, I've seen that.

Q And were you ever presented or given an opportunity to review what has been styled as a justification for continued operation prepared by Alabama Power Company dated November 24th, 1987? That's been previously marked as APCo Exhibit 59.

A [Witness Jacobus] Yes, I reviewed that in regard

to the terminal blocks.

Q Do you recall in either of these documents ever having seen a discussion of when the instrument circuits in which these terminal blocks are located would be required to operate?

A [Witness Jacobus] I am not aware specifically of where that might be.

I have seen numerous arguments since the inspection that said the terminal blocks do not need to operate at different conditions.

I am not sure where each of those arguments were presented initially.

Q But you don't recall whether it was in either of those two documents?

A [Witness Jacobus] I'd be happy to look if you wish.

Q It's not necessary, no.

Let me back up a little bit here on EQ documentation.

You said the temperature was -- the temperature of these blocks needed to be qualified for was on the SCEW sheet?

A [Witness Jacobus] I believe it was. I don't have a copy of the SCEW sheet and I don't recall exactly what it said.

Q In performing the EQ inspection, do you routinely require documentation that addresses not only the qualification for the environment but documentation that addresses or explains the required environmental profile?

Is that part of the documentation that is required?

A [Witness Jacobus] Normally the way it works is the environmental profile is specified on the SCEW sheet. The basis for that profile is developed elsewhere through computer codes and the like, which we normally do not review as part of the EQ inspections.

The only way that that would be reviewed is if there was reason to believe that something had been inadequately considered in developing those profiles.

Q Right, but you do not expect to see in an EQ file detailed backup for the profile, is that correct?

A [Witness Jacobus] No, we take the profile that we are given and assume that it is correct in general.

Q Mr. Luehman, as an enforcement expert on EQ, do you ever recall a situation in which a licensee based on an inspection finding determined that in fact the piece of equipment involved didn't need to be qualified in the first place? Do you ever recall that happening or made an argument to that effect?

A [Witness Luehman] Yes, that's happened on a

number of occasions.

Q And is it the Staff's position in those cases not to take enforcement action where the licensee can show that the equipment didn't need to be qualified?

A [Witness Luehman] The Staff has taken the position where a licensee can show that a piece of equipment did not need to be on the master list because it performed no accident function, that it could be taken off, and we would not take enforcement action.

Q Dr. Jacobus, just to help us all understand this issue a little bit better, let me show you what has been labelled as Figure 2, a typical transmitter instrument loop signal path.

I'll represent to you that this is a figure out of APCo's pre-filed testimony in this case.

Would you say that this is a fair illustrative representation of a typical instrument loop?

A [Witness Jacobus] It would appear so.

What we have in this instrument loop is a number of different components. It may be a terminal block and again this is for illustrative. I'm not saying this -- every one is exactly like this.

We start with the transmitter. We have a terminal block.

There may be a containment penetration, maybe a

Raychem splice.

Now each of those items of equipment can contribute to the so-called accuracy effect.

Q That is correct? Okay. Now you have already told me that -- well -- prior to your information notice 84-47, which was not yours but was the NRCs based on Sandia tests -- you've already told me that it was the terminal blocks themselves were not considered to be a appreciable contributor to the instrument total loop accuracy, is that --

A [Witness Jacobus] Prior to our testing that's largely correct.

Q Okay. Now based on that testing, it was not -- or prior to that is it fair to say that it was generally considered that the loop accuracy effects based on the effects of temperature or environmental conditions on the sensor was the primary contributor to the loop, to the loop's accuracy?

A [Witness Jacobus] That is correct to the best of my knowledge.

Q And following 1984 and the testing on terminal blocks, were similar loop accuracy effects observed in cables and splices and other components within the instrument loop?

A [Witness Jacobus] I am not sure I understand your

question.

Q When did we see the effects, the contributions, due to other components of that move; the cable?

A [Witness Jacobus] When did we see them?

Q Was that a well-known phenomena prior to 1984?

A [Witness Jacobus] Well, I am sure that people knew that the power supply, the isolator and the indicator were not perfect devices, if that answers your question. I am still not certain that I understand your question.

Q Well, I think what you are telling me is that those other components did know that they would have an effect on instrument accuracy?

A [Witness Jacobus] Right. During activated conditions, though, they were assumed to not be major contributors, and therefore looking only at the end-device of accident conditions would be generally sufficient.

Q When you say the end-device do you mean the sensor?

A [Witness Jacobus] The sensor, yes.

Q So, the effects relative to the sensor were minor?

A [Witness Jacobus] That was generally assumed, to the best of my knowledge.

Q Okay, is that no longer believed to be the case?

A [Witness Jacobus]" Depends on the circuit. If it has terminal blocks in it, of course the answer to that

question is certainly not.

Q Right. We know terminal blocks now have that effect. How about the other items?

A [Witness Jacobus] Some people are now considering in great detail all of the other contributions. I personally have never been convinced that those other contributions are major contributions. Now, whether anybody has found that they are or not I am not aware of.

Q Have you been involved at all in the NRC industry efforts to resolve the so-called loop calculations of the total accuracy effect?

A [Witness Jacobus] My involvement has primarily been limited to the kind of issues we are talking about today, the effects of the cables and the terminal blocks.

Q Okay, so you basically are there to say terminal blocks or cables may make a contribution. Guys, go figure it out how to calculate it.

A [Witness Jacobus] The idea being that the terminal blocks may be making very large contributions and they may be dominating everything else. So, it is something that we need to resolve right now. The other issues, playing around with half a percent here and half a percent there, were considered much less important, and that is something that can be taken at a slower pace, if you will.

Q In 1984 when Sandia decided or basically made the

finding that terminal blocks were having that instrument effect, was that something that you said that needs to be resolved right now?

A [Witness Jacobus] The information notice basically said that that is an important thing that licensees should consider as part of their final 5049 reviews.

Q Is it your testimony that, in fact, it was resolved by the industry right now?

A [Witness Jacobus] Well --

Q In the near term.

A [Witness Jacobus] To my knowledge, most plants went in and replaced terminal blocks in 4-20 milliamp transmitter circuits inside containment. Other licensees chose to go much more conservative and replace many more terminal blocks, sometimes even extending the terminal blocks outside containment, terminal blocks and control circuits. Some licensees went quite far in replacing the terminal blocks.

Q Now, for those licensees that didn't replace the terminal blocks, and even if they did they were still doing their loop accuracy calculations; correct?

A [Witness Jacobus] I believe that most of them are.

Q And they are still doing them now?

A [Witness Jacobus] Most of them still are doing them.

Q And that is an issue that was not a trivial issue to come up with a calculational methodology to do that; is that correct?

A [Witness Jacobus] To do the entire loop accuracy, I understand some people went to fairly great detail. To look at the contribution of a terminal block is a relatively simple matter.

Q But that contribution needs to be factored into the overall loop effect?

A [Witness Jacobus] That is correct. But in the first order you find that the terminal block is going to wipe you out, then you need to do something about the terminal block right now.

Q Did the information notice say that the terminal block was going to wipe you out?

A [Witness Jacobus] It gave values for what the insulation resistance could become and some of those values implied that the errors could get fairly high.

Q Did the information notice say that licensees had to replace the terminal blocks?

A [Witness Jacobus] Absolutely not.

JUDGE BOLLWERK: Just so the record is clear, in the figure you have been referring to in this cross

examination is following Page 101 of the Love, Sundergill & Jones testimony, pre-filed testimony of APCo.

BY MR. REPKA:

Q When you wrote your input to the inspection report for the Farley inspection, Dr. Jacobus, you specifically fault that Alabama Power Company's analysis of the issue because they didn't use IR date for peak LOCA temperatures; correct? Greater than 150 degrees -- that is fahrenheit.

A [Witness Jacobus] That is correct.

Q When you reached that conclusion, did you base your finding on a review of any real instrument circuit?

A [Witness Jacobus] It is not necessary to go to that extent if I am told that something requires to be qualified to a certain level and I determine that it is not qualified to that level, that is the extent of the necessary review for me.

Q From your experience and your testing and your observation, what happens to insulation resistance behavior of the terminal blocks in the first 30 seconds of a transient?

A [Witness Jacobus] During the first 30 seconds the insulation resistance will very rapidly decrease and perhaps decrease to levels below what the steady state values of that insulation resistance will be.

Q So in your view, in your immediate effect --

A [Witness Jacobus] Very close. It is fairly similar to blowing some nice warm breath on a cold window on a nice winter's day and you immediately get oisture on that window. There is very little delay.

Q After the accident peak, the temperature continues to go up -- high temperature, high humidity. What happens to insulation resistance after the peak, when temperature and humidity begin to return?

A [Witness Jacobus] As the temperature profile returns to ambient conditions, the terminal blocks recover to within a couple of orders of magnitude of their pre-test values, i.e., to very high values.

Q So if I showed you that I didn't need to use an instrument circuit until out here, you wouldn't have a concern and a requirement for data up at the peak?

A [Witness Jacobus] Under the conditions which I delineated earlier, that is correct.

Q There is some discussion in your testimony regarding, and I believe it's IPS-107, but you can call it IPS-307 --

A [Witness Jacobus] All right, it is possible that IPS-307 is a summary of IPS-107, I'm not certain.

Q I'll look into that. But either way, there is some discussion in your testimony of bad or aberrant data points from that test report. Do you recall that testimony?

A [Witness Jacobus] Yes, I do.

Q And those were the data points for IR at the higher LOCA temperatures, is that correct?

A [Witness Jacobus] That is correct.

Q Now, as you understand Alabama Power Company's position on this issue, isn't it true that Alabama Power Company was not relying on those data points at the higher LOCA temperatures?

A [Witness Jacobus] I'm not sure -- at what time are you referring to Alabama Power's position?

Q Let's take today. You've read the pre-filed testimony, I take it?

A [Witness Jacobus] Yes, I have. I believe at this point Alabama Power is claiming that the terminal blocks are not needed during peak LOCA conditions. They are needed early in the accident, and they are needed late in the accident, but not during the peak.

Q Right. And you've never heard that position before, before the pre-filed testimony?

A [Witness Jacobus] Not that particular position, no.

Q Either way, they were not relying -- strike that.

Isn't it true that these terminal blocks are no longer installed in these circuits at Farley?

A [Witness Jacobus] That is correct, to the best of

my knowledge.

Q Okay. So I am not saying today. I'm saying that this position, as you understand it for Alabama Power Company, is that these terminal blocks would not have been needed at the peak LOCA temperatures, correct? You understand that?

A [Witness Jacobus] That's what I understand Alabama Power's position is at this point.

Q And the way Alabama Power Company's explaining the data they used for insulation resistance, and they did use insulation resistance data, did they not?

A [Witness Jacobus] Yes, they did.

Q Okay. And that was the data taken from the Conax Report?

A [Witness Jacobus] Yes, it is.

Q At about 150 degrees?

A [Witness Jacobus] Yes, it is.

Q And that data was, I believe, 1E 7 Ohms?

A [Witness Jacobus] That's correct. Or, I believe the actual report at 3 times 10 to the 7th. And Farley chose a slightly lower value of 1 times 10 to the 7th.

Q And that slightly lower value was more conservative for that temperature, is that correct?

A [Witness Jacobus] That would be correct, for that temperature.

Q Lower IR is better?

A [Witness Jacobus] In your calculations, yes. For the actual equipment, it's worse.

Q To make your calculations more conservative?

A [Witness Jacobus] That's correct.

Q To show an EOP, a bigger error bar, is that correct?

A [Witness Jacobus] Yes.

Q Be that as it may, they were not relying on the data, and are not relying on the data that you are saying in your testimony is aberrant?

A [Witness Jacobus] At the meeting in Atlanta, that data was presented on a figure. And it was claimed that that data at the higher temperatures was actually higher than the data they were using, so they did not need to use the data from the higher temperatures, because it had higher insulation resistance -- the same argument you just used that that would be conservative.

Q But they were not actually using that data to submit to Westinghouse for their loop accuracy calculations?

A [Witness Jacobus] They were not using it because the claim at that point was that it was higher values than the data that was submitted to Westinghouse.

Q That's the claim as you understand it?

A [Witness Jacobus] As I understand it, yes.

Q Or as you understood it back then?

A [Witness Jacobus] As I -- well, correct.

Q The argument that they weren't using it because it was -- they were using more conservative data, is not inconsistent with an argument that they weren't using it because they didn't need to use it, is it?

A [Witness Jacobus] Yes, those are inconsistent.

Q How are they inconsistent?

A [Witness Jacobus] They are inconsistent because that data was invalid. If they had taken actual valid data, the data would have been lower than the data that they used. So therefore, it's inconsistent.

Q Well, they are saying they didn't need to use that data, because the instrument circuits won't be relied upon during that time. Is that --

A [Witness Jacobus] That is not the argument that was given at the Atlanta meeting.

Q That's the argument that I am hypothesizing now.

A [Witness Jacobus] Then, one --

Q But either way, they didn't use that data? Let's just cut through this.

A [Witness Jacobus] They did not use that data.

Q So it doesn't matter whether that data was aberrant or not? Or conservative, or anything?

A [Witness Jacobus] It does matter if one is trying

to imply that the data at 150 degrees is more conservative than the data at 300. And that is the reason we are not using that data. Then it matters greatly.

Q Do you understand that Alabama Power Company is taking that position?

A [Witness Jacobus] I understand that they are now taking the position that that data is not necessary. That they do not need blocks above some temperature, which as of yet has not been specified to me.

Q When you wrote your inspection finding on this, when you wrote up your testimony on this issue, did you make any attempt to try to correlate between terminal blocks at issue and any particular instrument circuits?

A [Witness Jacobus] No, I did not.

Q So you had no idea how many systems were affected, or what those systems might be?

A [Witness Jacobus] I have since, in response to some things, looked at those circuits. I believe the Bechtel analysis that you referred to earlier does have a listing of the instruments in containment that use the terminal blocks. And I have taken a look at those.

Q Okay. So which Bechtel analysis now are you referring to?

A [Witness Jacobus] I believe it's the one that is the EQ response to action items 18 and 67. APCO Exhibit 52.

Q I thought you told me earlier that that didn't have any list of instrument circuits or what was required, when, or any discussion of that issue?

A [Witness Jacobus] It did not have any discussion as to what was required when. It did have a listing of the instruments that use terminal blocks.

Q Okay. So prior to writing your direct testimony -- prior to issuing this inspection finding, and even prior to writing your testimony, you never made any correlation between the terminal blocks at issue and particular instrument circuits, correct?

A [Witness Jacobus] No, that was never requested.

Q No -- does that mean you never did it?

A [Witness Jacobus] I never did it because my responsibility effectively ended when the equipment was determined to be not qualified.

Q Mr. Merriweather, did you ever make that correlation?

A [Witness Merriweather] I can't tell you exactly the systems I identified as the ones that had terminal blocks because we didn't have that information.

Q So, do you know how many systems were affected by this issue?

A [Witness Merriweather] We never were provided that information.

Q Did you make any attempt to determine whether or not, from a performance standpoint, whether this, in fact, would affect any systems?

A [Witness Merriweather] I didn't make that determination, but I gathered from that one day meeting that there were certain operator actions that were required, I think, within the first 20 minutes, and they relied on certain instrumentation to make that judgment as to what operator actions were required.

And I believe if you look at the Confirmation Action Letter, that was the basis for why they had to replace the terminal blocks.

Q Okay, so, you never attempted to ascertain whether or not -- you never ascertained what the systems were that were affected by these blocks?

A [Witness Merriweather] No, I didn't.

Q Okay, and so you never made any attempt to correlate whether or not these systems would be required at conditions other than 150 degrees Fahrenheit?

A [Witness Merriweather] No, I did not.

MR. REPKA: Judge Bollwerk, this may be a good time to take our morning break.

JUDGE BOLLWERK: I was thinking the same thing, but I don't know how much longer -- then you want to take a break right now? You have some more cross examination, I

take it?

MR. REPKA: I think I may have a little bit more, but this may be a good time to just assess where I am.

JUDGE BOLLWERK: Is the staff going to need some time for redirect before we --

MR. HOLLER: We can discuss the testimony that's been given so far and be prepared for that and then only enough to identify what is brought up on cross afterwards.

JUDGE BOLLWERK: Why don't we take 15 minutes.

[Brief recess.]

JUDGE BOLLWERK: Please be seated.

Mr. Repka, you may continue.

BY MR. REPKA:

Q Dr. Jacobus, at the break, I discussed with my witnesses the issue of IPS-107 and IPS-307. They assured me they were relying on IPS-107.

A [Witness Jacobus] That's correct. We also checked at the break, and everytning should be corrected to IPS-107, as you stated.

Q Great. Thank you.

Let me focus just for a minute here on the issue of similarity, and particularly, Alabama Power Company's IR data was from testing on a Connectron block. Is that correct?

A [Witness Jacobus] That is correct.

Q And you have said that the similarity analysis provided assessing the similarity between Connectron blocks and the States and GE blocks was inadequate.

A [Witness Jacobus] That is correct.

Q Okay. But you have also said that you did have in front of you a similarity analysis.

A [Witness Jacobus] Yes. I have also said that the similarity analysis was not really relevant, because the -- the terminal blocks that were tested did not have the insulation resistance data that, to the best of my knowledge, was required.

Q Right, because it didn't have the data at higher than 150 degrees.

A [Witness Jacobus] Correct.

Q Let's put that issue aside, though, and let's just look at the similarity.

A [Witness Jacobus] Okay.

Q Now, does it continue to be your testimony that, even if the data had been at higher temperatures, Alabama Power Company couldn't use it, because the blocks were too dissimilar?

A [Witness Jacobus] That is correct.

Q Okay.

Is there any similarity analysis that you would have found acceptable between these two or three types of

blocks?

A [Witness Jacobus] I don't believe they are sufficiently similar to say they are similar.

If -- from a technical standpoint -- I'm going to stick to that again -- if the block were only needed at 105 degrees and -- and -- and that were the -- were the conclusion we came to, a similarity analysis, in my view, from a technical standpoint, would not need to be as rigorous, and perhaps a similarity analysis would be acceptable for that situation, because -- because the environments are much less severe.

Q So, your real problem with similarity, then, was not the blocks being dissimilar but was just the fact that the -- the environment tested was different from what you were looking for.

A [Witness Jacobus] That's the primary issue, yes.

Q Okay.

Otherwise, you're aware that Alabama Power Company's similarity analyses had looked at the geometry of the blocks, the dimensions of the blocks.

A [Witness Jacobus] That's correct, although the dimensions that they looked at were looked at not quite correctly. That was the major issue with the similarity analysis itself.

Q In your view, they were not looked at.

A [Witness Jacobus] Yes. Would you like me to give you more detail on that?

Q Well, what I -- let me refer you first to page seven of your testimony. Do you have that in front of you?

A [Witness Jacobus] Page seven? I do.

Q About -- the second paragraph on that page, about halfway down, the sentence reads, "The inspectors did not agree that the similarity analysis was sufficient and felt that the quoted IRs were totally unrealistic." Do you see that sentence?

A [Witness Jacobus] That's correct.

Q Okay. So, the second half of that, again, is -- I mean am I correct to characterize that as saying what you just told me now, that your real problem was that the temperatures -- the data was at a temperature you didn't feel was acceptable?

A [Witness Jacobus] That is correct.

Q And so that was the real reason that you felt that the reports, as it were, were dissimilar.

A [Witness Jacobus] That -- that is the major reason.

Q Okay. And you said that they did not agree that the similarity analysis was sufficient otherwise. That's the first half of that sentence.

A [Witness Jacobus] That's correct.

Q Okay. And no other detail was given in your inspection report, was it?

A [Witness Jacobus] That is correct.

Q Okay.

Now, the reason for finding the similarity to be insufficient was dimensional?

A [Witness Jacobus] That was one of two primary reasons.

Q Okay. And dimension was or was not something that Alabama Power Company addressed in their analysis?

A [Witness Jacobus] It was something that they considered, but in my view, they considered it incorrectly.

Q Okay.

Did the step arrangement of the Connectron blocks have anything to do with your dissimilarity conclusion?

A [Witness Jacobus] Yes, it did. That was the most important part.

Q Okay.

Now, you felt that, because the Connectron block was stepped, that was what? That dimension would be a preventive measure with respect to the moisture film that was going to cause the instrument accuracy?

A No. It would change the distances between adjacent terminals. APCo, in the analysis, considered the horizontal distance between adjacent terminals and said that

the States and GE terminal blocks had larger distances between terminals.

However, it did not consider the additional distance that you would get on the Connectron blocks because of the blocks having the step configuration.

To take it to extremes, let's say the -- the horizontal -- the horizontal -- or the vertical offset was one foot and there was a half-an-inch between terminals. What is the approximate distance between terminals, between the electrical connections?

Well, it's very close to one foot, but if we only look at the distance between terminals, we may come to a very different conclusion as Alabama Power Company.

Q Was the vertical dimensions of the Connectron blocks one foot?

A [Witness Jacobus] No, it was not.

Q It was significantly less than one foot, wasn't it?

A [Witness Jacobus] Yes, it was. It was small.

Q Can you tell me what it was relative to the horizontal dimension?

A [Witness Jacobus] I have photographs of them. I could not find or could not read the actual dimensions on the drawings that I was supplied by Alabama Power.

Q How big are these blocks? Let's take a States.

A [Witness Jacobus] They will easily fit in my hand, roughly the size of one of the old book-match books, the boxes of stick matches.

Q And that would be with how many poles?

A [Witness Jacobus] That would be, say, a six-pole block.

Q Now, a Connectron block, also six poles, would that be about the same size?

A [Witness Jacobus] Roughly. It would fit in your hand.

Q So, we're talking about dimensions between poles of an inch or so.

A [Witness Jacobus] More like, probably, center to center spacing of a half-an-inch or so, maybe three-quarters.

Q Now, in Sandia's testing which resulted in your finding that a moisture film is the cause of the instrument accuracy problems, is there any -- does Sandia have any data to show when moisture films appear or how they appear?

A [Witness Jacobus] Only from the results of the test.

You look at when the insulation resistance is lowest, and at that point, you assume you have essentially the worst moisture films, and when the data begins to recover, you assume essentially that the moisture films are

starting to go away.

Q So, basically, in finding the two blocks dissimilar, you were relying on your engineering judgment?

A [Witness Jacobus] I was relying on the fact that this other dimension, this vertical dimension had not been considered. To me that is not engineering judgment. If you don't consider something that's potentially important, it's wrong.

Q Okay. So, you're not saying that the vertical dimension necessarily makes it dissimilar?

A [Witness Jacobus] No. I didn't say that.

Q You're just saying it wasn't considered at all?

A [Witness Jacobus] Right.

Q You didn't see it addressed in the similarity analysis?

A [Witness Jacobus] That is correct.

Q And you don't have an opinion one way or the other as to whether it makes a difference?

A [Witness Jacobus] In general, my belief is that it's fairly difficult to do a similarity analysis of terminal blocks if you have severe accident conditions that you're addressing. It's very difficult to do a similarity analysis of radically different blocks like that and very different configurations. Even blocks that looked fairly similar, that you almost might confuse in our tests had some

different performance.

Q So, are you saying because you believe these blocks are radically dissimila', is that the word you just used?

A [Witness Jacobus] Well, let's soften that just a little bit. They are dissimilar configurations. They also may have different surface char' ristics. The way moisture films may form, they ' get into different crevices and things like that on the blocks. Those are very difficult to address.

Q Surface -- what were your words?

A [Witness Jacobus] Surface characteristics.

Q Surface characteristics.

A [Witness Jacobus] That would be the second reason -- the second area where the APCo similarity analysis was not adequate. It did not address that at all. It only addressed the material itself and not the surface characteristics.

Q Did you ever mention surface characteristics in your inspection finding?

A [Witness Jacobus] No, I didn't. All I said was that the dissimilarity analysis was inadequate.

Q Did you ever address surface characteristics in your notice of violation or the order imposing a civil penalty?

A [Witness Jacobus] I did not prepare those documents.

Q Did you ever address service characteristics in your testimony?

A [Witness Jacobus] I don't know if I specifically addressed those or not.

Q So you don't remember what you said in your direct testimony?

A [Witness Jacobus]" I think -- I believe I said something to that effect.

Q So, basically, you're telling me that you would not ever find a similarity analysis between these two blocks to be acceptable?

A [Witness Jacobus] That is not what I'm saying. It would depend on the environments that the terminal blocks were required to function in, as I mentioned earlier.

Q So, if they had -- if the connectron blocks had been tested at peak LOCA temperatures, you might have found them similar?

A [Witness Jacobus] No, no. You're not with me.

Q In more ways than one.

A [Witness Jacobus] In effect, if the terminal blocks are exposed to fairly mild conditions, from a technical standpoint, there's very little that you have to do to show similarity. Okay?

Q Right.

A [Witness Jacobus] If the blocks are exposed to fairly severe conditions, you have to do much more.

Q And you are looking for them to be addressed for fairly severe conditions?

A [Witness Jacobus] That was my understanding of when they were required --

Q Okay. And, in fact, that would be --

A [Witness Jacobus] -- when they were required to be qualified.

Q In fact, that would be for the worst case possible conditions?

A [Witness Jacobus] It depends when you're talking about. At the time of the inspection, that was the only information that I had.

Q That's what you were looking for?

A [Witness Jacobus] That's correct.

Q Mr. Luehman, this issue, again, came to you in the enforcement process; is that correct?

A [Witness Luehman] Yes, it did.

Q On page 21 of your testimony, answer 19, are you with me?

A [Witness Luehman] Yes, I am.

Q APCo, after the inspection had to do significant analysis to attempt to assess the qualification status of

the terminal blocks; do you see that?

A [Witness Luehman] Yes.

Q What analysis are you talking about?

A [Witness Luehman] Well, I think that probably Dr. Jacobus and Mr. Merriweather will probably have to help me here. But, my understanding is that at the time of the inspection, the -- the terminal blocks were required to be -- were stated to be have to be qualified to some temperature, I think, that was in excess of 300 degrees. And that's what the inspection findings were made on.

Subsequently, at the meeting in Atlanta that occurred in a week or two later that has already been referred to in their testimony, Alabama Power made an argument for a somewhat lower temperature that the blocks would have to be qualified to and now, in testimony that -- in pre-file testimony, Alabama Power is asserting that the blocks now have to be qualified -- I guess the temperature that's been thrown around here is 150 degrees.

So, what I'm saying is that a significant analysis had to be done because it appears that the licensee's basis for what was acceptable has changed from in excess of 300 degrees to 290 something degrees, now to less than 150 degrees. And that's what we're referring to as the significant analysis.

Q Okay. And it was your understanding that Alabama

Power Company's position all along was that the blocks were qualified; is that right?

A [Witness Luehman] They maintained that they were qualified, but they kept changing what their basis for that was it appears.

Q But they maintained, they were trying to show and satisfy the staff that the blocks were qualified?

A [Witness Luehman] That's what they tried to do, yes.

Q Okay. And they provided an evaluation first in October of '87 to try to address the staff's concern? Did you ever review that document?

A [Witness Luehman] Yes, I think I have.

Q And did you review it before you issued the notice of violation?

A [Witness Luehman] I think we did, yes.

Q Think or you know?

A [Witness Luehman] I cannot state for a fact. But I am -- but I know that it was reviewed by the staff, if not personally, by me.

Q Okay. So, you don't know and you don't -- and you don't know whether it was -- you said "we," is that somebody other than you?

A [Witness Luehman] As I've stated, I think -- I'm sure that it was reviewed by other people. I know that -- I

cannot recall specifically that I looked at it. I know that I have looked at it. When in this process was the first time I looked at it, I cannot recall.

Q Okay. And then in November 1987 Alabama Power Company prepared a justification for continued operation. Do you recall that?

A [Witness Luehman] Just the discussion of it that's gone on.

Q Now, do you recall that that JCO was prepared at the request of the NRC?

A [Witness Luehman] No, I do not.

Q So, you don't know that one way or the other?

A [Witness Luehman]" Not at this time, no, I don't.

Q Okay. And do you know or did you review before writing this sentence in your direct testimony -- did you ascertain whether or not that JCO -- strike that.

Isn't it fair to say, Mr. Luehman, that that JCO was just another attempt by Alabama Power Company to convince the staff of the Power Company's position?

A [Witness Luehman] Well, the justification for continued operation can -- is designed to allow the plant to continue to operate. I don't know that we would have necessarily accepted that as a qualification argument. We might have accepted it as a justification for continued operation. But --

Q We all know the NRC didn't accept it as a qualification argument. That's why we're here.

A [Witness Luehman] Uh-huh. That's correct.

Q But, in fact, it was intended to show that these terminal blocks didn't need to be qualified for the same temperature and conditions which the staff alleged; is that right?

A [Witness Luehman] Without reviewing it, I'd have to take your word for it.

Q So you don't know?

A [Witness Luehman] Not right now.

Q You also were involved in the "clearly should have known" finding on this issue; is that correct?

A [Witness Luehman] That is correct.

Q Prior to writing that finding, did you review the Franklin TER of 1983?

A [Witness Luehman] I don't recall whether I reviewed the TER on this specific issue or not.

Q Did you review the meeting minutes for the January 11, 1984 meeting?

A [Witness Luehman] I think that we did review the meeting minutes. We did have some discussions on the meeting minutes, yes.

Q Who be "we?"

A [Witness Luehman] I know that I had those with

Bob Weismann of the Office of General Counsel, in specific. I cannot recall the particular members of the Technical Staff by name, although I would assume that it was probably the members of the Panel.

Q Did you ever discuss it with anybody who was at that meeting?

A [Witness Luehman] No, I don't think I did.

MR. REPKA: Thank you. I have no further questions.

JUDGE BOLLWERK: Mr. Holler, are you ready, or do you need a couple minutes?

MR. HOLLER: If I may briefly just confer for five minutes?

JUDGE BOLLWERK: Why don't we recess then for five minutes and we'll be back at ten after.

[Brief recess.]

JUDGE BOLLWERK: Be seated, please. Let's go back into session. Maybe I can clarify one matter. I want to make sure that I had it. I take it that all references to IPS-307 in Mr. Jacobus' testimony should be IPS-107; is that it?

MR. HOLLER: I will let Mr. Jacobus answer that one.

WITNESS JACOBUS: That is correct.

JUDGE BOLLWERK: That includes the pretrial

testimony and his testimony on cross examination?

MR. HOLLER: Again, I'll ask Mr. Jacobus to answer.

WITNESS JACOBUS: That is correct.

REDIRECT EXAMINATION

BY MR. HOLLER:

Q I will address this to Mr. Luehman. The Panel has testified on cross examination regarding the terminal block currently -- the January 11th 1984 meeting with the licensee, the licensee's February 1984 letter documenting that, and Information Notice 84-47.

Would you please describe for me the timeline or the timing of these various documents?

A [Witness Luehman]" I think, as Mr. Shemanski pointed out, the timeline really starts with the Commission meeting that the Staff had with the -- on where the issue of terminal block current leakage came up, which I believe he said was January 6th, but it was -- in any case, if that's not the exact date, it was a few days before the meeting with Alabama Power at which Mr. Shemanski also testified.

That meeting took place on the 11th. The terminal block issue was discussed as a potential concern. That was the -- then there was the licensee's February 29, 1984 letter which was a -- their summary of the meeting that took place and then the Information Notice itself was issued in,

I think, the June 1984 timeframe.

I would add that in the -- that the licensee -- and one other thing I guess I would say in addition to that is that the test reports or the information from Sandia that was issued -- that would support the conclusions or the concerns of 84-47 were issued later on in 1984 in the August '84 timeframe.

One of the things that needs to be added to that is that in their document dated February 29, 1984, the licensee, in response to one of the NRC comments relative to Information Notices and generic correspondence in Attachment 2, Item 3 to that, the licensee stated that they had a program to respond to all NRC generic correspondence, although responses to INs and Circulars was not required to be submitted to the Commission; that they would internally document their resolution of those concerns.

That was -- and they stated that in February. And that document went on to point out some Information Notices that were of particular concern at that present time. However, given that the Information Notice in question, 84-47, wasn't an issue till July, the Staff obviously didn't ask them about that particular Information Notice. But their response would give the Commission -- would give the Staff the impression that they would adequately respond to future ones, that being 84-47 when it came out in July.

And then even if there wasn't enough information there, when the supplement -- I mean, if there -- if it was not clear what the concern was when the information was then -- the test reports that supported 84-47 came out in August, they could have supplemented the response to the Information Notice internally.

Q Let me just ask the panel then, is it fair to say that the information notice and the reports that amplified it were available to licensees before November 30, 1985?

A [Witness Luehman] Yes.

Q Let me address this to Dr. Jacobus or to the panel -- what were the loss of coolant accident LOCA temperatures identified by APCO at which terminal block instrumentation circuits were needed during the inspection?

A [Witness Jacobus] Which -- at what point in time are you referring to?

Q Well, Dr. Jacobus, starting with the inspection.

A [Witness Jacobus] Okay. As I recall from the inspection, there was a temperature somewhere in excess of 300 degrees, that we saw nothing to tell us that they did not have to be qualified to that temperature. So it was somewhat above 300 degrees.

At the meeting in Atlanta, APCO, while they didn't explicitly state it, implied that the terminal blocks did not have to work at temperatures above 296. They actually

explicitly stated they did not have to work above 296. They did not explicitly state that they had to work at 2°6.

Subsequent to that, in their direct testimony I believe, while they don't actually specify a temperature, the temperature is implied as being 150 degrees fahrenheit.

Q Let me ask the panel if anyone in the panel has any knowledge of precise temperatures before or after the peak LOCA temperatures, at which Alabama Power Company asserted to you, the blocks were required to operate?

A [Witness Luehman]" No more than what I just mentioned.

A [Witness Merriweather] No.

Q Dr. Jacobus, in your cross-examination you testified that you found a G.E. report in the procurement file. But you also testified that no G.E. qualification file existed. Can you please explain that for me?

A [Witness Jacobus]" Normally what would happen in a licensee is they would receive such a qualification report, and incorporate it into their entire qualification file. That would include the report, an evaluation of the report, the SCEW sheet, other supporting information that they might need in that file.

The report that I found, had it been properly evaluated for the temperatures which at that time we believed the terminal blocks needed to be qualified to,

would have come to the conclusion that the terminal blocks would not meet their accuracy requirements.

Of course, that is a qualification requirement. The piece of equipment has to meet specified functional performance requirements. Had the G.E. report had sufficient information in it to demonstrate that the terminal blocks would function at those temperatures, basically what would have happened is that Alabama Power would have been told that they needed to prepare an entire qualification package, although the violation would have been basically a documentation violation, rather than an actual equipment violation.

Q Let me ask Mr. Luehman in follow-up to that: Do you have an opinion as to whether or not the NRC would have taken escalated enforcement for the situation Dr. Jacobus described, the hypothetical situation?

A [Witness Luehman] Well, I think the answer is that we, in the hypothetical situation if the test report had clearly bounded the conditions required, and it was just a matter of incorporating that into the file, without any additional testing or extensive analysis, then it would have been viewed as a violation of less significance under the modified policy, and a severity level 4 or 5 violation would have been issued for that.

Q I will address this to the panel: Dr. Jacobus, in

his cross-examination, testified that there were technical and regulatory issues associated with the terminal blocks not needed above certain temperatures. My recollection is that he has informed of those technical issues. Maybe the panel could explain what the regulatory issues are?

A [Witness Luehman] I guess I'll start out -- I think it goes back to the modified policy. As Dr. Jacobus stated, a technical argument can be made if you consider the issues such as whether an operator in the control room will be misled by an indication, when exactly the particular indication or function is needed, either to be relied on as an indication or to perform a trip function -- whatever the case may be.

If those things are evaluated by the licensee, and their people are trained on them prior to the discovery of such a problem, like in this case, then you could probably make an acceptable regulatory argument, considering the technical arguments that Dr. Jacobus has made.

However, if the problem is discovered that there is a potential accuracy problem with these devices, in this case terminal blocks, and then after the fact you want to make an argument that the operators may or may not have been misled, that you can go on after the fact and incorporate precautions into your emergency procedures, you can refine your argument to see at what temperatures they will be

required after the fact, the modified policy -- which is the enforcement and regulatory document that is in effect for this inspection -- doesn't allow that.

The policy says that if those things, if a licensee discovered those things prior to the deadline, for instance, that a piece of equipment wouldn't operate as required, and they put administrative controls on that equipment such that it would not have adverse effects, if they did that prior to the deadline -- although the equipment in the plant per se would not be qualified, they would have taken compensatory measures.

However, if they want to take those, we will not consider arguments where they take compensatory measures after the fact. And that is essentially what is being argued here, in our opinion.

And, therefore, it's subsequent to the escalated provisions of the modified policy.

Q Let me direct this question to Mr. Luehman.

As you finished your cross examination, you had offered testimony with regard to an October, 1987 document which, I believe, is marked for identification as APCo Exhibit No. 52. Is this the document that you had in mind when you were giving your response?

A [Witness Luehman] No, I don't think it is. Although I think that I have seen APCo Exhibit No. 52 in the

course of these proceedings or the course of the document exchanges and everything leading up to this actual hearing. I cannot state that this document was reviewed by anybody on the Staff, to my knowledge, prior to issuance of the NOV that we are here on.

The document that I think that I was referring to is Staff Exhibit No. 47, which is a January 8, 1988 letter from Alabama Power Company to Region II and the subject is environmental qualification of Raychem/Chico A sealant and terminal blocks. That is the document that I am fairly certain was reviewed by the Staff prior to the issuance of the Notice of Violation.

Q I will address this to Dr. Jacobus. The Board has already made clear that your testimony with regard to the products test report, IPS-307, in fact, applies to 107. I would just, to make it perfectly clear, the testimony that you have offered in your direct testimony and the comments that you have made today apply to 107.

A [Witness Jacobus] That is correct.

MR. HOLLER: I have no further questions.

JUDGE BOLLWERK: Mr. Repka.

MR. REPKA: I have a few questions.

RECROSS EXAMINATION

BY MR. REPKA:

Q Mr. Luehman, you referred to some of Alabama Power

Company's arguments on this issue as after the fact assessments of compensatory measures -- I am not sure what the other words you used were -- do you recall saying that?

A [Witness Luehman] That is correct.

Q And you said that modified policy precludes consideration of those types of arguments?

A [Witness Luehman] That is correct.

Q And you are referring to Section 4 of the modified policy; is that right?

A [Witness Luehman] Yes, I am referring to Section 4 at the bottom of Page 3 of the modified policy.

Q And that relates to the safety significance of violations that you found; right?

A [Witness Luehman] I guess I don't understand that.

Q Section 4 relates to assessments of the safety significance or severity of violations that the staff has found?

A [Witness Luehman] Section 4 is titled, "Basis for Determining Civil Penalties".

Q And it relates to the severity level of the violation; does it not?

A [Witness Luehman] In part, yes.

Q Last week we discussed the modified policy at length; do you recall that?

A [Witness Luehman] Yes.

Q Before you get to severity of violation, don't you have to find violation?

A [Witness Luehman] Yes.

Q True or false, an argument that relates to the appropriate temperature or data needed for qualification, relates to qualification?

A [Witness Luehman] Excuse me?

Q An argument related to what the appropriate temperature is that needs to be evaluated for temperature is a qualification issue; is it not?

A [Witness Luehman] That is part of it, yes.

Q In your redirect you also discussed the time line of events on this issue; do you recall that testimony?

A [Witness Luehman] Yes.

Q You went to great pains to explain that Information Notice 84-47 came out after the January 11, 1984 meeting.

A [Witness Luehman] That is correct.

Q Mr. Luehman, from your personal recollection of this issue, what changed between January, 1984 and the information notice?

A [Witness Luehman] What changed is simply that the Staff officially took the position that the Sandia information, which I think was the result of testing done in

1983, was significant enough to publish to the industry. Prior to that point, while the Staff, as Mr. Shemanski stated, had some concerns, it wasn't until the information notice was issued that the Staff took the official position that licensees needed to look at that. At the meetings held prior to that time definitely gave licensees a heads-up on that issue, but the Staff's position relative to that issue wouldn't develop until the information notice was issued.

Q Information notices don't develop out of nowhere; do they?

A [Witness Luehman] That is correct.

Q They take time to develop?

A [Witness Luehman] That is correct.

Q And this concern that you are referring to that was reported in Information Notice 84-47, was known well prior to that time; was it not?

A [Witness Luehman] It was known, yes.

Q Were you there?

A [Witness Luehman] No.

Q If I am a licensee and I am aware of a concern, and I go to a meeting and I tell the NRC exactly what I am doing about that concern and the NRC says fine, several months later an information notice comes out and says, here's a concern, the same concern we have already addressed. Can I take no comfort in the fact that I have

already got a resolution to that issue?

A [Witness Luehman] You can take as much comfort in it as is technically allowed. I think 84-47 came out -- I think the NRC Staff is even willing to say that the information notice, you know, alerted licensees to the concern and a company like Alabama Power would say well, we think we have resolved this, but then subsequent to that the test data that supported that information notice came out and again that would provide a second opportunity for the licensees such as Alabama Power to evaluate its conclusions. The Staff, because it issues it as an information notice, has not looked at the generic applicability from plant to plant. That is the licensee's responsibility. And in those two places, the licensee was given a clear opportunity to do that for their particular circumstances and not the generic case.

Q The information notice said that the concern had to be addressed.

A [Witness Luehman] That is addressed.

Q That IR values needed to be put into emergency operating -- calculated into the emergency operating procedures.

A [Witness Luehman] That's correct.

Q Did it say anything about what those IR values had to be?

A [Witness Luehman] I'm not aware that it did. And that was not -- my function was not to make those evaluations.

Q So your function was to provide the perspective of 1987 on this issue, wasn't it?

A [Witness Luehman] That's not correct at all.

MR. REPKA: No further questions.

JUDGE BOLLWERK: Any questions, Mr. Holler?

MR. HOLLER: No, sir.

JUDGE BOLLWERK: All right. We will have questions from the Board. Judge Carpenter.

BOARD EXAMINATION

JUDGE CARPENTER: Mr. Luehman, Mr. Holler and Mr. Repka pretty well asked my questions. So, I just want to ask one further one along that same line.

Accepting on page three of the modified enforcement policy, it says the NRC will not consider the actual time the equipment is required to be operable at that point. On the next page item three, under corrective action, including the time taken to make an operability or qualification determination, there is a fine point here I'd like you to help me with.

WITNESS LUEHMAN: Yes, sir.

JUDGE CARPENTER: To what extent are those two perspectives compatible? One page says we won't consider it

and the next page says, for mitigation purposes we will. Or do I read it correctly?

WITNESS LUEHMAN: Well, I think you read it correctly. The only distinction, I think, that is made there is for the purpose of deciding whether a violation exists or not, we will not -- we cannot accept those arguments -- or we will not accept those arguments. For the purpose of and/or whether -- and in determining the severity level of that argument, we will not consider those. In considering how we will deal with a violation at a particular severity level, in other words, the size of the fine if there is going to be one, we will consider what a licensee did in reponse to finding the problem.

But, the fact that they take good corrective action after the fact does not mitigate the fact that there was a violation.

JUDGE CARPENTER: Fine. What sort of time scale is the time taken in practice? What sort of times do you consider reasonable; a few months, a few days or what?

WITNESS LUEHMAN: Well, I think that -- for corrective actions, sir?

JUDGE CARPENTER: Yes.

WITNESS LUEHMAN: I think that normally -- for large undertakings, I think that adequate corrective actions for violations that were found such as -- I mean, and I'm

not just talking about the Alabama case, because I'm not -- you know, I cannot recall specifically how long, you know, actions to change out different equipment took Alabama Power or Farley. But, some of the larger undertakings, such as the significant splice change-outs, significant terminal block changes, et cetera, the order of, you know, weeks or months is considered an acceptable length of time for corrective action.

JUDGE CARPENTER: Thank you for your perspective.

Dr. Jacobus, maybe more out of an intellectual curiosity than this case, are you knowledgable about the Sandia tests of these terminal blocks?

WITNESS JACOBUS: Yes, I am.

JUDGE CARPENTER: In the Sandia tests were sprays used?

WITNESS JACOBUS: There were chemical sprays used in -- the tests were done in two phases. I believe both phases did use chemical sprays. The blocks -- the terminal blocks were protected by NEMA-4 enclosures during that time though.

JUDGE CARPENTER: I'm not familiar with that enclosure.

WITNESS JACOBUS: Oh.

JUDGE CARPENTER: Can you just tell me, is it --

WITNESS JACOBUS: It's basically --

JUDGE CARPENTER: -- fairly tight, very tight or almost impervious?

WITNESS JACOBUS: Fairly tight, but clearly not sealed. The cables enter the box through a conduit -- flexible conduit that comes into the side of the box and that conduit is filled with cables, but it is not sealed. Also, in the bottom of the box, there were quarter-inch what we call weep holes drilled in the box to allow the pressure to equalize inside and outside, otherwise the blocks will collapse. The other purpose of the weep hole is to allow any moisture condensation to drain out. And that's typical of installations in plants.

JUDGE CARPENTER: The reason I was asking you, when you talk about the moisture films causing the problem on the blocks perhaps -- and I want to know if the case -- whether moisture film included sodium hydroxide and boric acid was included in the test?

WITNESS JACOBUS: Generally, the findings of the test were that the chemical sprays made little difference. Because the protection of the blocks were adequate to preclude the chemical spray from getting in and having significant effects. That was determined by --

JUDGE CARPENTER: So, this degree of protection is the degree you would expect throughout the industry?

WITNESS JACOBUS: That is correct.

JUDGE CARPENTER: Fine. Because I couldn't understand its recovery if the film had sodium hydroxide and boric acid.

WITNESS JACOBUS: Oh, okay.

JUDGE CARPENTER: Thank you very much.

JUDGE BOLLWERK: Judge Morris.

JUDGE MORRIS: I'd like to have some discussion on the record here of what we're talking about, really, and as I understand it, there are several categories of terminal blocks, instrument control and power. Is that correct?

WITNESS JACOBUS: There are -- they're categorized that way. In most cases, the blocks are identical, however. They're not different blocks designed for those diiferent applications, in general.

JUDGE MORRIS: Is the controversy here restricted to those blocks used in instrument loops?

WITNESS JACOBUS: Yes, it is.

JUDGE MORRIS: There was reference made to the IEEE standard 323-1974. Is that equivalent to NUREG-0588, or the other way around? Does 0588 reflect what's in the IEEE standard?

WITNESS JACOBUS: NUREG-0588 Category 1 effectively endorses the standards in IEEE 323-1974, with some exceptions.

Category 2 endorses IEEE 323-1971, with some

modifications.

JUDGE MORRIS: On page 11 of the testimony, in the first paragraph, it says the staff issued several information notices on these issues. Are there any information notices on these issues that we haven't heard about in the testimony so far?

WITNESS SHEMANSKI: Let me answer that one.

Basically, what I was referring to there, in terms of the other information notices, as the EQ program within NRC was progressing and NRC became more knowledgeable about failures of equipment that normally would be on the EQ master list, NRC issued a series of information notices, and typically, these information notices would contain a listing of the dozen or so different components and the types of problems that they encountered, and that was what I was referring to.

I don't recall specifically if terminal blocks were included in those information notices. I believe they were. I believe they were. Maybe someone else on the panel has some additional information on that. What I'm referring to is information notices in addition to 84-47.

WITNESS JACOBUS: I believe there was an Information Notice 82-03 that was issued earlier. However, that information notice was largely superseded by 84-47.

The series of information notices that Mr.

Shemanski is referring to. I am familiar with those. I believe I have the numbers in my book if you're interested in finding out what those numbers are.

JUDGE MORRIS: I'm not interested in numbers. I just wanted to make sure that those that are relevant are before us.

WITNESS JACOBUS: The major one is 84-47.

WITNESS LUEHMAN: But I would add, I think that we -- in the course of the first-round EQ inspections, it was found that -- I think that Dr. Jacobus is right -- Information Notice 82-03 was an information notice that talked about terminal blocks.

One of the early concerns with terminal blocks was the cleanliness of the block; in other words, getting foreign material on the block and -- and possibly concerns in that area, grease build-up, etcetera, and the -- that information notice, while it didn't deal with the -- the -- the -- the subject -- the technical subject at issue here, did precipitate the first of -- of some licensees going to qualified splices, rather than terminal blocks, because of some of these issues that the NRC was pointing out.

JUDGE MORRIS: Dr. Jacobus, you told us, in your correction on page 13, about the fact that the relationship between insulation, resistance, and temperature was not linear on a semi-log plot. Were you referring to a specific

document where data were plotted?

WITNESS JACOBUS: Yes. I was referring to a plot that was presented by Alabama Power at the November -- late November meeting in Atlanta.

At that point, they took data from the Sandia test reports, and they took data at -- roughly at ambient temperature, at the peak LOCA temperatures, and connected them and the interpolated between those two points, as if it were a linear --

JUDGE MORRIS: Simply exponential.

WITNESS JACOBUS: Right. And in fact, then, we subsequently plotted the actual data from the report that was taken at multiple temperatures and clearly demonstrated that it was not of that form.

JUDGE MORRIS: Were such data available to the licensee?

WITNESS JACOBUS: That was in the test reports that were issued in 1984.

JUDGE MORRIS: On page 20, at the top of the page, the last sentence of that unfinished paragraph states, "Private plant records indicate that the terminal blocks were installed prior to November 30, 1985."

What records were those, please?

WITNESS MERRIWEATHER: Basically what we are saying there is we didn't have any indication that they had

been changed out.

JUDGE MORRIS: Were terminal blocks installed in the penetrations?

WITNESS MERRIWEATHER: So we didn't have reference to show that they were changed out.

JUDGE MORRIS: If there were changed out, there would have been records, is that correct?

WITNESS MERRIWEATHER: Should have been done by plant modifications or something like that, yes.

WITNESS JACOBUS: We also have the EQ response. I believe it's APCo Exhibit 52 that delineated what circuits had terminal blocks in them and it was our understanding that those terminal blocks were installed at the time, basically at the time the plant was put together.

WITNESS MERRIWEATHER: Also I believe in their response to the circular 78-08 they indicated that they had, states terminal blocks installed. That was for Unit 1, I believe.

JUDGE MORRIS: Could you give me some idea of how many terminal blocks you are talking about inside containment?

MR. JACOBUS: Yes. There is a listing in I believe in APCo Exhibit 52 that lists each terminal block with the associated instrumentation circuit that it's used in. I think it would be best to refer you to that, if that

is acceptable.

JUDGE MORRIS: That's fine.

It isn't clear what you were implying in your discussion of testing at 137.5 volts as to whether this would have meaning for performance of lesser voltages.

MR. MERRIWEATHER: What I meant by that was I think during the inspection we accepted the qualification for these terminal blocks and those control circuits such as solenoid valves, the limit switches, whatever. We had accepted the qualification. We felt that that document was adequate for those types of circuits.

JUDGE MORRIS: But not for instrumentation circuits?

MR. MERRIWEATHER: But not for instrumentation circuits because of the performance requirements for instrument accuracy.

JUDGE MORRIS: Thank you. I have no further questions.

JUDGE BOLLWERK: I think Judge Carpenter has other questions.

JUDGE CARPENTER: I'd like to follow up on Judge Morris's questions.

Do you have Staff Exhibit 50, Dr. Jacobus?

MR. JACOBUS: Yes. I have it here.

JUDGE CARPENTER: If you would help me with the

legend, please.

MR. JACOBUS: Okay.

JUDGE CARPENTER: The solid blocks are labelled Alabama Power Company data, EB 25 end points. What's EB, please?

MR. JACOBUS: The EB 25s are a type of terminal blocks that were tested in the Sandia tests.

At the meeting in Atlanta APCo used that data to come up with end points through which they drew the straight line that I discussed earlier.

JUDGE CARPENTER: So Alabama Power does not have any original data? This is data from a Sandia report?

MR. JACOBUS: Well, they have their data from the Conax Report on the Connectron blocks.

They also have the data in the GE test reports.

JUDGE CARPENTER: Let's just stay with Staff Exhbiit 50, please.

MR. JACOBUS: Yes, this data was taken from the Sandia test report.

JUDGE CARPENTER: On the right-hand side in the legend, it shows the triangles, this EB 25 complete plot.

MR. JACOBUS: Okay.

JUDGE CARPENTER: Do I read this correctly that the Alabama Power Company data points of which there are two came from the document that has the EB 25 complete plot data

points?

MR. JACOBUS: I am not quite sure I got that question. Could you repeat it, please?

JUDGE CARPENTER: Am I correct in thinking that the Alabama Power Company data labelled EB 25 end points came from the same document as the triangle data points EB 25 complete plot?

MR. JACOBUS: Yes, that's correct.

JUDGE CARPENTER: Why don't the triangle and the box at 345 degrees line up?

MR. JACOBUS: There were actually two peak LOCA temperatures in these tests.

The one that they used was from the, I believe the first peak, because basically what happens is the temperature goes up to 340 degrees and then comes back.

They took the data from that first transient where there was only data from ambient temperature and 340 degrees.

The data I used was from the second transient where in addition to data at the peak temperature there was data throughout the range of temperatures coming back down to essentially ambient temperatures.

JUDGE CARPENTER: So there is a certain amount of hysteresis here depending on the cycle?

MR. JACOBUS: Exactly.

JUDGE CARPENTER: In presenting this data to you and to the NRC, did Alabama Power indicate that they had ignored the data at the intervening temperatures?

MR. JACOBUS: They didn't explicitly state that but of course all they showed was the end point data so all you can assume is that they didn't consider the remaining data.

JUDGE CARPENTER: Did you or anyone at the meeting inquire as to why they hadn't considered the intervening data?

MR. JACOBUS: Well, my best guess is that the intervening data shows that it is not linear and that's not the answer they needed to show.

JUDGE CARPENTER: They were trying to estimate the insulation resistance at some particular temperature.

What was that temperature?

MR. JACOBUS: To the best of my knowledge it was 296 degrees F. They need to show at that temperature that the insulation resistance was above 5 times 10 to the 5th ohms.

JUDGE CARPENTER: Since there is an observation at 300 degrees, why is it necessary to interpolate given the data set?

MR. JACOBUS: That was the question that we wanted to know.

JUDGE CARPENTER: Did you get an answer?

MR. JACOBUS: No. We basically at that meeting we made a rough plot just like this, a handwritten plot that showed this data effectively and at that point everybody left the meeting and it was decided that they were going to replace the terminal blocks because they couldn't show they were qualified.

JUDGE CARPENTER: But just -- they were looking for evidence for what the resistance would be at 295 degrees, and there was an observation at 300 and they ignored it?

MR. JACOBUS: I think you need to ask them that question.

JUDGE CARPENTER: I shall, thank you.

MR. JACOBUS: Thank you.

JUDGE BOLLWERK: Judge Morris, just as a matter of curiosity, you indicated that the terminal blocks had been replaced?

MR. JACOBUS: That is correct, to the best of my knowledge.

JUDGE MORRIS: We will ask the Applicant -- the licensee, I should say.

JUDGE BOLLWERK: I have a couple of questions.

This is by way of explanation as to what's clear in my mind.

Where did the temperature of 300 degrees come from again? You mentioned it started at 300, then 296 you thought, then 150.

Where did the 300 degrees come from?

MR. JACOBUS: It was somewhere in excess of 300 degrees. I believe they had two different temperature profiles that we saw at different times. One was for a combined LOCA HELB, loss of coolant accident, high energy line break.

I believe that one went to somewhere in excess of 350, something like 365.

At another point I saw one that was only for LOCA conditions that I believe was something like 310. That's why I say somewhere in excess of 300 without being totally specific because it's still not clear to me whether they need them for high energy line breaks or LOCAs or both or when, when they need them and when they don't.

JUDGE BOLLWERK: These were shown to you at what point?

MR. JACOBUS: I believe during the initial inspection they showed us the combined profile, which went to 365 degrees.

JUDGE BOLLWERK: What about the second one you mentioned?

WITNESS JACOBUS: I believe I saw that more

recently. Norm thinks that it is in their testimony. I am not sure exactly where I saw it, but I did see a profile that I believed to be LOCA conditions that goes to only approximately 310 degrees.

JUDGE BOLLWERK: But the 365 degree one, your recollection is you didn't see that -- you were shown that during the inspection?

WITNESS JACOBUS: I believe that to be the case.

JUDGE BOLLWERK: Mr. Luehman, I believe I have asked you this question before and I think the answer is fairly clear. But I take it that 84-47 is the basic document on which you relied or clearly known or should have known in this instance?

WITNESS LUEHMAN: That and as Mr. Shemanski said, the NRC's -- maybe warning is too strong -- but their discussion of this issue in their January meeting and also the information notice supported by the actual issuance of the test reports that support that information notice later in 1984.

JUDGE BOLLWERK: I take it looking at it -- Judge Morris, I think, asked a question about the testimony on Page 20 of the Farley Plant records indicate that "terminal blocks were installed prior to November 30, 1985". I take it that that is an important fact because given the enforcement policy, November 30, 1985 is a date on which you

are looking in terms of qualification and equipment.

WITNESS LUEHMAN: That is correct. If there happened to be a case where a licensee had splices in there and then for some reason, you know, went to terminal blocks after they had splices in there, then the equipment could have been qualified before the deadline and unqualified after the deadline, not with specific regard to terminal blocks or instrument circuits like this, but we did have one case of that in the modified policy where a licensee had something where the NRC would have qualified in a particular application and changed it out after the deadline.

JUDGE BOLLWERK: Was that considered a violation of the policy statement?

WITNESS LUEHMAN: No, it was not considered under the modified policy; no, sir.

JUDGE BOLLWERK: And in an instance -- this is just a matter of information -- of taking the flip side, if they had something they later put in and inspected it that was qualified, but prior to 1985 they may have had a piece of equipment you would have considered unqualified but it was no longer there by the time you inspected, did you go back and see on November 30, 1985 what equipment was there?

WITNESS LUEHMAN: I think that the answer to that is that at the time of the inspection, that the inspectors basically -- and I will defer to inspectors for this

particular inspection -- but as a general rule we discussed this in the modified policy meetings -- I mean, in our review panel meetings -- as a general rule inspectors didn't go back and try to track what documents and what the status of the qualification file and exactly what equipment was in the plant at November 30, 1985. Basically, what the inspectors did is they looked at the files the day they got on site, and judged the licensee's qualification and status relative to the modified policy based on those files, unless there was clear evidence that the licensee had, in fact, had different equipment prior to the deadline. In other words, the inspectors did not try to go back and play detective because in very many cases -- for instance, I will give you an example.

The licensees were making -- lots of licensees were enhancing their files after the deadline prior to the inspections. They might have had many revisions to their files. The inspectors simply did not have the time to go back and unless there was an obvious reason to, go back and determine exactly what part of that revision was -- how much of that revision was in there prior to the deadline and how much wasn't. Basically, licensees got the benefit of the doubt with regard to the status of their files unless there was clear information to the contrary, such as the NRC did, if licensee event reports were submitted, notify the

Commission that the licensee had discovered unqualified equipment prior to the deadline, it may have been the case that when we got there for the inspection, that equipment had been changed out. However, the NRC would, because they were on clear notice that the licensee had unqualified equipment at the deadline, look at that type of information if the licensee had been required to report it. But we did not make an effort, I don't think as a general rule inspectors made an effort to try to recover the file status as of the deadline. That was just too difficult of a task.

Q So, if a licensee changed his qualification documentation but didn't tell you that he had done it, as opposed to someone who told you that they did have a problem, he might be penalized; is that it?

WITNESS LUEHMAN: Excuse me?

Q If someone changed out their qualification documentation, but did not tell you that there was a problem, as opposed to another utility which might have come in and said there is a problem here which we are identifying to the NRC, the second utility is going to be penalized rather than the first.

WITNESS LUEHMAN: Well like I said, I think that there is a certain amount of reasonableness that goes into it. I think the answer to that in a particular case may be yes, there may have been individual licensees that radically

changed their documents after the deadline and who were not under any requirements to report to us because of the reporting requirements, and we may not have known that. However, there were other cases where it was clearly evident that either through reports or through complete file reconstruction, that the inspector would have picked up if, in fact, the whole thing had been created after the deadline. And that would not have necessarily been acceptable.

JUDGE BOLLWERK: Did you have any evidence, though, of Alabama Power changing any documents in this instance?

WITNESS LUEh...N: Changing any documents?

JUDGE BOLLWERK: Or updating their file after the deadline? I take it you gave them credit for that.

WITNESS LUEHMAN: I think the answer to that in the Alabama Power case is that they, in fact, were updating their documents and I think at the time of the inspection and we looked at the files that they had, and I don't think that there was any attempt on the part of the inspectors to take those files back to November 30, 1985. We accepted what was in the file as of the date of the inspection; isn't that correct?

WITNESS MERRIWEATHER: That is correct.

JUDGE BOLLWERK: Does everyone agree with that?

WITNESS JACOBUS: That is correct.

JUDGE BOLLWERK: One other question. In terms -- we talked about in terms of documentation being updated, if in a situation where you had your documentation up to date, for instance with the GEMS Level transmitter question, my understanding is that that was a problem with the equipment when you looked at it and not with the documentation; am I correct in that assumption?

WITNESS LUEHMAN: That is correct. If the oil had been to the full level, their documents were satisfactory to qualify it with the oil level full.

JUDGE BOLLWERK: Do you know the status of that piece of equipment, the oil level as of November 30, 1985? Is that a relevant consideration?

WITNESS LUEHMAN: I think it is, but I think that Mr. Levis is the person that inspected that piece of equipment, and my recollection is that he could find no indications that that was not, in fact, the equipment status as of deadline.

I think you would have to ask him that question.

JUDGE BOLLWERK: With respect to the grease problem, is there anything in the record that you're aware of that indicates what the status of the grease in the particular piece of machinery was as of November 30, 1985?

WITNESS LUEHMAN: I think the answer is that --

that -- again, I'd have to defer to the inspectors, but I think that it was a similar -- the similar answer is that -- that we had no indication that it had been changed subsequent to November 30, 1985, and the position the -- the staff has taken is that, absent indication that it was changed after the deadline, licensees shouldn't be rewarded for failure to have adequate documents.

In other words, a licensee that has no documents and therefore can tell us when they did something would get a benefit by not having those documents, whereas a licensee that had documents that indicated that they did something either before or after a fact would then, in fact, receive a potentially increased sanction.

So, I think you'd have to talk to the inspectors involved in those two things as to how they reached those conclusions.

JUDGE BOLLWERK: All right.

I have no further questions. Anybody else have anything?

JUDGE CARPENTER: I might ask one, being lazy.

Dr. Jacobus, can you recall who presented this two-point plot of insulation resistance versus temperature at the meeting?

WITNESS JACOBUS: I'r not absolutely certain, but I believe it was Jesse Love from the licensee.

JUDGE CARPENTER: Thank you. I'll ask him.

WITNESS JACOBUS: I'm not absolutely certain on that point.

JUDGE BOLLWERK: I think there is nothing further for the panel. Then I guess we will excuse this panel of witnesses.

I think, with regard to Mr. Jacobus, Mr. Merriweather, and Mr. Shemanski, you are finished in terms of your direct examination and cross examination. The Board thanks you for your testimony and your service to the Board, and you are subject to recall at any time deemed necessary.

Mr. Luehman, I think we'll be seeing you again.

WITNESS LUEHMAN: Yes, sir.

[Panel excused.]

JUDGE BOLLWERK: Mr. Holler, you have some business to take care of with some exhibits, I think.

MR. HOLLER: Yes, sir.

If I may, at this time, we would like to move that certain exhibits be admitted into evidence: what has been marked for identification as Staff Exhibit No. 47, EQ of Raychem Chico sealant and terminal blocks, a letter from R.P. McDonald to D.M. Verrelli dated January 8, 1988; what has previously been marked as Staff Exhibit No. 48, IE Information Notice No. 84-47, EQ test of electrical terminal blocks dated June 15, 1984; what has previously been marked

for identification as Staff Exhibit No. 49, terminal block insulation versus temperature graph, 11/25, Figure A1-21, page 210, source SNL report SAND 83-1617, undated; what has previously been marked for identification as Staff Exhibit No. 50, insulation resistance versus temperature chart number 1, data based on SAND 83-1617, undated; and what has previously been marked for identification as Staff Exhibit No. 51, insulation resistance versus temperature chart number 2, data based on SAND 83-1617, undated.

At this time, I move that Exhibits 47, 48, 49, 50, and 51 be admitted into evidence.

JUDGE BOLLWERK: Any objection?

MR. REPKA: No objection to any of those.

JUDGE BOLLWERK: Then Staff Exhibits 47, 48, 49, 50, and 51 are received into evidence.

[Staff Exhibit Nos. 47, 48, 49, 50, and 51 were received in evidence.]

JUDGE BOLLWERK: Anything further from either of the parties at this point?

MR. REPKA: Nothing here.

MR. HOLLER: If I may remind the Board of our discussions on Friday, we indicated we would have a starting time of a half-hour later to allow one of our witnesses time to get here.

JUDGE BOLLWERK: Correct.

Yes, Mr. Hancock.

MR. HANCOCK: Just one thing, Judge Bollwerk. The Board had mentioned last week an interest in seeing a 5-to-1 splice. We have two examples that were sent up this weekend, made down at the plant.

The Board has agreed that those are, in fact, 5-to-1 splices. That's as far as they're willing -- excuse me. The staff has agreed that those are, in fact, 5-to-1 splices.

That's as far as they are willing to go, and we will hear some testimony on that when Alabama Power Company puts on its evidence.

JUDGE BOLLWERK: Do either of the parties have any intention to mark these for identification as exhibits or to move them into evidence?

MR. REPKA: Judge Bollwerk, what we propose to do is, when we present our technical panel, the Jones, Love, Sundergill panel, we would like to take each of the demonstrative pieces of evidence, have them explain it, and then, at that time -- I don't think -- will we move them into evidence?

I don't believe -- we're using them for demonstrative purposes, but what we would like the witnesses to do is to explain what they are, what they represent, and do that as an adjunct to our direct case.

MR. MILLER: In some instances, we have a photograph, say, of the ChicoA/Raychem seal or the V-type splices, and it's easier to have something you're holding onto when you describe it, and in that instance, we probably wouldn't want to introduce it.

I don't think we've got a photograph of those, and what we may do is describe it for the record, then take a picture of it, put the picture in the record.

JUDGE BOLLWERK: All right.

MR. MILLER: It would just a burden on the clerk, I think, to start keeping up with all of the --

JUDGE BOLLWERK: We can certainly -- if you think it's necessary, we can mark them and keep them. I mean it's up to you. If not, we'll give them back to you.

MR. MILLER: Well, said that way, Judge, you can keep them. We have others.

JUDGE BOLLWERK: The question is are we going to put them in a file and send them up to White Flint at some point? I don't know if that's necessary for this proceeding or not.

MR. MILLER: If we have the option, then we might as well go ahead and mark them, and we'll do that in our direct case, so it will be an orderly process.

JUDGE BOLLWERK: All right.

JUDGE CARPENTER: Mr. Miller, I would point out

that there is an excellent cross-sectional drawing of this 5-to-1 in whatever number staff's exhibit, Mr. Holler's letter.

Do you happen to recall, Mr. Holler?

MR. HOLLER: Let me double-check that, Judge.

MR. MILLER: Yes, sir.

MR. REPKA: We did discuss that during the testimony on this issue. We're familiar with that.

MR. HOLLER: Just to answer your question, Judge Carpenter, that would be what's been marked and admitted as Staff Exhibit No. 58.

JUDGE CARPENTER: So that, if one were trying to describe the situation, that drawing serves quite well, even better than a photograph.

MR. MILLER: Thank you, sir.

MR. BACHMANN: Your Honor, the staff would, in the future, object to it being admitted into evidence if it were stated or represented that this was a splice exactly the same as in the plant.

The staff is willing to say this is a 5-to-1 splice, and you can look and see that there are five cables going in and that there's tape around them and one coming out.

I have been informed by my people who were actually at the plant and who, unfortunately, are no longer

able to be on the -- be brought up here, that the splices that they saw looked considerably different from these.

So, as a sample of what a general 5-to-1 splice is, we have no objection. We would strenuously object to say that these splices are the way they looked in the plant.

MR. MILLER: That's just makes -- we'll present our description, and we still have an evidentiary point conflict. We'll need to take a ruling.

JUDGE BOLLWERK: All right. One other thing: I'm going to have to do some checking in terms of physical exhibits, but I'm not sure if we're going to need three of these or not. Let me check that out and see. I hope not, put it that way.

Is there anything else that the parties have?

MR. REPKA: Nothing else.

JUDGE BOLLWERK: All right. We stand in recess then until 9:30 tomorrow morning.

[Whereupon at 12:21 p.m. the hearing was recessed, to reconvene the following day, Wednesday, February 19, 1992 at 9:30 a.m.]

REPORTER'S CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission
in the matter of:

NAME OF PROCEEDING: Alabama Power Company

DOCKET NUMBER: 50-348-CivP,
50-364-CivP

PLACE OF PROCEEDING: Bethesda, Maryland

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Lynn Estep

Official Reporter
Ann Riley & Associates, Ltd.