

# ORIGINAL

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

In the matter of:

COMMONWEALTH EDISON COMPANY

(Byron Nuclear Power Station,  
Units 1 & 2)

Docket No. 50-454 OL  
50-455 OL

Location: Rockford, Illinois

Pages: 10,459-10,682

Date: Tuesday, August 21, 1984

*TR-010/1*  
*Orig to E. Pleasant*  
*H-1149*

*Additional 2 copies ASLBP*

**TAYLOE ASSOCIATES**

Court Reporters  
1625 I Street, N.W. Suite 1004  
Washington, D.C. 20006  
(202) 293-3950

B408270025 B40821  
PDR ADOCK 05000454  
T PDR

1bl

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

----- X  
:
In the matter of: :
:
COMMONWEALTH EDISON COMPANY : Docket Nos. 50-454 OL
: 50-455 OL
:
(Byron Nuclear Power Station, :
Units 1 and 2) :
:
----- X

U. S. District Courtroom  
Second Floor  
Federal Building  
211 South Court Street  
Rockford, Illinois

Tuesday, 21 August 1984

The hearing in the above-entitled matter was reconvened, pursuant to recess, at 9:00 a.m.

BEFORE:

IVAN W. SMITH, Chairman  
Atomic Safety & Licensing Board

A. DIXON CALLIHAN, Member  
Atomic Safety & Licensing Board

RICHARD F. COLE, Member  
Atomic Safety & Licensing Board



lb

## 1 APPEARANCES:

## 2 On Behalf of the Applicant:

3 MICHAEL I. MILLER, Esq.  
4 MICHAEL GOLDFEIN, Esq.  
5 MARK FURSE, Esq.  
6 Isham, Lincoln & Beale  
7 Three First National Plaza  
8 Chicago, Illinois 60603

9 JOSEPH GALLO, Esq.  
10 VICTOR G. COPELAND, Esq.  
11 Isham, Lincoln & Beale  
12 1120 Connecticut Avenue, N.W.  
13 Suite 840  
14 Washington, D.C. 20036

## 15 On Behalf of the NRC Staff:

16 STEPHEN LEWIS, Esq.  
17 MICHAEL WILCOVE, Esq.  
18 Office of the Executive Legal Director  
19 U.S. Nuclear Regulatory Commission  
20 Washington, D.C. 20555

21 On Behalf of the Joint Intervenors: DAARE/SAFE and  
22 Rockford League of Women Voters:

23 DOUGLASS CASSEL, JR., Esq.  
24 TIMOTHY WRIGHT, Esq.  
25 HOWARD LEARNER, Esq.  
Business and Professional People for the  
Public Interest  
109 N. Dearborn  
Chicago, Illinois 60602

mm

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25I N D E X

<u>WITNESSES:</u>	<u>BY:</u>	<u>DIRECT</u>	<u>CROSS</u>	<u>BOARD</u>	<u>REDIRECT</u>	<u>RECROSS</u>
(Resumed)						
K. Connaughton	) Mr. Wilcove	10,463				
D.W. Hayes	) Mr. Cassel		10,486			
J. Muffett	) Mr. Miller		10,500			
	Judge Callihan			10,522		
	Mr. Cassel		10,526			
Dev S. Kochhar	Mr. Learner	10,537				
	Mr. Miller		10,539			
	Mr. Learner	10,565				
	Mr. Miller		10,568			
	Mr. Wilcove		10,629			
	Judge Cole			10,631		
	Judge Callihan			10,633		
	Mr. Learner				10,634	
	Mr. Miller					10,635
	Mr. Wilcove					10,638

<u>RECESSES:</u>	<u>Page:</u>
Morning	10,525
Luncheon	10,563
Afternoon	10,628

<u>EXHIBITS:</u>	<u>IDENTIFICATION</u>	<u>EVIDENCE</u>
Staff No. R-1 (Inspection Program)	10,481	10,481
Appl. No. R-2 and R-3	10,609	--

<u>LAY-INS:</u>	<u>Following Page:</u>
NRC Staff Testimony, Re: Equipment Supplied to Byron by SCC.	10,478
Figure 3 to Testimony of Kostal	10,502
Testimony D. S. Kochhar	10,538

syllbl

P R O C E E D I N G S

1  
2 JUDGE SMITH: Ladies and gentlemen, may we proceed?

3 There is an item of unfinished business that I  
4 had overlooked yesterday. And that is I would like to  
5 dispose of the question of the Office of Investigation  
6 report. If you recall, we had deferred to this reopened  
7 session hearing from you, Mr. Cassel, on any requirements  
8 you may have respect to the Office of Investigation report.  
9 Are you prepared to address that matter? Or if you prefer,  
10 we could take it up later.

11 MR. CASSEL: I would prefer we take it up later,  
12 Judge. I don't think -- whatever point, if any, I might  
13 raise would not have an impact on scheduling or calling of  
14 witnesses or anything.

15 JUDGE SMITH: Okay. The next item is the motion  
16 for Dr. Bleuel. We won't be prepared until after the morning  
17 break to discuss completely our ruling on it, because it's  
18 a matter of importance to all parties. But we wish to  
19 announce now, so that you may have the maximum amount of  
20 time for scheduling, that our ruling will be that we accept  
21 no part of Dr. Bleuel's testimony. We will announce our  
22 reasons and we will provide for you to offer his testimony as  
23 a rejected exhibit or as rejected evidence, so you may  
24 preserve your rights.

25 We will take that up after the morning break.

syllb2

1           We will take up a motion with respect to Mr. Stokes  
2 immediately following the noon lunch break.

3           Two members of the Board are prepared for that now,  
4 but I simply am not. I haven't had a chance to pick up on  
5 that.

6           With that, is there any other preliminary business?

7           MR. MILLER: No, sir.

8           MR. WILCOVE: Mr. Chairman, at this point we are  
9 ready to proceed with the Staff testimony on Systems Control  
10 Corporation equipment, and I will ask Mr. Muffett, Mr. Hayes,  
11 Mr. Connaughton to take the stand.

12           Whereupon,

13                                   KEVIN CONNAUGHTON

14                                   D.W. HAYES

15                                   JAMES MUFFETT

16 resumed the stand and, having been previously duly sworn,  
17 were examined and testified further as follows:

18           MR. WILCOVE: Mr. Chairman, all of these witnesses  
19 have been previously sworn in these proceedings.

20                                   DIRECT EXAMINATION

21           BY MR. WILCOVE:

22           Q   Beginning with Mr. Connaughton, would you please  
23 state your name and position with the NRC?

24           A   (Witness Connaughton) My name is Kevin Connaughton.  
25 I work for the Nuclear Regulatory Commission. I am a Resident

syllb3

1 Inspector assigned to Byron.

2 A (Witness Hayes) My name is D.W. Hayes. I am  
3 Project Section Chief for Byron.

4 A (Witness Muffett) James Muffett and I am  
5 Reactor Inspector.

6 Q Mr. Muffett, do you have in front of you the  
7 testimony of the NRC Staff with respect to equipment supplied  
8 to Byron by Systems Control Corporation?

9 A Yes.

10 Q Within this document there are answers to questions  
11 which are designated by your name. Did you prepare those  
12 answers?

13 A Yes.

14 Q Within this document, there are answers to questions  
15 designated by the term "panel." Did you prepare those  
16 answers in conjunction with the other members of the panel?

17 A Yes.

18 Q Do you have any changes or corrections that you  
19 wish to make to your testimony?

20 A At page 10 --

21 JUDGE SMITH: Let's follow our previous practice  
22 and go off the record for these changes. Will they be on the  
23 copy put in?

24 MR. WILCOVE: Mr. Chairman, they are on the copy  
25 I gave to the reporter yesterday.



syllb4

1 JUDGE SMITH: All right. Let's just go off the  
2 record.

3 (Discussion off the record.)

4 JUDGE SMITH: Back on the record.

5 BY MR. WILCOVE:

6 Q Mr. Muffett, with the changes that have been  
7 noted off the record and are included on the copy that has  
8 been given to the court reporter, is the testimony which you  
9 are sponsoring true and complete to the best of your knowledge  
10 and belief?

11 A (Witness Muffett) Yes.

12 Q Turning to you, Mr. Hayes, do you have in front of  
13 you a copy of the testimony of the NRC Staff with respect to  
14 equipment supplied to Byron by Systems Control Corporation?

15 A (Witness Hayes) Yes, I do.

16 Q And within this document there are answers with  
17 your name designated in front of those answers. Did you prepare  
18 those answers?

19 A Yes, I did.

20 Q There are also answers designated by the term  
21 "panel." Did you prepare those answers in conjunction with  
22 the other members of the panel?

23 A Yes, I did.

24 Q Do you have any changes you wish to make to your  
25 testimony?

syllb5

1 A No, I don't.

2 Q Is the testimony which you are sponsoring true and  
3 complete to the best of your knowledge and belief?

4 A Yes, it is.

5 Q Turning to Mr. Connaughton, now. Do you have  
6 in front of you a copy of the testimony of the NRC Staff,  
7 with respect to equipment supplied to Byron by Systems  
8 Control Corporation?

9 A (Witness Connaughton) Yes, I do.

10 Q And again, certain answers bear your name. Did  
11 you prepare the answers to those questions?

12 A Yes, I did.

13 Q Certain answers bear the term "panel." Did you  
14 prepare the answers to those questions, in conjunction with  
15 the other members of the panel?

16 A Yes, I did.

17 Q Do you have any changes you wish to make to your  
18 testimony?

19 A No, I do not.

20 Q Is the testimony which you are sponsoring true and  
21 complete to the best of your knowledge and belief?

22 A Yes, it is.

23 MR. WILCOVE: Mr. Chairman, I know offer into  
24 evidence the testimony of the NRC Staff with respect to  
25 equipment supplied to Byron by Systems Control Corporation and

syllb6

1 ask that it be bound into the record as if read.

2 JUDGE SMITH: Are there any objections?

3 MR. CASSEL: No objection, Judge.

4 MR. MILLER: Judge Smith, on behalf of the  
5 Applicant, we do have an objection to question and answers  
6 12 and 13, which are found at pages 7 and 8 of the prepared  
7 testimony. These two questions and answers deal with  
8 the procurement practices of Commonwealth Edison Company  
9 with respect to Systems Control Corporation components and  
10 equipment.

11 Our objection is that the questions and answers  
12 go beyond the scope of this reopened hearing. In its order  
13 remanding the record to the Licensing Board, the Appeal  
14 Board referred to certain serious quality assurance failures  
15 at Systems Control and referred to the discussion of those  
16 quality assurance failures by the Licensing Board, in its  
17 initial decision.

18 The Appeal Board went on to note that this Board,  
19 the Licensing Board, apparently proceeded on the assumption  
20 that all Systems Control material already shipped to Byron  
21 were to be reinspected and the Appeal Board then went on to  
22 refer to a letter that I sent to it, and a further letter that  
23 Staff counsel sent to the Appeal Board, indicating that  
24 the representations that were contained in the letter on which  
25 the Licensing Board apparently relied in making its assumption

syllb7

1 about the status of the reinspections were not correct.

2           The Appeal Board went on to note that there was  
3 a possibility that certain pieces of equipment, supplied  
4 by Systems Control, had not been reinspected and raised  
5 certain questions about the status of the equipment. And  
6 concluded, at page 32 of ALAB 770 that this matter, meaning  
7 the quality of the Systems Control equipment, also warrants  
8 explanation on the evidentiary record.

9           There is nothing in the Appeal Board's order, nor  
10 is there anything in this Board's memorandum and order  
11 following prehearing conference of June 8, 1984, which deals  
12 with procurement practices of Commonwealth Edison Company  
13 with respect to Systems Control Corporation.

14           These issues, with respect to procurement, are the  
15 subject of an Inspection Report that was issued by Region III  
16 and the Company has not yet responded to it.

17  
18  
19  
20  
21  
22  
23  
24  
25  
endl

1           It seems to me that this question of procurement  
2 practices, while it was addressed in the Initial Decision  
3 of this Board, was not one of the key factors in your  
4 decision. Nor would it be of any assistance, really, to  
5 the Board to have an evidentiary presentation on the record  
6 with respect to what the status of the procurement of this  
7 material was at various stages in time.

8           As you know, Commonwealth Edison Company has not  
9 addressed this procurement issue in its testimony with  
10 respect to Systems Control Corporation. I believe it's  
11 irrelevant to any of the issues that are on remand, and ask  
12 that Questions 12 and 13 and their answers be stricken.

13           MR. WILCOVE: Mr. Chairman, if I could respond  
14 briefly and make a few points. The first point is that  
15 we think that the new information that the Staff has uncovered  
16 with respect to procurement practices with respect to  
17 Systems Control Corporation is actually part of the new  
18 information that we have recently acquired with respect to  
19 Systems Control Corporation. We think it falls within that  
20 category, and for that reason, the Board should consider it.

21           Number two, I have never read the Appeal Board  
22 decision as putting any sort of blinders on the licensing  
23 board in that the quality of the hardware should be litigated  
24 strictly divorced from any question or any testimony about  
25 the quality assurance practices with respect to either



1 Systems Control Corporation itself or CECO's oversight of  
2 Systems Control Corporation.

3 I think it's very difficult to divorce those  
4 matters completely and it should not be done considering  
5 that there has been a general contention about quality  
6 assurance at Byron.

7 Further, I would note that there's also a  
8 footnote, I think it's 72, that's been referred to over and  
9 over again, which gives the licensing board discretion to  
10 hear other matters not necessarily within the specific scope  
11 of what the appeal board delineated.

12 So even if this matter were not within the specific  
13 scope of what the appeal board delineated -- and I think  
14 it is -- I think that the licensing board should receive  
15 the testimony, and I don't think the licensing board should  
16 necessarily let stand a finding that the Staff believes  
17 needs to be qualified rather seriously.

18 For those reasons, I think that that testimony  
19 should stand.

20 And also, I think the fact that CECO has not yet  
21 responded to the Inspection Report is not necessarily a  
22 matter that the licensing board need consider. Mr. Miller  
23 is perfectly free to cross examine the panel if he wishes  
24 on the matter, and the fact that they haven't submitted a  
25 certain piece of paper that says, here's our response, is

1 just not a matter that I think the Board need consider.

2 MR. CASSEL: One additional point, Judge, if  
3 Mr. Wilcove is finished. Intervenors concur in Mr. Wilcove's  
4 comments, and I might also point out that when Mr. Marcus  
5 was on the stand toward the close of the last hearing, I  
6 think perhaps Mr. Miller may have left at that point. I did  
7 cross examine Edison's witness, Mr. Marcus, on this point.  
8 I would have to go back and pull the specific Q and A from  
9 the transcript, but there is already testimony on the record  
10 from an Edison witness addressing the issue of the procurement  
11 practices at the prior hearing.

12 So for that additional reason, the issues are  
13 already in the case, and they ought to be developed fully  
14 enough for the Board to have an understanding of it because  
15 it relates, I think, primarily to Edison's oversight of  
16 contractors and its own QA practices, as Mr. Wilcove  
17 pointed out.

18 MR. MILLER: Excuse me, Judge Smith. It's clear  
19 to me that what this relates to is Commonwealth Edison's  
20 procurement practices, not quality assurance practices.  
21 And that is certainly a matter that is divorced from  
22 certainly the mainstream of this hearing.

23 If the point of this testimony was to serve as  
24 notification to the Board with respect to the Staff position  
25 on a certain matter, that's fine. I have no objection to its

1 standing for that limited purpose.

2 What I'm trying to avoid is the necessity to  
3 offer rebuttal evidence and proposed findings and so on on  
4 a matter that I believe is just tangential to what the  
5 main thrust of the evidentiary presentations by all parties  
6 have been on the Systems Control issue.

end 2

7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

mm31b1

1           JUDGE SMITH: I am somewhat confused as to why  
2 everyone discussing speaks of procurement practices. I  
3 agree that Commonwealth Edison procurement practices, as such,  
4 were not anticipated in the remand order, nor were they a  
5 part of our decision -- material part of our initial decision.  
6 But the fact of procurement, after what we found to be a  
7 cutoff date, seems to me to be related to the deficiency  
8 that we expressed concern about in the Quality Assurance  
9 program with respect to Systems Control.

10           That is, we found as stated by the Staff that  
11 Systems Control was barred from procurement activity on  
12 safety related purchases indefinitely.

13           So that bounds the problem of Systems Control. From  
14 that point on it would not be a problem. The fact is, however,  
15 procurement continued. So the efficacy of the Quality  
16 Assurance program, with respect to Systems Control, followed  
17 necessarily the procurement.

18           I agree that the Appeal Board did not specifically  
19 put that in there, but they also informed us that we should  
20 revisit our initial decision, not only make a supplemental  
21 initial decision, but cure errors in it. Now I don't believe  
22 this is a real big deal here. I agree that we are not making  
23 an inquiry into procurement practices, but I don't think anybody  
24 has explained how we can cut off procurement from the Quality  
25 Assurance issue.

mm31b2

1 Do you want to address that?

2 MR. MILLER: Yes, sir. I'd be happy to.

3 I think the statement is actually the two words,  
4 procurement activity, that are found in the Board's finding  
5 are taken from the representations in the Commonwealth Edison  
6 letter that responded to the NRC's Inspection Report in  
7 1980. And the question is, what does procurement activity  
8 mean?

9 Does it mean that, as of that date, there would  
10 be no more Systems Control material accepted at Commonwealth  
11 Edison? Does it mean that there would be no change orders  
12 issued? Does it mean that as design changes occurred at the  
13 Byron Station that there would not be additional quantities  
14 of material that conformed to that already in the plant,  
15 ordered from Systems Control?

16 Or did it mean that in terms of new purchase orders  
17 and significant procurement -- see I'm using the word, too,  
18 significant procurement activity -- that they would not  
19 be considered?

20 And the reason that I am objecting to this is  
21 the Company recognizes that, in terms of the commitment with  
22 respect to source inspections, which was found in its  
23 January 26th, 1981 letter, that its performance was not what  
24 it said it was going to be. That is that for an 11 month  
25 period there were some shipments of Systems Control material



1 that were not source inspected. :

2 And that's what we have addressed, because that  
3 goes directly to quality of the Systems Control equipment  
4 installed at the plant. The question of what it was that  
5 Commonwealth Edison Company purchased, by way of change  
6 order or otherwise, from Systems Control, as I say, just  
7 seems to me to be tangential.

8 JUDGE SMITH: Okay, that may be. I don't see how  
9 that is important in the context of the case, whether by  
10 change order or by letter. It was a fulfillment of  
11 previously placed orders that continued to come, or whatever.

12 But I still don't see how it even rises as an  
13 issue. I mean, I don't see how we have an issue either before  
14 us, if we're going to have testimony that equipment whenever  
15 purchased comes with it Quality Assurance, that's the issue.  
16 And when it was purchased, whether we were wrong or correct  
17 in that finding, is not important.

18 MR. MILLER: I couldn't agree more, Judge Smith.  
19 We have differentiated, in our analysis of the quality  
20 Systems Control equipment, as to whether it was equipment  
21 procured in 1977 or whether it was procured in 1981.

22 I agree with you, it is simply not important as  
23 to what our procurement practices were, as to whether or not  
24 the equipment is safe. Indeed, that's the basis for my motion.

25 JUDGE SMITH: I think that, having discussed the

mm31b4

1 reasons why we are looking at the matter, and not only what  
2 we intended but what the relevance was in our initial decision,  
3 I think it should remain, but for the purposes we have  
4 discussed, to demonstrate what the realities were of the  
5 purchasing and the attempt at quality assurance, as  
6 contrasted to the actual mechanism of purchasing, which I  
7 don't see is really before us.

8 MR. WILCOVE: Staff is completely in agreement  
9 with this scope -- the intent of that testimony, and that  
10 is how we view its scope.

11 JUDGE SMITH: Well, I guess, in a sense, it's  
12 overruling your objection, but not entirely. I think we  
13 will struck understanding as to what the issue is before us  
14 today and what it is not.

15 MR. MILLER: Thank you.

16 JUDGE SMITH: Mr. Cassel, will you have a comment?

17 MR. CASSEL: I'm not sure I understand what our  
18 understanding is. Are you saying the testimony is being  
19 admitted for the limited purpose of clarifying what is  
20 apparently an inaccurate statement in the Board's initial  
21 decision, based on an Edison document which was either  
22 ambiguous or inaccurate, depending on what it meant?

23 JUDGE SMITH: Well, we made a finding, the only  
24 relevance of which, in our initial decision -- we made a  
25 finding that new purchases from Systems Control, new purchases,

mm31b5

1 had been discontinued, new purchases. We were aware that the  
2 word "new" was in there and that did not foreclose continued  
3 shipments and acceptance and payment and everything else.  
4 Nor did we even consider, even think about, change orders  
5 or anything else. That was just not our part that we  
6 believed to be relevant to seeing the end of any quality  
7 assurance problem with respect to Systems Control.

8           It was not, in our view, relevant to a purchasing  
9 method or purchasing practices. There was no litigation of  
10 that. There is no consideration of that. It was only  
11 relevant to the fact that there was some bounding, imprecise  
12 perhaps and not clear, but some bounding of the Systems  
13 Control problem.

14           The fact is, purchases continued. And to the extent  
15 that they continued, we will follow them, as we agreed, for  
16 the quality assurance issue, only as a quality assurance issue.

17           With that, then, your objection is either overruled  
18 or satisfied.

19           MR. MILLER: Thank you.

end 3

20  
21  
22  
23  
24  
25

T4 mml

MM

1 MR. WILCOVE: Mr. Chairman, is the testimony  
2 now received into evidence?

3 JUDGE SMITH: Yes, if there are no further  
4 objections.

5 MR. MILLER: I have no further objections.

6 JUDGE SMITH: All right.

7 (Testimony follows)

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

August 13, 1984

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
COMMONWEALTH EDISON COMPANY	)	Docket Nos. 50-454
(Byron Station, Units 1 and 2)	)	50-455

SUMMARY OF "TESTIMONY OF NRC STAFF  
WITH RESPECT TO EQUIPMENT SUPPLIED  
TO BYRON BY SYSTEMS CONTROL CORPORATION"

This testimony discusses (1) information acquired since August 1983 regarding corrective actions taken with respect to equipment supplied to Byron by Systems Control Corporation (SCC) and (2) steps taken to establish the adequacy of that equipment. It makes the following principal points:

1. In the course of inspections undertaken since August 1983, the Staff became aware of uncorrected weld discrepancies on equipment supplied by SCC.
2. In a letter from Cordell Reed to James Keppler, dated January 26, 1981, Commonwealth Edison Company (CECo) stated that Pittsburgh Testing Laboratory had been and was continuing to source inspect SCC equipment. However, the extent of those source inspections was less than what was stated in the January 26, 1981 letter.
3. While CECo did not issue new purchase orders for SCC equipment after January 1978, it has procured additional items from SCC by adding safety related items to purchase orders via change orders.
4. Due to the discovery of the uncorrected weld discrepancies, CECo has undertaken steps to establish the adequacy of the equipment supplied by SCC.



5. The Staff has reviewed and found acceptable the steps taken by CECo to establish the adequacy of main control boards, DC fuse panels local instrument racks and <sup>solid</sup>~~solid~~ bottom cable tray fittings. With two reservations identified in the testimony, the Staff has reviewed and found acceptable the steps taken to establish the adequacy of solid bottom cable trays and ladder type cable trays and fittings. The Staff expects that CECo will have satisfied these reservations by August 20, 1984. The Staff has reviewed analyses undertaken for CECo to determine the adequacy of cable pan hangers and has caused CECo to undertake additional inspections. During the course of these inspections, CECo discovered missing welds in two highly-stressed connections. CECo has orally committed to an expanded inspection to resolve the concern raised in these inspections. Subject to its review of the documentation of the commitment, the Staff believes the expanded inspection will determine the adequacy of cable pan hangers.

August 13, 1984

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of )  
COMMONWEALTH EDISON COMPANY ) Docket Nos. 50-454  
(Byron Station, Units 1 and 2) ) 50-455

TESTIMONY OF NRC STAFF WITH RESPECT TO EQUIPMENT  
SUPPLIED TO BYRON BY SYSTEMS CONTROL CORPORATION

Q1. Please state your names and positions with the NRC.

A1. (Mr. Hayes) My name is D. W. Hayes. I am Chief of a Reactor  
Projects Section in Region III.

(Mr. Connaughton) My name is K. A. Connaughton. I am a Resident  
Inspector (reporting to the Senior Resident Inspector) at the Byron  
Station.

(Mr. Muffett) My name is James Muffett. I am a Reactor Inspector in  
the Division of Reactor Safety, NRC Region III.

Q2. Have your professional qualifications previously been submitted in  
this proceeding?

A2. (Mr. Hayes) Yes. A copy of my professional qualifications is  
attached to the "Testimony of NRC Staff on Allegations Resolved (In

Part or In Whole) by the Reinspection Program or Otherwise Relevant to the Reinspection Program," filed on July 2, 1984.

(Mr. Connaughton and Mr. Muffett) Yes. Copies of our professional qualifications are attached to the "Testimony of NRC Staff on Remanded Issues With Respect to the Reinspection Program," filed on July 2, 1984.

Q3. What is the purpose of this testimony?

A3. (Panel) During inspections conducted since the close of the licensing hearings in August 1983, the staff became aware of uncorrected weld deficiencies on equipment supplied by SCC. This testimony discusses information acquired since the close of the licensing hearings in August 1983 regarding the extent of corrective actions taken relating to Systems Control Corporation (SCC) equipment and presents the Staff position on the adequacy of the equipment.

In Attachment A to its letter from Cordell Reed to James G. Keppler dated January 26, 1981 (attached), the Applicant stated that (1) for SCC equipment, source inspections had been conducted for all safety related equipment shipped since February 1980 and that source inspections would be conducted on all future shipments of SCC work and (2) with respect to SCC work shipped from May 1977 to February 1980, in each case of deviation from specified technical requirements, items of nonconformance had been identified and

documented on nonconformance reports. In view of these statements, the Staff did not expect to find uncorrected weld deficiencies.

- Q4. Briefly state what actions were taken as a result of the Staff becoming aware of the uncorrected weld discrepancies mentioned in the response to the previous question.
- A4. (Panel) Because of these findings, the Staff conducted a special inspection that focused on CECO's corrective actions relating to all identified deficiencies with SCC equipment, including those corrective actions described in the January 26, 1981 response. Details and findings of this inspection were documented in NRC Inspection Report Nos. 50-454/84-32, 50-455/84-25. As a result of the Staff findings from this inspection, the Applicant has recently initiated further efforts to establish the acceptability of equipment supplied by SCC. These efforts are described in the testimony of Kenneth T. Kostal, following Tr. 10159, and the testimony of Bradley F. Maurer, following Tr. 10158. The Staff has also requested and received additional information from the Applicant in the course of the Staff's inspection effort.
- Q5. Please describe the scope-of-work/equipment supplied by Systems Control Corporation.
- A5. (Panel) SCC was a supplier of both safety-related and non safety-related electrical, instrumentation, and control components. More specifically, SCC supplied electrical cable trays and associated fittings, cable tray hangers (supports), local instrument panels

(racks), portions of the main control boards, and certain vertical panels. SCC procured materials for cable trays, fittings and hangers and fabricated these items. For local instrument panels, main control boards and vertical panels, SCC procured materials, designed and/or fabricated the structures and installed appurtenant electrical, mechanical, instrument, and control components manufactured by others (e.g., valve manufacturers, instrument manufacturers). The scope of SCC work was defined by Sargent and Lundy engineering specifications F/L 2815 for cable trays, fittings and cable tray hangers, F/L 2809 for local instrument panels (racks), and F/L 2788 for the main control boards and vertical panels.

Q6. Did the Applicant establish, in February 1980, an independent inspection program for equipment supplied by SCC?

A6. (Mr. Hayes and Mr. Connaughton) Yes.

Q7. Why was it necessary to establish that program?

A7. (Mr. Hayes and Mr. Connaughton) SCC began shipping safety-related local instrument panels to Byron in December 1979. On February 11, 1980, Region III received an anonymous allegation that welding on local instrument panels supplied by SCC did not conform to engineering specifications. As a result of discussions between Region III and the Applicant concerning this matter, the Applicant's Byron site QA organization conducted surveillance inspections of local instrument panels on February 14, 1980 and determined that the



majority of welds inspected were deficient. On February 15, 1980 the Applicant issued CECO Nonconformance Report (NCR) No. F-474 which identified a generic problem with welds on local instrument panels supplied by SCC. To resolve this generic problem the Applicant established a program of independent inspection of local instrument panels.

Q8. What was involved in the independent inspection program, in terms of (1) the equipment shipped prior to initiation of the program, and (2) the equipment shipped subsequent to initiation of the program?

A8. (Mr. Hayes and Mr. Connaughton) The independent inspection program which began on February 15, 1980 required the inspection of all safety-related local instrument panels supplied to Byron by SCC. Local instrument panels shipped prior to that date were inspected at Byron by Pittsburgh Testing Laboratory (PTL) and either repaired and reinspected onsite or sent back to SCC for repairs. Local instrument panels initially shipped from SCC after February 15, 1980 were inspected by PTL prior to shipment. Local instrument panels being reshipped from SCC (following repair) after February 15, 1980 were also inspected by PTL prior to shipment. Ultimately, all safety-related local instrument panels were independently inspected by PTL and accepted.

Q9. Was this independent inspection program as described in the Applicant's January 26, 1981 response to item of noncompliance (50-454/80-04-01; 50-455/80-04-01)?

A9. (Mr. Hayes and Mr. Connaughton) No. The response letter stated that all safety-related equipment shipped from SCC since February 1980 had been inspected by PTL inspectors at SCC prior to shipment (i.e., source inspected). During the special inspection referred to previously, the staff learned that the only items subject to 100% source inspection from February 1980 to January 26, 1981 were safety-related local instrument panels. Other safety related equipment shipped to Byron during that period (i.e., one hanger, numerous cable pans and fittings, two sections of the Byron Unit 2 main control board (MCB) and four DC fuse panels) were not source inspected. However, the MCB sections and DC fuse panels were inspected at the Byron site.

The Applicant's January 26, 1981 response letter also stated that all future shipments of safety-related equipment would be subject to source inspection. Source inspections were performed on at least a sample of each SCC shipment subsequent to January 26, 1981.

Q10. Was PTL responsible for the failure to conduct inspections in accordance with the January 26, 1981 response letter?

A10. (Mr. Hayes and Mr. Connaughton) No. PTL did as directed by the Applicant.

Q11. Please summarize which safety related equipment supplied by SCC was subject to inspections by anyone other than SCC personnel and which equipment was not subject to such inspections.

A11. (Mr. Hayes and Mr. Connaughton) All local instrument panels were inspected by PTL.

All main control boards and vertical panels were inspected by Sargent and Lundy and partially inspected by Westinghouse. The results of these inspections were analyzed by Westinghouse or Sargent & Lundy.

A number of cable pans, fittings and hangers were inspected by Peabody Testing Services, Industrial Contract Services, the Applicant's quality assurance personnel, Hatfield Electric Company, Sargent and Lundy and PTL.

An undetermined number of cable pans, fittings and hangers have not been inspected by personnel other than SCC inspectors.

Q12. Finding D-105 of the Licensing Board's Initial Decision states as follows: "Applicant discontinued new purchases from SCC in January 1978. As a result of Region III's findings, Systems Control has been barred from procurement activity on safety-related purchases indefinitely." Commonwealth Edison Company (Byron Nuclear Power Station, Units 1 and 2), LBP-84-2, 19 NRC 36, 133-134 (1984). Do you believe that this finding needs to be qualified?

A12. (Mr. Connaughton) Yes.

Q13. In what way do you believe Finding D-105 needs to be qualified?

A13. (Mr. Connaughton) As discussed in Inspection Report 50-454/84-32; 50-455/84-25, CECo did not issue new purchase orders after January 1978. However, from January 1978 through May 1984 CECo did procure additional items from SCC by adding safety-related items to existing purchase orders via change orders. In particular, change orders were utilized either to increase the quantities of previously specified items or to add item types which had been specified in amendments to existing engineering specifications for which SCC had previously been awarded bids.

Q14. What has the Staff determined to be required in order to provide reasonable assurance of safety with respect to SCC supplied equipment?

A14. (Panel) SCC supplied equipment was the subject of a number of Nonconformance Reports (NCRs). These NCRs, including several issued in late 1983 and early 1984, lead us to believe that the SCC QC inspections as well as licensee corrective actions had not been effective. Due to these NCRs, the Staff formulated a position that CECo had to demonstrate that all SCC supplied equipment in the as-built condition is able to withstand as-built loads while conforming to applicable codes.

Q15. What steps has the Staff taken to determine the acceptability of the Main Control Boards?

A15. (Mr. Muffett) I reviewed the Westinghouse analysis of this equipment as described in testimony of Bradley Maurer. This analysis includes a Finite Element Analysis of the equipment, and an engineering evaluation of the welds.

Furthermore, Sargent & Lundy submitted comments to Westinghouse. Those comments generally concerned details of the analytical methodology used by Westinghouse. I have reviewed the Sargent & Lundy comments and Westinghouse replies and found the comments valid and the replies acceptable.

Q16. What are the results of this analysis?

A16. (Mr. Muffett) This analysis demonstrates that the stresses in the members and the stresses in the welds are within the code allowables. (As used in this testimony, "code" refers to either the American Institute of Steel Construction (AISC) or the American Iron and Steel Institute (AISI) codes, as applicable.) Accordingly, the equipment is acceptable.

Q17. What steps has the Staff taken to determine the acceptability of the DC fuse panels (1DC10J, 1DC11J, 2DC10J and 2DC11J)?

A17. (Mr. Muffett) I have reviewed a number of documents relating to the four fuse panels. They include the Sargent & Lundy seismic qualification of DC fuse panels, weld maps of the DC fuse panels, static and dynamic analyses and the weld evaluation of DC fuse panel 2DC10J, and Wyle seismic test report of DC fuse panel 1DC10J.



Q18. Were any welding discrepancies on the DC fuse panels discovered in inspections subsequent to SCC QC inspection?

A18. (Mr. Muffett) Yes.

Q19. What is the nature of discrepancies on the DC fuse panels?

A19. (Mr. Muffett) Discrepancies on the four DC fuse panels included lack of fusion, craters, undercut, porosity, underrun, and underlength. Also, missing stitch welds were identified between the end weld connections on one diagonal brace of one panel (2DC10J).

Q20. How were the DC fuse panels originally evaluated?

A20. (Mr. Muffett) The DC fuse panels were originally evaluated using a dynamic test performed by Wyle Labs on panel 1DC10J.

Q21. After the weld discrepancies discussed in Answer <sup>19</sup> ~~17~~ were discovered, what steps were taken to determine whether the dynamic test of panel 1DC10J remained valid to demonstrate the structural adequacy of the remaining panels?

(Mr. Muffett) A21. The discrepancies on all four panels were evaluated. For two of the panels it was determined that the original Wyle dynamic test remained valid. I agree with this conclusion. However, the deficiencies on panel 2DC10J were such that the original Wyle dynamic test of panel 1DC10J <sup>was</sup> ~~were~~ not valid for panel 2DC10J. Therefore, a detailed engineering analysis of panel 2DC10J was performed.

Q22. What are the results of this analysis of panel 2DC10J?

A22. (Mr. Muffett) All stresses in the members and in the welds are within code allowables. The highest stress in a weld (in the center cross brace area) is only 38% of the code allowable. Therefore, the structural adequacy of the DC fuse panels has been demonstrated.

Q23. What steps has the Staff taken to determine the acceptability of local instrument racks?

A23. (Mr. Muffett) I have reviewed a number of documents relating to the local instrument racks. These documents include "Evaluation of 17 Local Instrument Panels Inspected by S&L," "Determination of Total Weld Length, Area, and Discrepancies for SCC Panels 1PL54J, 1PL71J, 1PL78JA, 1PL60JA," "Seismic Qualification of Local Instrument Panels" and Wyle Laboratories "Seismic Qualification Test Report of a Local Instrument Rack."

Q24. Were any welding discrepancies discovered in inspections of local instrument panels subsequent to the SCC QC inspection?

A24. (Mr. Muffett) Yes.

Q25. What were the nature of these discrepancies?

A25. (Mr. Muffett) The welding discrepancies discovered included overlap, craters, undercut, arc strikes and under length. No missing welds or cracked welds were discovered.

Q26. How was the structural adequacy of the local instrument racks demonstrated?

A26. (Mr. Muffett) Two methods were employed to demonstrate the adequacy of the racks.

The first was to compare the "as-built" conditions of the racks with the two racks which had been dynamically tested by Kyle Laboratories and demonstrate their equivalence. The second method was to develop a detailed computer model of an eight foot rack and utilize the finite element method to determine forces, moments and stresses in the members and the welded connections.

Q27. What were the results of these two methods?

(Mr. Muffett) A27. The first method demonstrated that the panels were dynamically equivalent (based on total effective weld). The second method showed that the most highly stressed connection was stressed to 10% of code allowable. When the greatest strength reduction from a discrepancy found anywhere on these racks is applied to the most highly stressed weld, a factor of safety of approximately 8 relative to the code still exists. Therefore the structural adequacy of the local instrument racks has been demonstrated by both of these methods.

Q28. What steps has the Staff taken to determine the acceptability of the ladder trays and fittings?

A28. (Mr. Muffett) I reviewed Sargent & Lundy Calculation (12.2.140 Revision 0 and Revision 1) "Ladder Type Cable Tray Weldment Evaluation."

Q29. Were any welding discrepancies discovered in inspections of ladder trays and fittings subsequent to SCC QC inspection?

A29. (Mr. Muffett) Yes.

Q30. What is the nature of these discrepancies?

A30. (Mr. Muffett) These discrepancies include lack of fusion, craters, underlength, and overlap.

Q31. How was the structural adequacy of ladder trays and fittings demonstrated?

A31. (Mr. Muffett) Detailed engineering evaluations were performed using weld maps of the individual connections from a sample of the populations of ladder trays and fittings.

Q32. What were the results of this analysis?

A32. (Mr. Muffett) The conclusions drawn by S&L in this analysis were that: (1) the worst strength reduction found in the sample of straight ladder trays could be applied to any connection on the straight ladder trays and the trays would still meet code allowables with respect to the design load; (2) the worst strength reduction found in the sample of ladder fittings could be applied to any

connection on any ladder fitting and the fitting would still meet code allowables with respect to design load.

Q33. Do you agree with these conclusions?

A33. (Mr. Muffett) Generally, yes. However, I have one reservation.

Q34. What is this reservation?

A34. (Mr. Muffett) In some instances the pipe rung of a ladder tee or cross intersects the side channel at an angle of 45°. I believe that the S&L method for determining the strength of this connection should be refined to take into account the reduction in effective throat at the 45° intersection.

S&L has been notified of this concern and is presently recalculating the strength of these connections. I anticipate that the reanalysis will be reviewed by the Staff by August 20, 1984.

Q35. What steps has the Staff taken to determine the acceptability of the solid bottom cable trays and fittings?

A35. (Mr. Muffett) I reviewed two documents concerning the cable trays and fittings. These documents are S&L calculation (8.20.1-3) "Effect of Missing Stiffener on Cable Tray Design" and S&L calculation (12.2.139) "Cable Tray Fittings."

Q36. Were any welding discrepancies discovered in inspections subsequent to SCC QC inspections?



A36. (Mr. Muffett) Yes.

Q37. What were the nature of the welding discrepancies?

A37. (Mr. Muffett) The welding discrepancies included lack of fusion, undersize, craters, undercut, porosity, and small cracks (less than  $\frac{1}{4}$ " long).

Q38. How was the structural adequacy of the cable trays and fittings demonstrated?

A38. (Mr. Muffett) The question of the structural adequacy of cable tray stiffeners is addressed by S&L calculation "Effect of Missing Stiffener on Cable Tray Design." The questions regarding the structural adequacy of cable tray fittings are addressed in S&L calculation "Cable Tray Fittings."

Q39. Are any conclusions drawn by these reports?

A39. (Mr. Muffett) Yes, the first conclusion is that the cable pan stiffeners are not required to carry the design loads. The second is that, with one qualification, fitting welds are not required to carry the design loads. The qualification pertains to 90° fittings. On the outside of those fittings only two load paths exist; the fitting weld and the fitting stiffener weld. Therefore, if either weld is missing or otherwise incapable of carrying the requisite load (i.e., cracked) the other weld must be capable of doing so. To provide assurance that there is no 90° fitting with two inoperative

load paths, all 90° fittings are being inspected for missing or cracked fitting welds.

Q40. Do you agree with these conclusions?

A40. (Mr. Muffett) In general yes. However, I have one reservation.

Q41. What is your reservation?

A41. (Mr. Muffett) In the calculation "Effect of Missing Stiffener on Cable Tray Design" the methodology of combining seismic response does not adhere to the methodology to which the Byron plant is committed pursuant to its FSAR. S&L has been notified of this concern and at the present time is performing a re-analysis using the combination methodology to which the Byron plant is committed. I anticipate that the reanalysis will be reviewed by the Staff by August 20, 1984.

Q42. What steps has the Staff taken to determine the acceptability of the cable pan hangers?

A42. (Mr. Muffett) I reviewed S&L calculation (19.1.6) "Hatfield and SCC Weld Discrepancies."

Q43. Were any discrepancies discovered in inspections of cable pan hangers subsequent to SCC QC inspections?

A43. (Mr. Muffett) Yes.

Q44. What were the nature of these discrepancies?

A44. (Mr. Muffett) The discrepancies included underlength, undersize, overlap, undercut, craters, and two connections with missing portions of welds. No cracks were present in the sample of welds inspected.

Q45. How was the structural adequacy of the cable pan hangers demonstrated?

A45. (Mr. Muffett) A random sample of 80 hangers was inspected and found to have 107 discrepant welds. Each of these discrepant welds was subjected to a detailed engineering evaluation. None of these connections exceeded code allowables. Nevertheless some large strength reductions were apparent. Based on the largest strength reduction (53%) observed in this sample an additional inspection was required. This inspection inspected 100% of the connections which could not withstand this strength reduction.

Q46. What are the results of this inspection and the Applicant's evaluation of the results?

A46 (Mr. Muffett) The additional inspection identified two connections having missing welds. Based on those findings, the Applicant is initiating a program to inspect all accessible cable pan hanger connections to determine if welds required by design are present. The results of those inspections will be evaluated to determine the need to inspect inaccessible welds. The inspection efforts are expected to take 2 to 6 weeks to complete. The documented program

is expected to be received by the Staff by August 14, 1984. The Staff agrees with the concept of the program as it has been described verbally by the Applicant and believes the program will provide adequate confidence in the acceptability of the installed cable pan hangers. However, final Staff acceptance of the program will await Staff's review of the documented program. The Staff anticipates it will have reviewed the documented program by August 20, 1984.



January 26, 1981

Mr. James G. Keppler, Director  
Directorate of Inspection and  
Enforcement - Region III  
U.S. Nuclear Regulatory Commission  
799 Roosevelt Road  
Glen Ellyn, IL 60137

Subject: Byron Station Units 1 and 2  
Response to IE Inspection Reports  
No. 50-454/80-04 and 50-455/80-05

Reference (a): December 30, 1980 letter from J. G. Keppler  
to B. Lee

Dear Mr. Keppler:

Reference (a) contained the report of an investigation conducted by Messrs. J. B. McCarten and J. E. Konklin of your office and Mr. L. E. Ellershaw of Region IV regarding activities at Systems Control Corporation and at Byron Station. During that investigation it was determined that certain activities were in noncompliance with NRC requirements. Attachment A to this letter contains Commonwealth Edison Company's response to the Notice of Violation which was appended to Reference (a). The corrective action discussed in Attachment A also addresses your request for discussion of contributing management factors relative to the violation.

Attachment B to this letter contains the requested additional information regarding resolution of the item from Commonwealth Edison Audit No. 6-80-238.

Attachment C to this letter contains the results of the requested inspection of instrument lines.

Please address further questions regarding matters to this office.

Very truly yours,

C. Reed  
Vice President

Attachment  
CU-58



NRC Docket Nos. 50-454/455

ATTACHMENT A  
Response to Notice of Violation

INFRACTION

Criterion XVI of 10 CFR 50, Appendix B, states, in part, that "Measures shall be established to assure that conditions adverse to quality are promptly identified and corrected...and corrective action taken to preclude repetition."

The Commonwealth Edison Company Quality Assurance Manual in Quality Requirement QR No. 16.0, Section 16.1, states, in part, that "A corrective action system will be used to assure that such items as ...defective material and equipment...are promptly identified and corrected...this system will provide follow up to assure that corrective measures are effectively implemented."

Contrary to the above, during the period from May 1977 to February 1980, the licensee failed to take effective and timely actions to assure that deficiencies in the System Control Corporation (SCC) Quality Assurance Program and equipment fabrication activities were corrected, as evidenced by continued receipt and acceptance on site of defective safety-related equipment from SCC.

CORRECTIVE ACTION TAKEN AND RESULTS ACHIEVED

During the period in question, May 1977 to February 1980, Systems Control Corporation supplied various components under the scope of the following procurement specifications:

Main Control Boards	- Specification F/L-2788
Local Instrument Panels	- Specification F/L-2809
Cable Pans and Hanger Assemblies	- Specification F/L-2815

Systems Control Corporation in the course of fabricating components assemblies under the scope of each specification has deviated from certain specified technical requirements. In each case of deviation, the items of nonconformance have been identified and documented on a Nonconformance Report (NCR).

Corrective action has been completed for the Local Instrument Panels. Nonconformance Reports F-474 and F-484 covering this were closed on 10/21/80.

For the Main Control Boards, engineering analysis to determine disposition has been initiated under NCR F-544 dated 8/8/80.

For cable pan stiffener problems, NRC F-529 was issued on 7/9/80 and Sargent & Lundy has determined the stiffeners satisfied specification requirements. However, final disposition of this NCR is dependent on a re-survey of equipment in the field which is currently under way.

The waiver of inspection points without QA concurrence resulted from failure to recognize that QA approval of waivers was mandatory. Also, the site receipt inspection performed by the Project Construction Department was primarily an inspection for shipping damage. Subsequently, as identified in the NRC inspection report, detailed inspections were performed by Commonwealth Edison which identified deviations on components supplied by Systems Control. The deficiencies identified have been controlled via NCR's. In addition, the Commonwealth Edison Site Quality Assurance Department has established requirements for performing significantly more detailed inspections for all equipment received on site generally using the independent testing contractor. These inspections are in addition to those performed by Project Construction.

MANAGEMENT FACTORS WHICH LED TO CONTINUED RECEIPT OF NONCONFORMING MATERIAL AND ACTION TAKEN TO PREVENT RECURRENCE

With regard to the management factors contributing to the continued receipt and acceptance of defective equipment shipped by Systems Control, the previously established method of handling notification of inspection points was not sufficiently controlled to assure that all established mandatory inspection points were properly executed or properly waived. As a result, processing the notification of inspection points has been revised to ensure that all notifications are processed through a designated Project Construction coordinator who is responsible for: (1) assigning a Project Construction engineer to conduct the inspection point or, (2) obtaining documented waiver from Quality Assurance for all mandatory inspection points which are not to be conducted. Project Construction and Quality Assurance personnel who are involved in the processing of vendor inspection points have been retrained. In addition, all project specifications for the Byron Site have been reviewed to assure that mandatory inspection points are established.

As described in the preceding corrective actions, receiving inspections will be upgraded to provide significantly more detailed inspections for all safety related equipment.

For Systems Control Corporation, source inspection has been conducted for all safety-related equipment shipped since February 1980 and source inspection will be conducted on all future shipments involving Systems Control. These inspections have been conducted by

The Pittsburgh Testing Laboratory under the direction of the Byron Quality Assurance Department. The inspections cover welding, equipment identification, sealing of instrumentation lines and other specification requirements.

Furthermore, since January 1978 Commonwealth Edison has not made any purchases from Systems Control. As a result of the NRC verification of allegations against Systems Control, as reported to Commonwealth Edison on December 30, 1980, Systems Control has been barred from procurement activity involving safety-related purchases for an indefinite period.

DATE WHEN FULL COMPLIANCE WILL BE ACHIEVED

We are in full compliance at this time.

00468

mm2

1 MR. WILCOVE: Mr. Chairman, I do have some  
2 supplemental direct.

3 BY MR. WILCOVE:

4 Q Mr. Muffett, if you could turn to page 14 of  
5 your testimony, and I will call your attention to answer  
6 34, where you state that Sargent & Lundy is doing a  
7 recalculation of the strength of certain ladder fitting  
8 connections.

9 Has Sargent & Lundy done that analysis?

10 A (Witness Muffett) Yes.

11 Q Have you received it?

12 A Yes.

13 Q Have you reviewed it?

14 A Yes.

15 Q Do you find that analysis acceptable?

16 A Yes.

17 Q Do you now believe that the Applicant has  
18 established the adequacy of ladder type trays and fittings?

19 A Yes.

20 Q Now let's go to page 16 of your testimony.

21 Here you discuss another reanalysis -- first,  
22 I will call your attention to answer 41 of your testimony,  
23 where you discuss another reanalysis that Sargent & Lundy  
24 was to do.

25 Has Sargent & Lundy done that reanalysis?

mm3

- 1 A Yes.
- 2 Q Have you received and reviewed that analysis?
- 3 A Yes.
- 4 Q Was this analysis performed in accordance with  
5 the Applicants' commitment in its FSAR?
- 6 A The reanalysis.
- 7 Q The reanalysis, yes.
- 8 Do you find the reanalysis to be acceptable?
- 9 A Yes.
- 10 Q Do you believe that the Applicant has established  
11 the adequacy of System Control Corporation's cable trays?
- 12 A This -- the analysis in question here dealt with  
13 the effect of a missing stiffener and the analysis as it  
14 stands now does what it is purported to do.
- 15 Q And I now call your attention to answer 46 of  
16 your testimony on pages 17 and 18, in which you state that  
17 the Applicant will supply a documented program of its  
18 commitment to do a 100 percent inspection of welds on  
19 acceptable cable tray hangers.
- 20 Has the Staff received that documented program?
- 21 A Yes.
- 22 Q Do you have in front of you a document called  
23 Instruction for Walkdown of Cable Tray Hanger Connection  
24 Welds, Byron Station?
- 25 A Yes.



mm4

1 Q And this document has been marked Staff Exhibit  
2 R-1.

3 Could you tell us what that document is?

4 A It is delineation of a program to do inspectors  
5 for missing welds and cable tray hangers. It talks of the  
6 scope, the purposes, the procedures, the required  
7 documentation and certain references that the program is  
8 built on.

9 MR. WILCOVE: Mr. Chairman, I offer into  
10 evidence, Staff Exhibit R-1.

11 JUDGE SMITH: Are there any objections?

12 MR. CASSEL: No objections, Judge.

13 MR. MILLER: No objections.

14 JUDGE SMITH: The Exhibit is received.

15 (The document referred to was  
16 marked Staff Exhibit R-1 for  
17 identification and received in  
18 evidence.)

19 BY MR. WILCOVE:

20 Q Mr. Muffett, do you believe that the program that  
21 CECO has established to inspect 100 percent of the welds on  
22 accessible cable tray hangers, is acceptable?

23 A (Witness Muffett) The program as we have it is  
24 an acceptable program.

25 Q And has the Applicant established a training

XXX

mm5

1 program for the inspectors who will be looking for missing  
2 welds on cable tray hangers?

3 A Yes.

4 Q Within these training procedures is written  
5 material submitted to the inspectors?

6 A Yes.

7 Q Have you looked at that written material?

8 A Yes.

9 Q Does that written material provide instruction as  
10 to when a weld discrepancy should be classified as either a  
11 missing weld or a missing portion of a weld?

12 A Yes.

13 Q And, do you have an opinion as to how conservative  
14 those instructions are?

15 A It would be my opinion in regard to the structural  
16 significance, that in at least one case it was probably  
17 overly conservative.

18 Q Could you describe what that is?

19 A It has to do with the roundoff weld on the unistrut, how much  
20 of that weld can be missing as to when that will be called a  
21 defect.

22 Q And probably it would be helpful if you explain  
23 what you mean by saying that it is overly conservative.

24 A This is hard to explain without a drawing, but in  
25 this instance there could be a very tiny portion of weld

mm6

1 left off, which would be called a weld presence defect in  
2 this program, which would have virtually no impact on the  
3 strength reduction of the joint.

4 Q Now, in answer 46 -- strike that.

5 Talking now about connections other than DV-8 or  
6 DV-8(a) connections, if in the course of doing the inspection  
7 of connections other than DV-8, or DV-8(a) connections, if a  
8 missing weld should be discovered, what will CECO then be  
9 required to do?

10 A They will be required to remove the fireproofing  
11 or, I guess, in effect, make accessible all these connections  
12 for inspection.

13 At the present time, between 10 and 20 percent of  
14 these connections are inaccessible, so that out of a sample  
15 of 80 to 90 percent if we discover connections with missing  
16 welds, then we will call for complete inspection.

17 Q Let's suppose that CECO could show that the  
18 missing welds was unique to a particular connection, would you  
19 then necessarily require that all inaccessible connections  
20 be inspected?

21 A Well, we have taken a philosophical stance that  
22 if they can demonstrate to us that there is some unique  
23 circumstances associated with that connection, or that  
24 connection is unique, the unique type that is not included in  
25 the inaccessible ones, then we would entertain the notion of

mm7

1 not looking at the inaccessible ones.

2 Q And if a missing weld should be discovered on a  
3 DV-8(a) connection, will that trigger requirement that all  
4 inaccessible connections be inspected?

5 A The DV-8s and the DV-8(a)s are all being looked  
6 at no matter where they are, so that there will be none  
7 of those that will be classified as inaccessible.

8 Q Could you explain why all DV-8 and DV-8(a)  
9 connections are being looked at regardless of whether they  
10 are accessible or inaccessible?

11 A It has been our experience that the DV-8s appear  
12 to be the most troublesome connection in regard to these  
13 welding discrepancies.

14 Q And, if a missing weld is discovered on a DV-8  
15 or DV-8(a) connection, will non-DV-8 or DV-8(a) connections  
16 that are inaccessible have to be looked at?

17 A No.

18 Q Let's say a missing portion of a weld is  
19 discovered during the inspection of accessible connections,  
20 what will CECO be required to do?

21 A They will be required to evaluate that joint as  
22 to its adequacy.

23 Q Does the Staff intend to monitor CECO's  
24 implementation of this inspection to which they have  
25 committed?

mm8

1 Q And one last question.

2 Do you believe that the program -- and by program  
3 I mean in the broad sense of the word, what CECO is  
4 committed to, what they will be required to do, and the Staff  
5 monitoring of the implementation of CECO's inspections, do  
6 you believe these factors, or do you believe that this  
7 program in the broad sense will serve to provide reasonable  
8 assurance as to the adequacy of cable tray hangers?

9 A Yes, that's my opinion due to the large numbers  
10 that will be inspected.

11 MR. WILCOVE: Mr. Chairman, I have no further  
12 questions of the panel, I tender them for cross  
13 examination.

14

15

16

17

18

19

20

21

22

23

24

25



1

JUDGE SMITH: Mr. Cassel?

2

CROSS EXAMINATION

3

BY MR. CASSEL:

4

Q Mr. Muffett, in the answer to which Mr. Wilcove has just been referring, in the supplemental questions -- that is Answer 36, on pages 17 and 18 of your testimony -- the sentence that begins on the bottom of page 17 and carries over to page 18 indicates that the Staff expects to receive a documented program by August 14 and to have reviewed it by August 20.

11

Did both of those events occur?

12

A (Witness Muffett) Yes.

13

Q The answer also indicates that you expect the inspection efforts to take two to six weeks to complete. By approximately what date or dates, range of dates, does the Staff expect the inspection efforts to be completed at this point in time?

18

A Well, as was brought up yesterday in the hearing, I believe Mr. Miller said that they expected to be done within a few days. That was new information to me. I had done a rough calculation about how long I thought it would take to do, but it appears they are able to do it much more rapidly.

23

Q This being August 21st, then, if Edison were to complete the program in a few days, how long would it take before the Staff review of the results would be complete?

25



sy51b2

1           A     Well, I would say on the order of a week. There is  
2 a lot of things we would like to look at, obviously.

3           Q     Now on these percentages, accessible and  
4 inaccessible, Mr. Wilcove asked you about -- if I understood  
5 correctly -- two categories of welds, DV8 and DV8(a), on the  
6 one hand, and all other welds on cable tray hangers, cable  
7 pan hangers on the other hand. Is that correct?

8           A     That's correct.

9           Q     So that all the welds addressed by answer 46 falls  
10 in either one of those two categories?

11          A     The two categories, the one being DV8 and DV8(a) and  
12 the other category is everything else.

13          Q     Could you tell us, or tell me at least, what is  
14 a DV8 or a DV8(a) weld, as opposed to the other welds in  
15 the program?

16               MR. WILCOVE: More precisely, I believe, he has  
17 testified that the DV8 and DV8(a) are connections.

18               BY MR. CASSEL:

19          Q     All right. If you could distinguish those types  
20 of connections from the other types of connections, what are  
21 they?

22          A     (Witness Muffett) DV8s and DV8(a)s, the names  
23 come from a detail on the drawing which describes these  
24 connections. The DV8 is a horizontal unistrut welded to a  
25 channel section. That channel section is then bolted to a

sy51b3

1 vertical unistrut to form a connection.

2 Q That was the DV8?

3 A Yes.

4 Q And how does a DV8(a) differ from that, if at all?

5 A It has some slight variation, but I can't remember  
6 right now. It's really immaterial to what we are dealing with.

7 Q And of the -- when you said that 10 to 20 percent  
8 of the connections, other than DV8 or DV8(a), were inaccessible  
9 your percentage was referring to the number of connections,  
10 is that right, as opposed to the number of welds?

11 A Yes. I think, for matters of clarity, it's much  
12 better to stick with connections. To talk about weld is  
13 imprecise in that a connection could have a number of welds  
14 and different would design that number of welds differently.

15 So it's better for us to talk about connections.

16 Q And approximately how many connections would there  
17 be all together in this program?

18 A On the order of 30,000.

19 Q And of those, approximately how many would be  
20 DV8 or DV8(a)?

21 A I would say about 10,000.

22 Q Why is it that none of the DV8 -- excuse me. The  
23 10,000 is part of the 30,000, right?

24 A Yes.

25 Q Why is it that none of those DV8 or DV8(a) connections

sy51b4

1 are inaccessible, whereas 10 to 20 percent of the others are?

2 MR. MILLER: I object. I believe that the  
3 witness's testimony was just to the contrary. There was  
4 no statement by the witness that all of the DV8 or 8(a)  
5 connections are accessible.

6 MR. CASSEL: That's what I just asked him. Why  
7 is it the case that some of the other connections are  
8 inaccessible, whereas all of the DV8 or DV8(a) connections  
9 are accessible? Is there something different about their  
10 location?

11 WITNESS MUFFETT: I think there's a misunderstanding  
12 here. Some of the DV8s and DV8(a)s are inaccessible. But  
13 as a point of the program, the fireproofing or block walls  
14 will be removed to make them accessible.

15 BY MR. CASSEL:

16 Q I see. So with respect to connections that are  
17 not DV8 or DV8(a), some of them are inaccessible. And the  
18 reason that they are inaccessible is because they are  
19 covered by fireproofing or block walls?

20 A (Witness Muffett) Yes.

21 (Pause.)

22 Q Is it the case that the only plan the Staff  
23 currently has to require the inspection of the inaccessible  
24 connections is in the event that missing welds are found in  
25 the accessible connections? And even then only if Edison does

sy51b5

1 not succeed in explaining some difference between the  
2 accessible and inaccessible welds?

3 Let me backtrack. That was a compound question.

4 First of all, is it the case that the only plan  
5 the Staff has to require inspection of the inaccessible  
6 connections is in the event that missing welds are found among  
7 the accessible connections?

8 A Yes. I would like a chance to explain.

9 Q Please do.

10 A The DV8 connections, which we have a history  
11 of significant discrepancies in, we have asked for all of  
12 those to be reinspected. The other connections we don't  
13 have the same history and therefore we're going to formulate  
14 our views on defects in that population from the inspection.

15 The inspection will do 80 to 90 percent. And  
16 when that's done, we will feel that we have a good knowledge  
17 about capability of Systems Control in making those other  
18 types of connections.

19 JUDGE COLE: Mr. Muffett, just a clarification.  
20 I thought, at one time, you said they were going to inspect  
21 all of the DV8 and DV8(a) connections. Now you just said  
22 that that would include 80 or 90 percent.

23 WITNESS MUFFETT: Oh, it will be 80 or 90 percent  
24 of the other connections, not the DV8. There will be 100  
25 percent inspection of the DV8s and DV8(a)s, wherever they are,

sy51b6

1 and 80 or 90 percent of the other ones.

2 JUDGE COLE: Of all of 30,000.

3 WITNESS MUFFETT: That would be about 20,000. If  
4 we start with the total population of 30,000, there is  
5 approximately 10,000 of the DV8s and DV8(a)s, which leaves  
6 us with 20,000 other connections. And we will get between  
7 80 and 90 percent of those, in this program.

8 JUDGE COLE: Okay, thank you.

9 BY MR. CASSEL:

10 Q I am not leaving answer 46, Mr. Muffett, but  
11 referring to another answer, which I think may be relevant  
12 here. Let me refer your attention to answer 11 on page  
13 7 of your testimony. There is an answer for Mr. Hayes  
14 and Mr. Connaughton, so I will just address the question to  
15 the panel generally.

16 The last sentence in answer 11, on page 7, says  
17 "An undetermined number of cable pans, fittings, and hangers  
18 have not been inspected by personnel other than SCC inspectors."

19 My question is, Mr. Muffett or the panel, do you  
20 know how many of those 10 to 20 percent of the connections  
21 which are inaccessible are also among those hangers which  
22 have never been inspected by anyone other than SCC personnel?

23 A (Witness Muffett) No.

24 A (Witness Hayes) No.

25 Q Referring to answer 3, on page 2, and this question



sy51b7

1 is to the panel. The answer begins by indicating that the  
2 Staff became aware of deficiencies recently "during inspections  
3 conducted since the close of the licensing hearings in  
4 August 1983." I don't believe the record is clear as to  
5 how and when, and by whom, those deficiencies were  
6 discovered since August of 1983.

7 Could the panel clarify that?

end5

8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25



1           A           (Witness Hayes) I can give the first part of it,  
2 anyway. We were looking into two matters -- I was, actually.  
3 One was statements by some of Hatfield employees that they  
4 were getting blamed for welds that were made by Systems  
5 Control Corporation, and I was looking into that item.  
6 The other one was a follow-up on an allegation concerning  
7 DV-162's that our inspector had found some problems with.

8                       In the course of doing that, I found out about  
9 about 60 hangers had been identified that had weld defects.  
10 And from that, we just went forward. And we had thought  
11 that all hangers had been inspected but it turned out these  
12 hangers had not been inspected by anyone other than Systems  
13 Control Corporation.

14           Q           If I understand your answer correctly, then,  
15 there were two sources of your activity; one, an allegation  
16 concerning certain types of connections or hangers; and  
17 the other, complaints by Hatfield employees that they were  
18 being blamed for inadequacies in SCC welds?

19           A           That's correct, that's what triggered a look/see.

20           Q           And when did each of those two events occur?

21           A           In January or February of 1984.

22           Q           And following those two events, in the course of  
23 looking into each of those, you then found approximately  
24 60 -- were they hangers or connections, that had problems?

25           A           I believe these were identified as hangers.

1 Q And approximately when did you discover those?

2 A Well, in that same timeframe I was told about  
3 an NCR that had been issued where they had identified  
4 about that number. Those led to NCR-850 and 885, and as a  
5 result of that, we expanded -- or conducted a special  
6 inspection to look into all the corrective action relative  
7 to Systems Control Corporation supplied equipment.

8 Q And the Hatfield employee complaints about being  
9 blamed for defective welds, was that in the context of the  
10 Reinspection Program that they felt they were being unfairly  
11 blamed, or in some other context?

12 A No, that was just a comment by one of the  
13 inspectors that I felt was -- . We had assumed that welds  
14 on the DV's -- that the only allegations we had were on  
15 those made by Hatfield, and it turns out they were not made  
16 by Hatfield.

17 So it was just an offhand remark, and I thought  
18 it was worthwhile to follow up on. Kind of nosing around  
19 as an inspector.

20 A (Witness Connaughton) If I could add to Mr. Hayes'  
21 responses. Prior to Mr. Hayes' involvement in January,  
22 February of 1984, the other inspector that was involved in  
23 the follow-up of an allegation was Mr. Ward. And I believe  
24 he had looked into an allegation concerning a particular  
25 detail type, I believe in the November, December 1983

1 timeframe. The Inspection Report was 454/83-39 where he  
2 looked into this particular allegation.

3 I'd also like to clarify that the 60 hangers  
4 that Mr. Hayes referred to as being defective were discovered  
5 by Hatfield, documented on a non-conformance report and  
6 reported to the Applicant late August; August 30th, I believe,  
7 1983.

8 Q Returning to, or revisiting Answer 11, which is  
9 the one that says, "an undetermined number of cable pans,  
10 fittings and hangers have not been inspected by personnel  
11 other than SCC inspectors," -- and this question is to the  
12 panel, do you have any indication of what order of magnitude  
13 of non-inspected items is involved here?

14 MR. WILCOVE: Mr. Chairman, as a clarification,  
15 does Mr. Cassel mean not inspected by other than SCC as  
16 opposed to not inspected?

17 MR. CASSEL: Yes, that's what I mean.

18 WITNESS CONNAUGHTON: If we consider hangers, cable  
19 tray sections, fittings and hardware pieces as unique items,  
20 I guess we're talking on the order of  $10^4$ .

21 BY MR. CASSEL:

22 Q Help my arithmetic. What does that mean in  
23 numbers,  $10^4$ ?

24 A (Witness Connaughton) On the order of 10,000.

25 Q And when you say on the order of 10,000, do you

sy4

1 mean that that is the order of magnitude of the items that  
2 have not been inspected by personnel other than SCC inspectors?

3 A That would be our best guess. We could nail  
4 that down for hangers probably a lot better. It's a little  
5 tougher with pan pieces.

6 JUDGE SMITH: How are you using that term,  
7 order of magnitude? You're not using it in any way that  
8 I recognized it before.

9 WITNESS CONNAUGHTON: I believe as Dr. Callihan  
10 would. Between 10,000 -- well, greater than 5000 and less  
11 than 50,000.

12 JUDGE SMITH: All right.

13 BY MR. CASSEL:

14 Q In other words, you're saying that the number  
15 which has not been inspected by other than SCC inspectors  
16 in your judgment is in the ballpark between 5000 and 50,000,  
17 roughly?

18 A (Witness Connaughton) Yes.

19 Q Of that number, do you have a ballpark sense of  
20 what proportion are hangers as opposed to fittings or pans?

21 MR. WILCOVE: Mr. Chairman, I won't object to  
22 the question, but it can be very tempting for a witness --  
23 and just to try to be helpful -- to speculate or to give  
24 numbers out of the blue. If the witnesses have a basis or  
25 some means by which they can give a good, educated guess ,

1 that's fine. But I will ask that they be instructed not  
2 to speculate.

3 JUDGE SMITH: Well, we have observed these  
4 witnesses over many, many sessions, and I don't think they  
5 really need advice from the Board. They are very careful  
6 witnesses.

7 MR. WILCOVE: Thank you.

8 BY MR. CASSEL:

9 Q The question basically is: Is your educated  
10 guess or other information you have, and not if you don't  
11 have it, as to what proportion of this total number would be  
12 hangers as opposed to fittings or pans?

13 A (Witness Connaughton) I would only say that hangers  
14 probably comprise a minority of units.

15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
end 6



1           Q       Mr. Muffett, let me ask you to take a look at  
2 Answer 39 on pages 15 and 16. At the bottom of page 15 and  
3 carrying over to page 16, the sentence indicates that all  
4 90° fittings are being inspected for missing or cracked  
5 fitting welds. Do you have any information about the status  
6 of that inspection?

7           A       (Witness Muffett) Not at the moment. I am  
8 assuming you mean as to the completion of it.

9           Q       Right. And also, what the findings to date  
10 have been.

11          A       No, I do not.

12          Q       Do you know when that's due to be completed?

13          A       Well, I could only speculate but it has to be  
14 very soon.

15                   (Panel of witnesses conferring.)

16                   My friends here tell me that it is complete  
17 at this time.

18          Q       Does any member of the panel have any information  
19 about the status of the findings and when the NRC Review  
20 will be done?

21          A       (Witness Connaughton) I don't believe we've  
22 received documentation of that effort for our review, but  
23 it's our understanding, we have been informed verbally, that  
24 that program is complete, and that no missing welds were  
25 identified.



1 Q What about cracked welds?

2 A I don't believe there were any of those identified,  
3 either. That's my best recollection.

4 (Pause.)

5 Q In Answer 45 and 46, Mr. Muffett, you indicate  
6 that following the initial inspection of 80 hangers in  
7 which 107 discrepant welds were found, an additional  
8 inspection was required of 100 percent of the connections  
9 which could not withstand a 53 percent strength reduction.

10 Do you know approximately how many connections  
11 that additional inspection entailed?

12 A (Witness Muffett) On the order of 3000, or  
13 very close to 3000, I should say.

14 Q And do you know in that inspection of 3000, how  
15 many discrepant welds were found, approximately?

16 A This was an inspection to again look for missing  
17 welds.

18 Q Oh, it looked only for missing welds?

19 A Yes. And in that inspection there were four  
20 significant items found.

21 JUDGE COLE: Do you mean four missing welds?

22 WITNESS MUFFETT: Well, one had a weld that was  
23 in a place that would carry the load, but was not per the  
24 drawing. One was tack welded, one had a leg of a weld.  
25 We found four instances that we felt were significant.

sy71b1

1 MR. CASSEL: We have no further questions, Judge.

2 JUDGE SMITH: Counsel for Applicant?

3 CROSS EXAMINATION

4 BY MR. MILLER:

5 Q Mr. Muffett, I believe in response to a question  
6 from your counsel, you stated that the current expanded  
7 Reinspection Program for cable pan hangers that is underway  
8 at Byron is regarded as acceptable by the Staff?

9 A (Witness Muffett) Yes.

10 Q What do you mean by the term acceptable, sir?

11 A It's a program -- it's a program that will correctly  
12 inspect cable pan hanger welds that are accessible and the  
13 DV8s that we talked about before.

14 Q Well, it's a fact, is it not, that the results  
15 of the program will provide the basis for the Staff to reach  
16 a conclusion with respect to the adequacy of the cable pan  
17 hangers supplied by Systems Control, correct?

18 A The results of the program, in conjunction with  
19 our monitoring of the activity, yes.

20 Q I think you also, in response to a question from  
21 Mr. Wilcove, stated that in at least one instance the  
22 instructions that have been given to the individuals conducting  
23 the reinspection with respect to weld adequacy are overly  
24 conservative. Do you recall that?

25 A Yes.

sy71b2

1 Q And I believe you referred to a weld that was  
2 rounded off around a unistrut, is that correct?

3 A Yes.

4 Q Do you have, before you, Mr. Kostal's prepared  
5 testimony?

6 A No, I do not.

7 (Counsel handing document to witness.)

8 Q I would like to show you Figure 3, which is  
9 attached to his testimony.

10 JUDGE SMITH: Just flash it up here, so we know  
11 which one. Okay.

12 BY MR. MILLER:

13 Q That indicates, does it not -- or purports to  
14 represent -- a DV8 connection, correct?

15 A (Witness Muffett) Correct.

16 Q And the DV8 connection, as I believe you described  
17 it, has a unistrut member welded to a plate, correct?

18 A Correct.

19 Q And that is shown on Figure 3?

20 A Yes.

21 Q Now first of all, is this one of the welds on a  
22 unistrut that you said the instructions were overly conservative  
23 for?

24 A Yes, if this is the example.

25 Q If you could describe for the Board, referring to

sy71b3

1 Figure 3 if that would be helpful, what part of the weld  
2 is being identified in the instructions as a missing weld  
3 that you regard as being overly conservative?

4 JUDGE SMITH: Mr. Miller, may I suggest at this  
5 point that if you have a copy of Figure 3 to spare, that it  
6 be placed in the transcript as a part of the testimony?

7 MR. MILLER: I would be happy to do that, if the  
8 reporter could mark it at this place and we will get it to her  
9 at the break.

10 (The document follows:)

11

12

13

14

15

16

17

18

19

20

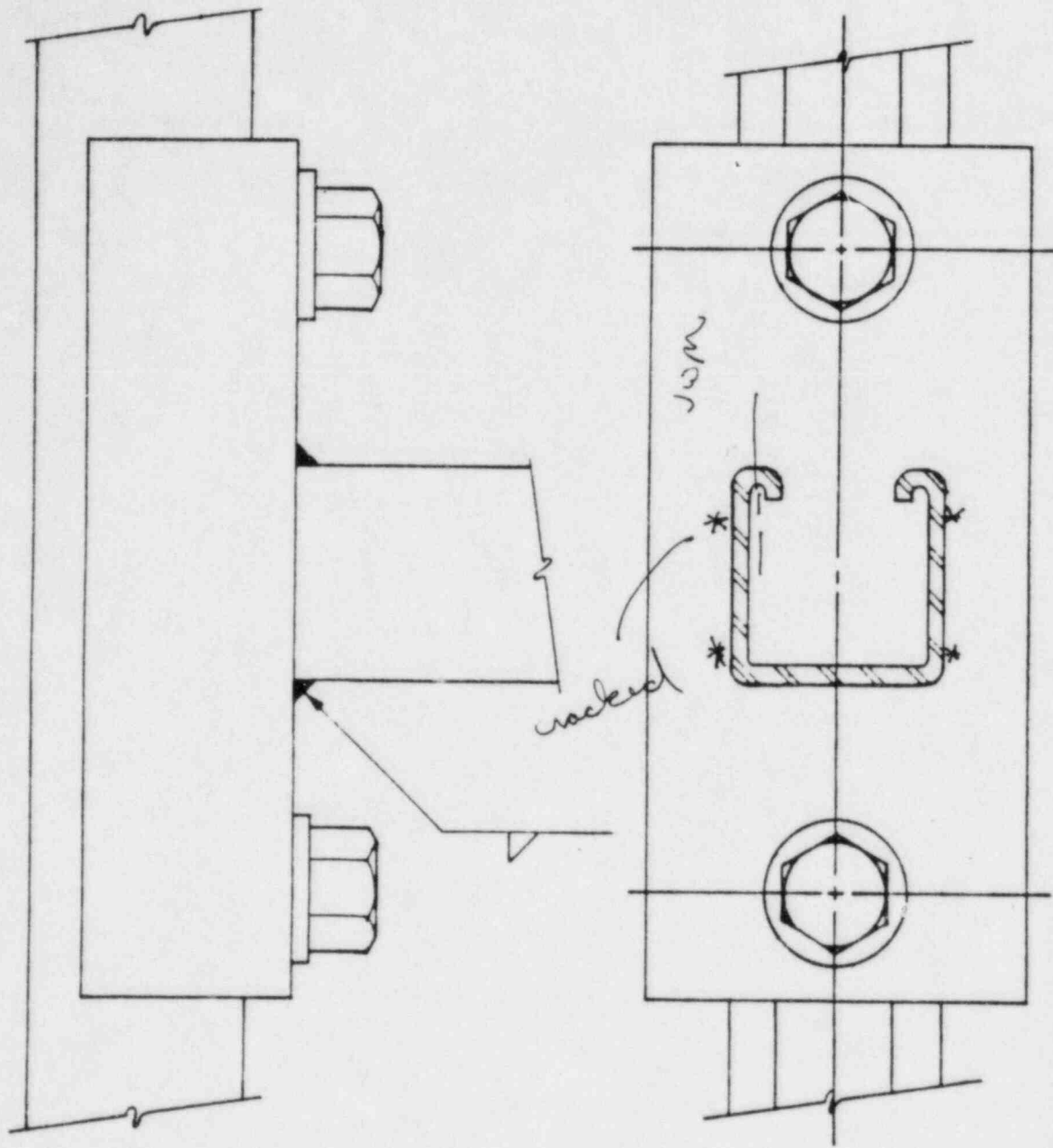
21

22

23

24

25



**FIGURE 3**  
SYSTEM CONTROL  
TYPICAL CABLE TRAY  
HANGER BOLTED CONNECTION - DV8

sy7lb4

1 JUDGE SMITH: If you could get it earlier, you  
2 could write on it and that would preserve for the record.

3 MR. MILLER: You can use that one that's before  
4 you, Mr. Muffett.

5 WITNESS MUFFETT: Okay, this is a little hard  
6 to verbalize, but I will try.

7 MR. MILLER: This copy will be the one that we  
8 will bind into the record.

9 (Discussion off the record.)

10 JUDGE SMITH: If he writes on there, I think it  
11 will be clear and he can initial any additions that he puts on.  
12 If you make any additions to that figure, and of course it  
13 is always available for comparison.

14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
end7



T8 MM/mml

1                   WITNESS MUFFETT: As you see at the top of the  
2 unistrut member, which is the crosshatch in the drawing on  
3 the right, the unistrut member is folded over at the top  
4 there. I am talking about these two areas here.

5                   Per the drawing, the weld is supposed to follow  
6 that curve all the way around until the metal, which makes  
7 the unistrut stops.

8                   In other words, the weld is supposed to go all  
9 the way around --

10                  JUDGE COLE: Around the loop?

11                  WITNESS MUFFETT: Around the loop.

12                  Now, under the program they have defined  
13 missing weld as any weld that doesn't come up to this line.

14                  JUDGE COLE: You mean the edge line of the --

15                  WITNESS MUFFETT: It would be the line that  
16 passes through the center of the arc formed on the return  
17 line.

18                  BY MR. MILLER:

19                  Q        Have you indicated that line on the drawing,  
20 Mr. Muffett?

21                  Okay, put your initials on there, as has been  
22 suggested.

23                  A        (Witness Muffett) So a very minor deviation, a  
24 very little less than meeting that line is called a weld  
25 presence defect. And you could have a very minor variation

mm2

1 from that line which would have very, very minimal impact on  
2 the strength of the connection which would still be entered  
3 into the program as a weld presence defect.

4 JUDGE COLE: You say that because the weld is  
5 supposed to be continuous around the entire length?

6 WITNESS MUFFETT: Correct.

7 JUDGE COLE: So what fraction of the weld might  
8 that be, a couple of percent?

9 WITNESS MUFFETT: Yes.

10 BY MR. MILLER:

11 Q Mr. Muffett, is there a process that will take  
12 place in the program after a defect is identified, to assess  
13 the significance of the defect?

14 A (Witness Muffett) The first inspectors, if they  
15 have determined what is called in the program, weld presence  
16 defects, then a Level -- I believe it is III -- weld  
17 inspector will go, also review this and make a weld map.

18 Q What will happen after the Level III has made  
19 this weld map?

20 A Then it can be subject to a detailed evaluation.

21 Q It's your judgment as you sit here today, though,  
22 that the missing weld defect at the top of the unistrut  
23 channel is one that would have no significance in terms of  
24 strength reduction, is that right?

25 A The significance would be very, very minor.

mm 3

1 Q Do you believe that there is any situation in  
2 which such a defect would lead to a conclusion that the missing  
3 weld resulted in a design significant deficiency on that  
4 particular connection?

5 A Based on my review of the way these joints are  
6 designed, I don't believe that that defect could cause a  
7 design significant or safety significant discrepancy.

8 Q Now, if we could back up just a little bit,  
9 Mr. Muffett, to the history of how this expanded reinspection  
10 effort occurred. And, I would like to refer you to answers  
11 45 and 46.

12 In answer 45 you referred to an inspection of  
13 100 percent of the connections which could not withstand the  
14 strength reduction, correct?

15 A Correct.

16 Q I believe you testified that that was somewhere  
17 in the neighborhood of 3000 connections?

18 A Yes.

19 Q Was there any connection in that 3000 that was  
20 inaccessible?

21 A No, I don't believe so.

22 Q So that every connection that was identified as  
23 being unable to withstand the strength reduction referred to in  
24 answer 45, was in fact reinspected without the necessity for  
25 removing fireproofing or going behind a block wall?

mm4

1           A       That's my understanding.

2           Q       Now you referred to the additional weld defects  
3 that were found in this reinspection program that is described  
4 in answer 45?

5           A       Yes.

6           Q       I believe you testified that there were four  
7 additional weld discrepancies that were identified during  
8 the course of that inspection. And those discrepancies were  
9 not bounded by the strength reduction that had been identified  
10 earlier. Is that correct?

11          A       Well, I am absolutely certain that that was true  
12 in one of the cases.

13                   I have not seen the actual evaluations for the  
14 other three, and it could go either way on those.

15                   But I know that there is one that was out of  
16 the bounds of the prior program.

17          Q       In other words, at least one of the connections  
18 that was reinspected in this program that you described in  
19 answer 45, had a strength reduction of greater than 53  
20 percent, correct?

21          A       Correct.

22          Q       Was that the one with the four tack welds?

23          A       Yes.

24          Q       Now, turning again to figure 3 attached to  
25 Mr. Kostal's testimony which I believe you have before you.

mm5

1 The connection that had the four tack welds.

2 A Yes.

3 Q Was in fact a DV-8 connection, was it not?

4 A Yes.

5 Q Would you indicate for the Board by placing a  
6 star or some other identifying feature on the drawing, where  
7 those four tack welds were located.

8 Maybe you can describe it in words where you have  
9 done it so that the Board members can mark their diagram  
10 accordingly.

11 A There are four beads of tack welds which are  
12 approximately at the four corners of the member. The one in  
13 the upper -- the upper-left one looked to me to be cracked.  
14 I'm not a weld inspector, but we went out there and looked at  
15 it.

16 MR. WILCOVE: Mr. Chairman, may I have permission  
17 to come and look at what the witness has done?

18 JUDGE SMITH: Yes.

19 (Counsel Wilcove and Cassel approaching the  
20 witness)

21 MR. CASSEL: May I assume that leave extends to  
22 me.

23 JUDGE SMITH: Yes.

24 BY MR. MILLER:

25 Q Now, it is those connections, some 10,000 of them



mm6

1 that are going to be 100 percent reinspected regardless of  
2 whether or not fireproofing or block wall has to be removed  
3 in order to get at them, correct?

4 A (Witness Muffett) Correct.

5 Q Now for all other connections, let us assume that  
6 on some other connection detail, a missing weld is identified  
7 on the accessible connections that are being reinspected.

8 What does the program call for in terms of an  
9 expanded effort in that event?

10 A Looking at the inaccessible ones.

11 Q For that connection or for all connections?

12 A Well, I would say all connections with one  
13 important qualification that I mentioned before, that  
14 Commonwealth Edison is able to demonstrate some unique  
15 circumstance to that joint or class of joints. Then we would  
16 entertain the notion of why they should only look for that  
17 one among the inaccessible.

18 Q Are there some connections that are not found  
19 in an inaccessible location? That is, are there some  
20 connection details that only appear in accessible locations, to  
21 your knowledge?

22 A I believe that is true.

23 Q What other unique circumstances might cause the  
24 Staff to agree to less than a 100 percent look at inaccessible  
25 connections?

mm81b1

1           A     I would only be speculating here.  One thing I  
2 could say, if they had documentation that the connection was  
3 not made by Systems Control, something in that nature.

end8

4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

mm91b1

1 Q Finally, I think you said that if the Staff --  
2 sorry. If this reinspection effort of cable pan hangers  
3 discloses a portion of the missing weld, then Commonwealth  
4 Edison Company will be required to evaluate those connections.  
5 Is that correct?

6 A Yes.

7 Q Is that in order to determine whether the missing  
8 portion of welds falls within the 53 percent reduction that  
9 you referred to in answer 45?

10 A That would be one part of why we would want to.

11 Q If it is 53 percent or less, Commonwealth Edison  
12 Company has already established that that strength reduction  
13 can be accomodated on every connection at Byron, regardless  
14 of whether it is accessible or inaccessible, correct?

15 MR. CASSEL: Objection, unless he's meaning by the  
16 question to infer that every connection of a certain source.  
17 Do you mean every connection in the plant or every connection  
18 of a certain type by a certain contractor?

19 BY MR. MILLER:

20 Q I mean every Systems Control connection.

21 A (Witness Muffett) I'd like to answer your question  
22 by saying that's correct, in light of the prior inspection  
23 program that looked at all the connections that could not  
24 withstand a 53 percent strength reduction.

25 Q Let me just see if I have this straight. The

mm91b2

1 reinspection effort that is described in answer 45 established  
2 that for all but approximately 3,000 connections, a strength  
3 reduction of up to 53 percent would still result in the  
4 connection being adequate, correct?

5 A Correct.

6 Q That the remaining 3,000 connections, they were  
7 completely reinspected?

8 A Correct.

9 Q Now in this expanded program, if a portion of missing  
10 weld is found, the first step in evaluating that will be  
11 to see whether it reduces the strength of the connection by  
12 53 percent or less, correct?

13 A Correct.

14 Q If so, then we know from the earlier effort that the  
15 connection is still adequate. Also correct?

16 A Correct.

17 Q Now what further analytical steps are contemplated  
18 in the event that a missing portion of welds is analyzed and  
19 it is determined that there is a greater than 53 percent  
20 strength reduction as a result of the portion of the weld  
21 being missing?

22 A This could call for more inspection.

23 JUDGE COLE: I'm sorry. I couldn't hear you.

24 WITNESS MUFFETT: This could require more  
25 inspections.

mm91b3

1 BY MR. MILLER:

2 Q In that case, it might be treated as if the entire  
3 weld was missing and all connections accessible or  
4 inaccessible would be reinspected?

5 A (Witness Muffett) As far as its effects on the  
6 program, yes.

7 Q Mr. Connaughton, I think you are asked to give some  
8 estimate of the number of components supplied by Systems  
9 Control Corporation that have not been inspected by anyone  
10 other than Systems Control Corporation Quality Control  
11 inspectors. Do you recall that.

12 A (Witness Connaughton) Yes.

13 Q And I think you said it was from 5,000 to 50,000,  
14 was your bounds for your estimate.

15 A That's correct.

16 Q We know that there has been inspections of all the  
17 main control panels, correct?

18 A Correct.

19 Q And all of the local instrument racks, correct?

20 A Correct.

21 Q And we now know that all of the cable pan hangers,  
22 except perhaps for those that are inaccessible, will be  
23 reinspected in this current effort for missing welds, correct?

24 A That's correct.

25 Q That leaves us, I think, just with cable pans and



m91b4

1 cable pan fittings. Am I right?

2 A Yes, and associated hardware.

3 Q Would you care to venture an estimate as to how  
4 many of those components will be uninspected by anyone other  
5 than Systems Control Company or Corporation Quality Control  
6 inspectors?

7 A I don't believe I would revise my estimate.

8 Q So what we're talking about, essentially, is  
9 5,000 to 50,000 cable pans, fittings, and associated hardware  
10 that will be -- that may be uninspected by anyone other than  
11 Systems Control Quality Control engineers, correct?

12 A That's correct, but for those classes of components,  
13 they have been dealt with analytically on a generic basis,  
14 so a large number of those items would be dispositioned on  
15 the basis of analytical efforts.

16 JUDGE COLE: I don't know what that means.

17 WITNESS CONNAUGHTON: For example, a large number  
18 of pieces are straight cable pan. The only welds on that  
19 straight, solid bottom, cable pan, are stiffener attachment  
20 welds. It's been shown analytically that those welds simply  
21 are not necessary on those items. Thus the fact that they  
22 haven't been inspected is, to my mind, neither here nor there.

23 BY MR. MILLER:

24 Q When you say neither here nor there, such an  
25 inspection would not be necessary to demonstrate their adequacy,

mm91b5

1 correct?

2 A (Witness Connaughton) Correct.

3 Q Now when you said associated hardware, were we  
4 talking about such items as bolts and clips?

5 A Clips that may have a small pinload on them, yes.

6 Q Are we talking about something called a splice  
7 plate?

8 A No, sir. Those are a single piece. Typically they don't  
9 have any welds on them. Certain clips may have a pin  
10 welded to them.

11 I should qualify, I was talking about pieces that  
12 have not been inspected. I was referring to those with  
13 weldments on them.

14 Q I take it you excluded bolts that may have been  
15 supplied by Systems Control, for example?

16 A Yes.

17 Q Is any member of the panel familiar with the  
18 testimony that was prepared for -- sponsored by Mr. Charles  
19 Stokes in this proceeding?

20 A (Witness Muffett) I've read it.

21 Q Have you read it, Mr. Connaughton?

22 A (Witness Connaughton) Portions of it, yes.

23 Q I don't know whether you have it before you. There  
24 is a reference, at the bottom of page 22 and the top of page 23,  
25 to concerns relating to Systems Control Corporation. I

mm91b6

1 believe counsel is providing you with a copy.

2 (Document handed to witnesses.)

3 MR. LEWIS: Question and answer 34?

4 MR. MILLER: Yes.

5 WITNESS MUFFETT: Yes.

6 BY MR. MILLER:

7 Q Are you familiar with the Non-Conformance Report  
8 that was written by Commonwealth Edison Company with respect  
9 to the use of Bondo in the main control panel?

10 A (Witness Connaughton) Yes, I am.

11 Q Do you know how the non -- first of all, would you  
12 explain to the Board how and where Bondo was used?

13 A In a number of instances, on main control board  
14 sections supplied by Systems Control, either because they  
15 cut the wrong size opening in the panel face or because of  
16 a modification to the panel had to remove the switch after a  
17 hole had been cut in the panel face for that item.

18 They repaired the panel face by inserting a piece  
19 of sheet metal, same size as that opening approximately, tack  
20 welding it into place in several locations, and then filling  
21 the remaining seams with what has been referred to as Bondo.

22 end9

23

24

25

mm101b1

1 JUDGE SMITH: Is that the same Bondo we buy at the  
2 hardware store?

3 WITNESS CONNAUGHTON: Yes, that product is reputable  
4 body shop --

5 (Laughter.)

6 MR. MILLER: And used car buyers have been fooled  
7 by the use of Bondo.

8 WITNESS CONNAUGHTON: Non-Conformance Report 695,  
9 which is referred to in Mr. Stokes' testimony, was written as  
10 a result of this practice being discovered by the Applicant  
11 because there were cracks in the Bondo at these seams. One  
12 could imagine that if the panel is subjected to any kind of  
13 vibration or shock in transit, or what have you, that the  
14 seams might crack.

15 In any event, the prescribed corrective action for  
16 the non-conforming condition was to perform full penetration  
17 welds around the entire seam. And I believe there was even  
18 a precaution in there concerning preventing warping. The  
19 repairs were done by Hatfield Electric in accordance with  
20 their Procedure 13A(a), I believe.

21 I reviewed the complete Non-Conformance Report  
22 which contained a description of the corrective action taken.  
23 And I gather, from reviewing Mr. Stokes' testimony, that the  
24 Non-Conformance Report that he reviewed was not complete. There  
25 was not a copy that indicated the corrective action taken.

mm101b2

1 I also discussed this matter with Mr. Binder, who  
2 has appeared here on behalf of the Applicant. And he indicated  
3 that a review had been conducted of all main control board  
4 sections by Westinghouse engineers. Electricians were also  
5 instructed to be on the look-out to determine if there were  
6 any other instances that may not have been detected as a  
7 result of cracking. And this practice is quite apparent from  
8 the rear of the panels.

9 So they did a search and all identified instances  
10 were corrected, in the manner I just described.

11 BY MR. MILLER:

12 Q In your judgment, Mr. Connaughton, was the  
13 corrective action for MCR 544 -- I'm sorry -- 695, adequate?

14 A (Witness Connaughton) Yes.

15 Q To your knowledge, is there any situation on the  
16 main control boards at Byron, where Bondo is being utilized  
17 in lieu of weld material?

18 A No.

19 Q Quite apart from its use earlier, as a substitute  
20 or in lieu of weld material, are there other applications of  
21 Bondo to the main control boards at Byron?

22 A Yes. I believe it has been used for cosmetic  
23 purposes, but not to serve any structural function.

24 MR. MILLER: Could I have just one second, Judge?  
25 I believe I'm almost finished.



1 (Counsel conferring.)

2 BY MR. MILLER:

3 Q Turning to question and answer 35 of Mr. Stokes'  
4 prepared testimony, it refers to another Systems Control  
5 Corporation issue dealing with the main control board. Is  
6 any member of the panel familiar with NCR F-544 and its  
7 disposition?

8 A (Witness Connaughton) Yes.

9 Q Would you describe the basis on which that NCR  
10 was closed out?

11 A It was based on inspections and analyses performed  
12 by Westinghouse. Originally when the Non-Conforming welds had  
13 been identified, the Applicant approached SCC to perform the  
14 evaluation to determine the structural adequacy of those  
15 control panels.

16 Because of inaction by SCC on this matter, for some  
17 time, and the fact that the human factor modifications were  
18 being performed, the Applicant opted to let SCC -- excuse me,  
19 opted to allow Westinghouse to take over the evaluation.

20 So while they had solicited alternate criterion from  
21 SCC, SCC never supplied those and they were not utilized.

22 Q Has any member of the panel reviewed the disposition  
23 of NCR 544?

24 A (Witness Muffett) In my testimony it says that I  
25 have reviewed Mr. Maurer's, of Westinghouse, analysis of the

rml01b4

1 main control boards.

2 Q And did that review, Mr. Muffett, include a  
3 review of this NCR and the engineering disposition by  
4 Westinghouse of these welding discrepancies?

5 A Yes.

6 Q What conclusion did you reach, concerning the  
7 adequacy of that analysis?

8 A As is stated in my testimony, the analysis  
9 demonstrates that the panels are structurally adequate to  
10 do the task that they are intended for.

11 Q Mr. Connaughton, Mr. Stokes' testimony states, in  
12 essence, in answer 35 that Systems Control Corporation was  
13 allowed to write its own acceptance criteria. Based on your  
14 review, of this matter, was Systems Control in fact allowed  
15 to write its own acceptance criteria for the main control  
16 board?

17 A (Witness Connaughton) The original acceptance  
18 criteria were contained in the engineering specification and  
19 that was supplied by the Applicant. As I stated, though, at  
20 one point in time, Applicant had solicited from Systems  
21 Control Corporation alternate acceptance criteria. Systems  
22 Control did not provide that alternate acceptance criteria,  
23 and therefore it was not used.

24 Q Finally, were members of the panel present when  
25 Mr. Kostal testified at our last hearing session?

mm101b5

1 A (Witness Muffett) I was.

2 A (Witness Hayes) I was.

3 Q At transcript pages 10,234 and 10,235, Witness  
4 Kostal stated with respect to the examination of the 90  
5 degree cable pan fitting welds. This is at page 10,235.  
6 "Maybe it would stop all the questions if I tell you we have  
7 already inspected them --" referring to those welds -- "and  
8 they are out in the field."

9 "Question: You already inspected all of them?"

10 "Answer: For vertical seam welds and they're all  
11 there."

12 "Question: All of the fitting welds?"

13 "Answer: We inspected all of the fitting welds  
14 that were addressed in this testimony, and they are all  
15 present."

16 Do you recall hearing that testimony?

17 A (Witness Muffett) Yes.

18 Q Does that indicate to you that the reinspection  
19 effort, with respect to cable pan fittings has, in fact, been  
20 concluded and indicates satisfactory welding on the cable  
21 pan fittings?

22 A It certainly does. We haven't received any documen-  
23 tation on it.

24 MR. MILLER: No further questions.

25 JUDGE SMITH: Any redirect?

mm101b6

1 MR. WILCOVE: Not now.

2 EXAMINATION BY THE BOARD

3 BY JUDGE CALLIHAN:

4 Q As usual, I address the panel. In the summary,  
5 page 2, of your prepared testimony, line 5, about midway down  
6 the left-hand margin. 1984 is my reference point. There  
7 begins a sentence there "The Staff has reviewed analyses  
8 undertaken for CECO's --" and so forth.

9 On page 5 there is question and answer -- Mr. Hayes  
10 was talking. "The independent inspection program, which  
11 began on February 15 --" and so forth. Is there a relation  
12 between those two statements?

13 A (Witness Muffett) No, that's two separate things.

14 Q Then page 5, since you're there, the independent  
15 inspection program, beginning on February 15th, 1980. By who  
16 was that reinspection done?

17 A (Witness Connaughton) The Applicant directed  
18 Pittsburgh Testing Laboratory by letter dated February 15th,  
19 1980 to inspect all future shipments of the local instrument  
20 panels from Systems Control Corporation.

21  
22  
23  
24  
25  
end10

1 Q So that is Pittsburgh, then?

2 A Yes. As directed by Applicant.

3 Q As used in that sense, Mr. Hayes and  
4 Mr. Connaughton, what is your concept of independent?

5 A In this context, we mean by other than Systems  
6 Control Corporation welding quality control inspectors.

7 Q And since I started this in your summary -- and  
8 maybe it's not proper for me to ask about the summary but I  
9 will anyway -- back on page 2 of the summary, Item 5, who  
10 did those analyses, if it wasn't PTL?

11 A (Witness Muffett) Where we say the Staff has  
12 reviewed analyses?

13 Q Yes. Undertaken by whom?

14 A Sargent & Lundy at the direction of Commonwealth  
15 Edison.

16 Q On page 4, your question 6, the "independent"  
17 there is PTL also, then, I presume. Question 6 on page 4 of  
18 the testimony.

19 A (Witness Connaughton) Your question again, sir?

20 Q Is it PTL?

21 A Yes.

22 Q There was discussion earlier -- and I return to  
23 it mildly -- of the changes in purchase orders and so forth;  
24 specifically, on page 8 of your prepared testimony, Answer 13.  
25 In your concept of changes in purchase orders or



1 however you characterize it, was there an effect of those  
2 actions on the concept of independent, or the exercise of  
3 independent inspections of materials from Systems Control?

4 A No, I don't believe there is any relation.

5 Q Were those items which were obtained from  
6 Systems Control through this bookkeeping mechanism, whatever  
7 it is, which is really not a subject of consideration, but  
8 were those additional items "completely" inspected? And if  
9 your answer is yes, tell me how completely and by whom.

10 A Among those items were numerous cable pan  
11 fittings. I can't tell you what percentage of those were or  
12 were not independently inspected.

13 Among those items were also the four DC fuse  
14 panels that we've discussed here. Those were independently  
15 inspected by Pittsburgh Testing Laboratory. There was one  
16 local instrument rack that was independently inspected by  
17 Pittsburgh Testing Laboratory.

18 Q Do you feel that this procurement action, however  
19 characterized, in any way compromised the inspection program?

20 A No, sir. But continued procurement made necessary  
21 in our opinion continuation of such inspection program.

22 JUDGE CALLIHAN: Thank you.

23 JUDGE SMITH: Would you explain, please -- would  
24 you restate what you said for the reporter?

25 WITNESS HAYES: I just was agreeing with

1 Mr. Connaughton.

2 JUDGE SMITH: Okay, thank you.

3 Mr. Wilcove?

4 MR. WILCOVE: I have no redirect, Mr. Chairman.

5 JUDGE SMITH: Do you have recross?

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

7 JUDGE SMITH: Perhaps we had better take our  
8 mid-morning break. We will return here at 11:00.

9 (Whereupon, at 11:00 a.m., a short recess  
10 was taken.)

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

1 JUDGE SMITH: I had indicated that we would  
2 give our reasons for denying the motion with respect to  
3 Dr. Bleuel. As it turns out, I think there are items of  
4 greater priority than that. We're running a little bit  
5 behind and we want to make sure that we can be ready for  
6 Dr. Kochhar. So I will defer that until there's a greater  
7 flexibility in the schedule.

8 MR. CASSEL: Fine, Judge. Dr. Kochhar has not  
9 yet arrived in the courtroom. Mr. Wright is going to call  
10 the motel and see if perhaps he stopped there en route in.  
11 We will let you know as soon as he arrives.

12 JUDGE SMITH: Okay. Well if we do have a void --  
13 I think that the matter of Mr. Stokes' testimony has priority,  
14 too, but if we do have a void I will take that opportunity  
15 to deal with the ruling on the motion.

16 FURTHER CROSS EXAMINATION

17 BY MR. CASSEL:

18 Q Mr. Connaughton, I believe you testified in  
19 response to a question from Judge Callihan concerning whether  
20 the continued procurement of SCC items via changes in the  
21 purchase orders compromised in any way the QA inspection  
22 program. And I believe you have answered that you believe  
23 that it did not, except that the continued procurement required  
24 continued inspections. Is that a fair statement of your  
25 answer?

1           A       (Witness Connaughton) That's correct.

2           Q       But didn't you also testify that among the  
3 items which continued to be procured were certain fittings  
4 which had never been, to your knowledge, inspected by anyone  
5 other than SCC personnel?

6           A       That's correct.

7           Q       So isn't it, therefore, the case that that  
8 continued procurement of those fittings which had never been  
9 inspected by anyone did interfere with the full QA inspection  
10 of SCC supplied equipment at Byron?

11                   MR. LEWIS: Anyone other than -- ?

12                   BY MR. CASSEL:

13           Q       By anyone other than SCC.

14           A       (Witness Connaughton) That's correct.

15           Q       Now, with respect to the --

16           A       Excuse me. I wouldn't say it interfered. That  
17 is, I wouldn't say continued procurement interfered with  
18 QA inspection, but it did result in additional items not  
19 being inspected. But I didn't understand the word "interfere."

20           Q       Thank you. Now with respect to the problem  
21 concerning Bondo on the SCC control panels, I believe you  
22 testified that in cases where the control panels had to have  
23 holes moved, in effect, or new holes put in, that where repairs  
24 were needed, sheetmetal was placed over the hole and a full  
25 weld done around the sheetmetal to replace what had been

sy121b1

1 partially sealed by Bondo. Is that correct?

2 A Yes, actually in the hole. In other words, the  
3 sheet metal piece is the same thickness as the rest of the  
4 panel face and was cut to fit within that opening.

5 Q Do you know what the thickness of that sheet metal  
6 was?

7 A My recollection is a quarter of an inch.

8 JUDGE CALLIHAN: Which is the same thickness as the  
9 panel?

10 WITNESS CONNAUGHTON: Yes, I believe so.

11 BY MR. CASSEL:

12 Q Are you aware of the problem of what to do about  
13 the Bondo, having been referred by Edison to Sargent & Lundy  
14 for a recommendation?

15 A (Witness Connaughton) I don't understand the question.

16 Q In other words, after the discovery of the Bondo  
17 being used for this purpose and before the ultimate disposition  
18 by full penetration welds, do you know whether the problem about  
19 how to resolve this issue was referred to Sargent & Lundy  
20 for recommendation by Edison?

21 A I don't recall seeing any correspondence to that  
22 effect, nor do I recall who signed off on the description of  
23 corrective action to be taken. That might be some indicator.  
24 It's contained on the Non-Conformance Report itself.

25 Q Well, let me try to get directly to the point. I



sy121b2

1 will refer to a document and if you need to see the document,  
2 or if you would like to see the document, or if anyone would  
3 to see the document, fine. But just in the interest of  
4 expedition, I am looking at a document dated May 20th, 1982  
5 which is a letter to Edison from Sargent & Lundy, specifically  
6 Mr. Treece.

7           And in lay terms, the subject is what to do about  
8 the Bondo. And there is a statement in the letter, and I  
9 quote, "We have reviewed this NCR --" and that is F-695  
10 "-- and find that the corrective action (reweld with full  
11 penetration) recommended under Section 16 is unacceptable  
12 because full penetration welding may cause warping of the  
13 boards."

14           Are you at all familiar with that statement by  
15 Sargent & Lundy?

16           A    No, sir, though I can understand why that was  
17 a concern.

18           Q    Do you know whether any warping of the boards, in  
19 fact, occurred when these full penetration welds were placed  
20 on the sheet metal?

21           A    No.

22           Q    How would one go about determining that? Is that  
23 something you can detect visually, or would you have to  
24 engage in some particular procedure?

25           A    It would have to be quite severe to see it visually.

syl21b3

1 One might be able to use either a level or a straight edge  
2 to determine that.

3 MR. CASSEL: For the record, I only have one copy  
4 of this letter. Oh, I am informed that we do have other  
5 copies of the letter, if anyone would like to see a copy of  
6 the letter. It is available.

7 MR. GALLO: Isn't that a part of Mr. Stokes'  
8 testimony?

9 (Counsel for Intervenor conferring.)

10 MR. GALLO: I am mistaken. It is referred to in  
11 Mr. Stokes' testimony. I guess I would like a copy.

12 (Counsel distributing document.)

13 BY MR. CASSEL:

14 Q Mr. Connaughton, if I heard you correctly, I think  
15 you also testified that Bondo continued to be used for  
16 cosmetic purposes on the main control boards. Did I hear  
17 you correctly?

18 A (Witness Connaughton) Yes. I believe that is the  
19 case.

20 Q Just so that the record will reflect, we have  
21 now distributed copies of the May 20, 1982 letter to counsel  
22 for the Staff and Edison. And for convenience, to the Board.  
23 But we are not offering the letter, although we would be  
24 happy to do so if anybody believes there is a reason for that.

25

end12

syl31b1

1 BY MR. CASSEL:

2 Q With respect to any cosmetic use of Bondo on  
3 these boards, Mr. Connaughton, can you give us, if you know,  
4 examples of how and where on the boards these cosmetic uses  
5 of Bondo have been made?

6 A (Witness Connaughton) It would be applied to the  
7 exterior surface of the panels where there might be scratches,  
8 or something of that nature.

9 Q Do you know whether it would be applied around  
10 in any instance-- around the perimeter of a dial or an  
11 instrument where it intersects with the panel itself?

12 A I don't know whether it does or doesn't. It could.

13 Q There are, inside the main control board, contact  
14 switches, are there not, for the controls on the panel?

15 A That's correct.

16 Q And if any Bondo could get inside the control  
17 boards and were to crack, could it not become lodged in  
18 the control switches? Contact switches, excuse me.

19 A I can't recall whether the contacts on all the  
20 switches are exposed. I believe there are some switches  
21 where yes, you could theorize a particle becoming lodged  
22 in the contacts. That is, if in fact Bondo had been used on  
23 the edge, and I can't imagine why. But if it were, in fact,  
24 used on the edge of an opening where a control switch or some  
25 other device is mounted. Generally, the borders of the

1 control switches and indicators are larger than the opening  
2 itself. So if it was being used for cosmetic purposes it  
3 would probably be outside that perimeter and away from the edge  
4 of the opening, if you will.

5 MR. CASSEL: I have no further recross, Judge.

6 MR. MILLER: I just have a very few on Mr. Cassel's.

7 BY MR. MILLER:

8 Q Mr. Connaughton, was there any differentiation  
9 in the cable pans and cable fittings that were supplied by  
10 Systems Control Corporation after 1981, or before 1981 in  
11 terms of their physical characteristics?

12 A (Witness Connaughton) None that I'm aware of.

13 Q In the analytical effort that's described in the  
14 Staff's prepared testimony that has been the subject of  
15 Mr. Kostal's testimony with respect to cable pans, is any  
16 member of the panel aware of any differentiation in the  
17 analytical effort with respect to pans that were supplied  
18 prior to 1981 and those supplied after 1981?

19 A (Witness Connaughton) No.

20 A (Witness Hayes) No.

21 A (Witness Muffett) No.

22 Q Would there be any reason for such a differentiation,  
23 as far as you know?

24 A (Witness Muffett) In the analysis, only if there  
25 was a physical difference.

Index

1 Q And to your knowledge, Mr. Muffett, is there such  
2 a physical difference?

3 A Not to my knowledge.

4 Q Mr. Connaughton, you were asked about the possible  
5 warping of main control boards where full penetration welds  
6 were used to secure new portions of panels. In your earlier  
7 testimony you referred to a Hatfield procedure, 13AA. Is  
8 that correct?

9 A (Witness Connaughton) That's correct.

10 Q What, if anything, does that Hatfield procedure  
11 have to do with precautions against warping of the material  
12 being welded?

13 A It's my understanding that a precaution was provided.  
14 It's not clear in my mind at this time whether it was in the  
15 procedure or whether it accompanied the procedure, but I do  
16 know that individuals involved in these repair efforts were  
17 provided a precaution concerning warpage.

18 Q What is the nature of that precaution, if you know,  
19 Mr. Connaughton?

20 A I am not certain. I don't know.

21 Q Does any other member of the panel know?

22 A (Witness Hayes) This says, "Use care to prevent  
23 warpage."

24 Q Does any member of the panel, on the basis of his  
25 own experience, know what types of precautions would normally



1 be taken in welding sheetmetal a quarter inch thick to  
2 prevent warpage?

3 A (Witness Muffett) Possibly pre-heat. There are  
4 a number of techniques that are used to deal with that.

5 A (Witness Hayes) A weld on one side and then  
6 the other side and back and forth. You can control it that way.

7 Q Finally, Mr. Connaughton, to clear up one matter,  
8 are you aware of Bondo being used in the proximity of any of  
9 the control switches in the main control panels?

10 A (Witness Connaughton) Not specifically, no.

11 MR. MILLER: I have no further questions.

12 MR. WILCOVE: I have nothing further.

13 JUDGE SMITH: Do you have anything further,  
14 Mr. Cassel?

15 MR. CASSEL: I don't believe so, Judge, but could  
16 I have just a moment?

17 (Pause.)

18 MR. CASSEL: We have no further questions of the  
19 witnesses, Judge. And I also might advise that Professor  
20 Kochhar has arrived.

21 JUDGE SMITH: All right, gentlemen, you may be  
22 excused.

23 (Witness Connaughton, Hayes and Muffett were  
24 excused.)

25

1 Whereupon,

2 DEV S. KOCHHAR

3 was called as a witness by counsel for Intervenors and, after  
4 being first duly sworn, was examined and testified as follows:

5 MR. LEARNER: Judge Smith, would you like me to  
6 briefly summarize Dr. Kochhar's testimony for the other  
7 persons in the courtroom?

8 JUDGE SMITH: You may proceed.

9 MR. LEARNER: Dr. Kochhar is an expert on human  
10 factors analysis as applied to job performance. He is a  
11 professor at the University of Michigan who has been engaged  
12 in extensive research and consultative activities with  
13 respect to the quality control inspections and job design  
14 factors that will enhance quality control performance.

15 He is here to testify today with respect to three  
16 human factors related principally to the Byron Reinspection  
17 Program.

18 The first is his view that limiting the reinspections  
19 to the inspectors' first three months of job performance led  
20 to a bias in the program results.

21 His second area of human factors discussion  
22 relates to that in those most cases, the reinspectors knew  
23 the results of the prior inspections, and that similarly led  
24 to a bias in the program results.

25 Finally, he will testify with respect to the fact

1 that in most cases, the reinspectors knew the names of the  
2 original inspectors, and that that human factor led to a  
3 bias in the program results.

4 He will describe with respect to each of those  
5 three human factors why that bias comes about, why and how  
6 inspectors behave and what these human factors are that  
7 affect their performance, and will then conclude that the  
8 cumulative effect of these three human factors is that it  
9 most probably increased the percentage of the original  
10 inspectors' work found to be acceptable by the original  
11 inspectors, and that reliable conclusions about the  
12 Reinspection Program can be reached only after these biases  
13 have been taken into account.

14 That is a brief summary of who Dr. Kochhar is and  
15 what he is going to testify principally to. I might note  
16 that his testimony will not relate, for example, to  
17 statistics. That will be the subject of Dr. Erickson's  
18 testimony. Nor will it relate to engineering and safety  
19 considerations, which has been the testimony of Mr. Stokes,  
20 and to some degree, perhaps Mr. Bleuel. Excuse me.  
21 Dr. Kochhar will be testifying principally on the effects of  
22 human factors on job performance, as in the Byron Reinspection  
23 Program.

24  
25  
end 13

T14 MM/mml

XXXX

## 1 DIRECT EXAMINATION

2 BY MR. LEARNER:

3 Q Dr. Kochhar, have you been sworn in?

4 A Yes, I have.

5 Q Do you have before you a document entitled  
6 Testimony of Dr. Dev S. Kochhar?

7 A I do.

8 Q Is this, in fact, your testimony prepared in  
9 conjunction with your attorneys?

10 A It is.

11 Q Do you have any changes to that testimony here  
12 today?

13 A Two brief changes if I may, please.

14 Q Would you please describe them?

15 A One is on page 2. It appears on line 7. That  
16 line should read "various issues pertaining to job performance,"  
17 rather than the subjects.18 The second modification is on page 7, line 1.  
19 That should read, "There are only a few differences between the  
20 tasks being"--

21 JUDGE COLE: Would you repeat that, sir?

22 There are only --

23 THE WITNESS: Page 7, line 1. "There are  
24 only a few differences between the tasks being."

25 JUDGE COLE: Thank you.

mm2

1

BY MR. LEARNER:

2

Q Do you have any further changes, Dr. Kochhar,  
3 in your testimony?

4

A I do not.

5

Q Dr. Kochhar, to the best of your knowledge, is  
6 this testimony true and correct representation of your  
7 views?

8

A It is.

9

MR. LEARNER: I would move at this point to  
10 offer Dr. Kochhar's testimony into evidence and ask that it  
11 be bound into the record as if read here today.

12

JUDGE SMITH: Are there objections?

13

MR. MILLER: No objection.

14

MR. WILCOVE: None from the Staff.

15

JUDGE SMITH: The testimony is received.

16

(Testimony of Dev S. Kochhar follows)

17

18

19

20

21

22

23

24

25



UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of: )  
COMMONWEALTH EDISON COMPANY ) Docket Nos. 50-454 OL  
(Byron Nuclear Power Station, ) 50-455 OL  
Units 1 and 2) )

SUMMARY OF THE DIRECT TESTIMONY OF DR. DEV S. KOCHHAR  
ON CONTENTION 1 (REINSPECTION PROGRAM)

- I. Dr. Dev S. Kochhar is an Associate Professor of Industrial and Operations Engineering at the University of Michigan. He has engaged in extensive research and consultation activities on how human factors affect quality control inspector performance.
- II. Dr. Kochhar describes how human factors can affect job performance, the typically monotonous nature of the inspection task and his familiarity with the Byron reinspection program.
- III. Dr. Kochhar identifies and discusses three particular human factors affecting inspector and reinspector performance that are apparent in the design methodology of the Byron reinspection program:
  - A. Limiting the reinspections to the inspectors' first three months of job performance.
  - B. That, in most cases, the reinspectors knew the names of the original inspectors.
  - C. That, in most cases, the reinspectors knew the results of the original inspectors.

- IV. Dr. Kochhar describes why inspector performance reaches its highest proficiency level in the period following completion of training. Inspectors are more attentive due to the novelty of the new job. The inspection task is monotonous, and as sensory stimulation declines over time, the level of performance effectiveness correspondingly declines.

Reliance on reinspection of the first three months of inspector performance and the corresponding assumption that this would lead to a conservative bias in the reinspection program results are highly questionable. It is likely that the reinspection program results reflect an opposite bias. The program would have more accurately examined inspector performance if the reinspections had been conducted over an extended range of the work period.

- V. Dr. Kochhar describes why the reinspection program results were biased because in most cases the reinspectors knew the identities of the original inspectors. This knowledge most probably led to a higher percentage of conforming reinspections.

- VI. Dr. Kochhar describes why the reinspection program results were biased because in most cases the reinspectors knew the original inspection results. This knowledge most probably led to a higher percentage of conforming reinspections.

- VII. Dr. Kochhar concludes that the cumulative effect of these three human factors on the Byron reinspection program results most probably increased the percentage of the original inspectors' work found to be acceptable by the reinspectors. Reliable conclusions about the reinspection program results can be made only after the biases from these human factors are taken into account.

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of: )  
 ) Docket Nos. 50-454 OL  
 ) 50-455 OL  
COMMONWEALTH EDISON COMPANY )  
 )  
(Byron Nuclear Power Station, )  
Units 1 and 2) )

TESTIMONY OF DR. DEV S. KOCHHAR

Q1: Please state your full name and place of employment.

A1: My name is Dev S. Kochhar. I am an Associate Professor of Industrial and Operations Engineering at the University of Michigan, Ann Arbor, Michigan.

Q2: Please describe your educational and professional background.

A2: I hold both a Ph.D. and M.A.Sc. in Systems Design Engineering from the University of Waterloo (Canada). Previously, I received a B.Tech. (Honors) in Mechanical Engineering from the Indian Institute of Technology (India).

Prior to obtaining my current faculty position at the University of Michigan in 1980, I was employed as an Associate Professor of Systems Engineering at the University of Regina (Canada) (1978-80), as an Assistant Professor of Industrial Engineering at the University of Windsor (Canada) (1976-78), as an Assistant Professor of Systems Design at the University of Waterloo (Canada) (1974-76) and as an engineer for the Canadian government (1970).

Q3: Please describe your recent reseach and consulting activities.

A3: My research and consulting activities are on human performance and job design. Since 1974, I have particularly studied the importance of human factors on performance of quality control inspectors. I have consulted extensively with a number of private companies and public agencies on various issues pertaining to ~~head subjects~~ <sup>job performance</sup>. Among others, I have been retained by the Firestone Rubber and Tire Company, ITT Continental Baking Company, the United States Department of Labor, the Equal Employment Opportunity Commission, Ford Motor Company, Monsanto Company and Kaiser Aluminum and Chemical Company. A more detailed listing of my consultations appear on page 3 of my resume that is Attachment A to this testimony.

I have also published a number of scholarly papers and handbook chapters on the subject of human factors and worker performance in industrial settings. In particular, I have conducted several studies and published several papers on the effects of human factors on quality control inspector performance. A more detailed listing of my research activities in this and other areas and my published papers appears on pages 5-9 of my resume that is Attachment A to this testimony.

Q4: Please describe your teaching duties.

A4: My teaching duties include classes on industrial work performance, ergonomics, human performance and industrial engineering systems and design. A principal focus of my research

and consultation activities has been on human factors affecting industrial engineering systems and design, generally, and quality control inspections and worker performance in particular.

Q5: Please describe what you mean by the terms "human factors" and "ergonomics".

A5: "Human factors" is concerned with human psychological and mental limitations and capabilities in relation to work tasks and job performance. Human factors research focuses on the effect on job performance of the type, amount and form of information presented to a worker, training, visual design and extrinsic and intrinsic values which a worker derives from his task.

Ergonomics traditionally has been predominantly concerned with the physiological and biological aspects of work performance, such as human limitations in lifting, pushing, pulling or standing during work performance.

Q6: Please describe your particular area of specialization in human factors and ergonomics.

A6: For over 8 years, I have examined how human factors can affect worker performance in the field of quality control inspections. I have designed and analyzed laboratory simulations of worker performance on different inspection tasks and have consulted with various private companies in applying my analytical experience to their industrial processes. I have examined the design of various inspection



tasks in order to facilitate performance and increase effectiveness. My most recent research activities have focused on developing a mathematical model to evaluate the number of repeat inspections necessary to achieve a defined level of product quality. The thrust of my research and some of my consulting activities has been to improve the design of inspection tasks in order to promote inspection effectiveness.

Q7: Have you previously examined quality control inspections in nuclear power plants?

A7: No.

Q8: Is your general expertise in the field of human factors affecting quality control inspector performance applicable to inspections of nuclear power plants?

A8: Yes. Although my exposure to inspections of nuclear power plant construction activities is limited, my experience in the field of human factors affecting quality control inspections at industrial plants is applicable. The work environment at nuclear power plant construction sites may be different from that in manufacturing facilities, but the human factors relating to quality control inspections have common elements. In both environments, the inspection task undertaken is often characterized by the same monotony, in which the worker repeatedly undertakes the same decision-making task -- an item is viewed, measured and then determined to be acceptable or unacceptable (a binary decision) in accordance with specified criteria. Regardless of the environ-

ment or the particular pace of work, the operational task of inspection is the same. In both cases, inspection is a process of selection.

Q9: Are you familiar with the standard reference books and articles in the field of quality control inspection?

A9: Yes.

Q10: Are you familiar with a book authored by Harris and Cheney, Human Factors In Quality Assurance?

A10: Yes.

Q11: Do you regard Human Factors In Quality Assurance as reflecting the latest research in this field?

A11: No. This book was published in 1969 and is outdated. Subsequently, there have been substantial advancements of knowledge in this field.

Q12: Are you familiar with the Byron reinspection program? If so, please describe your review of the program.

A12: Yes. I have reviewed Edison's Report on the Byron QC Inspector Reinspection Program (February, 1984) and the Supplement to that report (June, 1984). I have also reviewed the testimony of Edison's witnesses Del George, Hansel, Laney and Singh, and the testimony of the NRC Region III Staff on the reinspection program. In my review, I have examined the human factors affecting inspector and reinspector performance and biases in the reinspection program results that are likely to be attributable to these factors.

Q13: What is the purpose of your testimony?

A13: The purpose of my testimony is to express concern about several human factors affecting inspector and reinspector performance, that are apparent in the design methodology of the Byron reinspection program. My review indicates that three such human factors -- limiting the reinspections to the inspectors' first three months of job performance; that, in most cases, the reinspectors knew the names of the original inspectors; and that, in most cases, the reinspectors knew the original inspection results -- biased the program results most probably in a manner contrary to that suggested by Edison and the NRC Staff. When such biases are properly taken into account, the reinspection program results appear less positive.

Q14: What do you understand to have been Edison's purpose in undertaking the Byron reinspection program?

A14: I understand that a Nuclear Regulatory Commission inspection report identified certain deficiencies in the training and certification of quality control inspectors at Byron. Pursuant to negotiations with the Nuclear Regulatory Commission Region III Staff, Edison initiated the reinspection program to evaluate the adequacy of the training and certification of various quality control inspectors.

Q15: Please describe why your experience and research activities directed to simulated laboratory inspections are applicable to your assessment of the human factors affecting the inspections and reinspections at Byron.

A15: ~~Actually there is little~~ <sup>There are only a few</sup> differences between the tasks being performed by the individual under examination in the laboratory and the inspector at Byron. The individuals are performing a mundane task in which a decision is to be made based on certain criteria. In fact, the impact of various human factors can be studied more precisely in a controlled laboratory setting than in the workplace environment where many more variables are present that affect observation but not performance. In the laboratory setting, the experimenter is able to manipulate various details more efficiently. Knowledge of the human factors affecting inspector performance obtained from laboratory experiments can then be applied to workplace settings.

Q16: Are you generally familiar with the procedures and protocols used in the Byron reinspection program?

A16: Yes.

Q17: Please describe the time period over which the Hatfield, Hunter and PTL inspectors' performance was reinspected.

A17: The Byron reinspection program focused on the first three months of inspector performance. The only circumstances in which reinspections were conducted beyond that time period were when an inspector's performance was found to be unsatisfactory.

Q18: Are you familiar with the testimony of Edison's witnesses and the NRC Staff witnesses as to why the first three

months of inspector performance were selected for reinspection?

A18: Yes. They believed that any deficient work by an inspector is most likely to occur during the early months on the job, and that performance would improve as the inspectors continued their work at the site. Following that assumption, they viewed reliance on evaluations of the first three months of inspector performance as leading to a conservative bias in the reinspection program results. I disagree with their view.

Q19: Please describe your view of the human factors affecting performance of quality control inspectors over the period of their employment.

A19: Inspector performance can be expected to attain its highest proficiency level in the period following completion of training. Newly trained individuals generally perform better during the initial inspection period because they are more attentive due to the novelty of their new job; it begins as stimulating activity that provokes interest. The novelty and sensory stimulation decline over time, and the level of performance effectiveness correspondingly declines. The reason for this pattern of performance is the repetitive, dull and unstimulating nature of the inspection task.

Inspectors and reinspectors are engaged in a monotonous work activity that provokes little sensory interest. Even



if there is some variation of the precise attributes inspected, the actual inspection task is essentially the same and remains monotonous.

Numerous research studies have demonstrated this effect of human factors on inspector performance. Even though these studies have principally focused on fairly short performance periods, the results obtained may well be applied to inspector performance over a longer time period. However, I am not aware of any longitudinal studies that have directly examined inspector performance over an extended time period.

In many industrial and manufacturing settings, it is not uncommon to rotate individuals between inspections and hardware work tasks in order to mitigate the tedium of inspection tasks.

The assumption by the Edison and NRC Staff witnesses that the inspectors would perform at their lowest level of effectiveness in the first three months following training, and their corresponding conclusions that conducting the reinspections in this period would lead to a conservative bias in the reinspection program results are highly questionable. Since inspectors generally perform at their highest proficiency level in the period following completion of training, and performance effectiveness declines over time, it is likely that the reinspection program results reflect an opposite bias.

The reinspection program would have more accurately examined inspector performance and qualifications if the

reinspections had tested inspector performance over an extended range of the work period.

Q20: Are you aware that in most cases the reinspectors knew the names of the inspectors whose work they were reinspecting?

A20: Yes. According to Edison, virtually all types of reinspections were performed with the original inspection reports, and thus the reinspectors were aware of the names or initials of the original inspector. The reinspector received this original report before conducting the reinspection.

The only common exception to these circumstances was for the reinspection of "as built" dimensions, which were performed without previously-generated data from inspectors. Instead, drawings and other information were provided to reinspectors. I also understand that Mr. Hansel has testified that in some cases, involving Hunter, inspectors were identified by number.

Q21: How are the reinspection program results affected by the reinspector having known the name of the original inspector?

A21: The reinspector's knowledge of the identity of the original inspector of an attribute can lead to a bias in the reinspection results. Workplace dynamics and social associations can influence the reinspector's decision-making criteria.

The Byron reinspection program assigned site contractors responsibility to reinspect their own inspections. I recog-

nize that some procedures in the reinspection program may have mitigated these biases. For example, reinspectors were not permitted to verify their own inspections, (in accordance with NRC regulations), and PTL conducted a limited number of over-inspections. Moreover, the NRC Staff witnesses testified that approximately sixty percent of the Hatfield, Hunter and PTL inspectors were no longer on-site during the reinspections; that still leaves a large number of original inspectors on-site at the critical time, and these inspectors and reinspectors may have continued social associations with the off-site inspectors.

To have the maximum confidence in the validity of the reinspection results, the reinspector should be "independent" of the original inspector. Not only should the inspector's name be concealed, but to minimize bias the reinspector should have no previous involvement at the site, and thus no economic incentive to demonstrate a high level of work quality. That reinspectors were employed by site contractors, and received their initial instructions and general supervision from these same contractors, also may have led to bias of the reinspection results.

I am aware that the NRC regulations (10 CFR Part 50, Appendix B) permit site contractors to do both inspections and reinspections, but nevertheless the reinspectors' knowledge of the inspectors' names led to bias.

In practice, it might be difficult to undertake a completely independent reinspection program, but preventing

the reinspectors from knowing the names of the original inspectors would lessen the potential for a non-conservative bias resulting from reinspectors being more lenient. Even if the goal of complete independence cannot be achieved, it should be recognized that, in most cases, the reinspectors knew the names of the inspectors whose work they examined. This biased the Byron reinspection program results and most probably led to a higher percentage of conforming reinspections.

Q22: Are you aware that in most cases the reinspectors knew the original inspection results?

A22: Yes. For most of the reinspections in which the reinspectors were aware of the identities of the original inspectors, they likewise were aware of the original inspection results.

Q23: How are the reinspection program results affected by the reinspector having known the original inspection results?

A23: It is neither typical, nor desirable, industry practice to permit the reinspectors to know the original inspection results. This knowledge can lead to a phenomenon best described as a "mimic" effect in which reinspectors conform their results to the original inspection results. Various studies have shown that, in such circumstances, the reinspector will tend to shift his acceptance criteria toward reconfirmation because of a general human tendency to avoid deviation from a prior determination. Moreover, the reinspector might be somewhat reluctant to criticize the past

work of his employer, the site contractor, because of possible adverse economic consequences.

In most cases, the reinspectors knew the original inspection results. This biased the Byron reinspection program results and most probably led to a higher percentage of conforming reinspections.

Q24: What is your overall conclusion respecting the effects of human factors on quality control inspectors as applied to the Byron reinspection program results.

A24: The cumulative effect of these three particular human factors present in the structure and implementation of the Byron reinspection program -- reliance on reinspections of the inspectors' first three months of job performance; that, in most cases, the reinspectors knew the names of the original inspectors; and that, in most cases, the reinspectors knew the original inspection results -- biased the program results, and most probably led to a higher percentage of conforming reinspections. The percentage of the original inspectors' work found to be acceptable by the reinspectors thus would be higher than otherwise would have been justified by the circumstances. Reliable conclusions about the reinspection program results can be made only after the biases from these human factors are taken into account.



mm3

1 MR. LEARNER: Dr. Kochhar is now available  
2 for cross examination from the Board, Edison and the NRC.  
3 Thank you.

4 MR. MILLER: Judge Smith, I have a copy of  
5 my cross-examination plan. It is in handwriting, I trust  
6 it is legible.

7 (Document handed to Board)

8 CROSS-EXAMINATION

9 BY MR. MILLER:

10 Q Hello, Dr. Kochhar.

11 A Hello.

12 Q Dr. Kochhar, your deposition was taken in  
13 this proceeding on July 19th of this year. Since that time,  
14 what additional investigations, if any, have you performed  
15 with respect to the Byron reinspection program?

16 A I took a look at the training procedure briefly,  
17 and the procedures used for the reinspection, also briefly.

18 I also took a look at the NRC regulations that  
19 pertain to the reinspection program.

20 Q Dr. Kochhar, you just referred to a training  
21 procedure. Could you be a little bit more specific as to what  
22 training procedure?

23 A Yes.

24 My understanding is that the inspectors were  
25 given some on-the-job training with the supervisor. They

XXX

mm4

1 were also given a written test, and they were taught how  
2 to do the weld inspections and the objective measurements.

3 Q And how many different training procedures did  
4 you review, sir?

5 A I believe that is the one that I am referring to.  
6 The one that I am referring to is the one that I looked at.

7 MR. MILLER: Judge Smith, might I inquire of counsel  
8 as to whether or not that training procedure is present in  
9 the hearing room?

10 MR. LEARNER: No, it is not. I think if it would  
11 help save time, we sent considerable materials to Dr. Kochhar,  
12 and we discussed over the telephone and upon his arrival  
13 in Chicago, some of the training procedures that were employed  
14 by the company, with the NRC's assistance.

15 MR. MILLER: Judge Smith, I believe the Federal  
16 Rules of Evidence specifically state that an expert witness  
17 who testifies as to matters of opinion, should have the  
18 bases for that opinion present in the courtroom so that they  
19 are available for cross examination, if necessary.

20 I believe it is Rule 1006, but I am going from  
21 memory.

22 MR. LEARNER: I think, Mr. Miller, you are asking  
23 for a nonexistent document. The testimony of Dr. Kochhar  
24 does not include any description at length of materials he  
25 reviewed on training. I don't think he has testified as to

mm5

1 having received any materials at length.

2 What you are asking for we simply don't have.

3 MR. MILLER: I really don't understand what  
4 Mr. Learner is saying. Either there is a piece of paper  
5 that Dr. Kochhar looked at, or there wasn't.

6 Dr. Kochhar has identified such a piece of paper,  
7 I believe.

8 JUDGE COLE: Where is that now, Dr. Kochhar?

9 THE WITNESS: That is with my documents back in Ann  
10 Arbor.

11 MR. LEARNER: Mike, what are you looking for in  
12 particular. We would be glad to provide you any particular  
13 documents that you want that aren't covered by privilege.  
14 I'm not aware of any document here that specifically addresses  
15 what you are looking for.

16 MR. MILLER: I believe that the reason for my  
17 questioning will become apparent. I am not certain that I  
18 need the document. But, I believe that I need a description  
19 of the document in somewhat more detail than Dr. Kochhar is  
20 able to give us on the record.

21 I really don't want to prolong this. I just  
22 anticipated that any documents that formed a basis for  
23 Dr. Kochhar's opinion, would have been present in the  
24 hearing room for cross-examination purposes, if necessary.

25 JUDGE SMITH: To what extent do you feel you are

mm6

1 frustrated in your cross examination?

2 MR. MILLER: Let me ask my next series of  
3 questions, and I will find out perhaps I am not frustrated  
4 at all.

5 BY MR. MILLER:

6 Q Dr. Kochhar, are you familiar with the distinction  
7 in the reinspection program between objective inspections and  
8 subjective inspections?

9 A Yes, I am.

10 Q It is correct, is it not, that with respect to  
11 Hatfield, Hunter and PTL, that the only subjective inspections  
12 are visual weld examinations, correct?

13 A That's my understanding.

14 Q Now, in answer 13 of your prepared testimony, and  
15 again in answer 24, you express some conclusions regarding  
16 possible biases from a human factors standpoint that may have  
17 crept into the Byron reinspection program, correct?

18 A That is correct.

19 Q Those conclusions are limited only to subjective  
20 inspections, isn't that right?

21 A Yes, in most part that is correct.

22 Q Well, when you say for the most part, which part of  
23 them refer to objective as well as subjective?

24 A The reason why I say that is because even when  
25 you are indeed taking subjective measurements, that is --

mm7

1 pardon me, when you are taking objective measurements, there  
2 is some element of subjectivity associated with reading a  
3 gauge or an instrument, or a scale or what have you.

4 Q But, with respect to objective measurements, the  
5 human factors issues that you address are less of a concern  
6 because the data can be recorded through the use of  
7 measuring devices of one sort or another, correct?

8 A That is correct, because there is less of a  
9 judgment involved than there is in subjective measurements.

10 MR. MILLER: I can now state that any need for  
11 that material that I referred to has been mooted, and I  
12 can proceed, sir.

end 14



mra151b1

1 BY MR. MILLER:

2 Q Dr. Kochar, it's correct, is it not, that you  
3 don't consider yourself to be an expert in structural  
4 mechanical electrical engineering, do you?

5 A That's correct.

6 Q You have not been involved in the design enginee-  
7 ring or evaluation of nuclear power plants?

8 A That is correct.

9 Q You have never worked as a Quality Control Inspector?

10 A That is correct.

11 Q Now answer 6 of your prepared testimony discusses  
12 some of your background in the area of specialization and  
13 in human factors and ergonomics. I think you state, in the  
14 second sentence of answer 6, that "you have consulted with  
15 various private companies in applying my analytical experiences  
16 to their industrial processes."

17 And on the next page, page 4, the last sentence  
18 to answer 6, you say "The thrust of my research and some of  
19 my consulting activities has been to improve the design of  
20 inspection tasks in order to promote inspection effectiveness."  
21 I want to direct my questions to your consulting activities.

22 It's correct, is it not, that you consulted with  
23 Firestone Tire and Rubber Company with respect to the  
24 qualifications of a visually impaired worker to inspect  
25 tires on a tire assembly line? Is that correct?

mm151b2

1 A That's correct.

2 Q It is also correct, is it not, that prior to  
3 1980 you were not involved in any inspection tasks in  
4 industry?

5 A That is correct. Most of the work prior to that  
6 was in laboratory inspection tasks, yes.

7 Q And even after 1980 you performed no empirical  
8 studies with respect to inspections, right?

9 A Yes.

10 Q Is it correct then that the only experience  
11 that you have had, outside the laboratory, with inspection  
12 activities was in connection with your assignment for  
13 Firestone Tire and Rubber?

14 A Well, not necessarily true, and let me explain.  
15 Often there are very brief problems that crop up in industry  
16 that we generally do not refer to in a detailed curriculum  
17 vitae. And these require a brief consultation, of 15 minutes,  
18 20 minutes, or half an hour, or half a day, that we would  
19 simply offer advice on.

20 And being of such a short duration and not for  
21 extended periods of time, then these are basically very short  
22 term or very brief help that we can provide to industry.

23 There are several of those that I have not referred  
24 to in my CV.

25 Q Outside of the Firestone Tire and Rubber, and these

1 15 or 20 minute, perhaps half day, consultations, you have  
2 had no experience with inspection activities other than  
3 your laboratory experiments? Is that correct?

4 A That's correct.

5 Q Now in your assignment for Firestone, how many  
6 attributes did the inspector have to inspect on the  
7 tires as they were coming down the assembly line?

8 A If I recall, there were several of these  
9 attributes. A couple had to do with the type of tread, the  
10 type of markings, the embossed number -- that is the rotation  
11 number or the number that is inscribed on the number so that  
12 in case it needs to be traced back to the batch it was made  
13 with, in case of a recall or any other unforeseen problems.

14 These were perhaps the three or four major  
15 attributes that an individual needed to look at.

16 Q Did the individual in that inspection setting have  
17 to fill out any forms which indicated whether the individual  
18 accepted or rejected a tire?

19 A I do not recall.

20 Q And am I correct that this was an assembly line  
21 operation where the inspector was stationed at a particular  
22 location on the assembly line to perform the inspection  
23 function?

24 A Yes, and no. Because one of the job stations was  
25 one which required the individual to move along the line,

mm151b4

1 because of the fact that many of these tires were coming  
2 down a chute and going on to a loader conveyor. And then  
3 these needed to be sorted by tread, by marking, by batch  
4 number if you will.

5 And then, at other stations, the inspection was  
6 such that each tire was positioned into the fixture and  
7 examined and then released, and the next one was brought in.

8 Q Now in your answer 8, you refer to your -- in the  
9 first -- it's actually the second sentence of your answer --  
10 your exposure to inspections of nuclear power plant  
11 construction activities, as limited. In fact, it's limited  
12 to the review that you have made of the Byron Reinspection  
13 Program. Isn't that right?

14 A That's true.

15 Q And you have not visited the Byron Station, have  
16 you?

17 A I have not.

18 Q You then go on, in that sentence, to say that your  
19 experience in the field of human factors, affecting quality  
20 control inspections on industrial plants, is applicable.  
21 And there we are essentially talking, are we not, about the  
22 Firestone experience, correct?

23 A Well, that's part of it. And in addition to the  
24 other brief problems that often come up in industry, especially  
25 in locations which cannot be automated -- that is, you cannot

mm151b5

1 install cameras that will do the inspection for you  
2 automatically -- where humans are still doing the inspections.  
3 Those are, indeed, brief encounters. So I'm basing it as  
4 much on the Firestone as well as the other work that we have  
5 been doing since 1980, primarily with the auto industry  
6 and small parts manufacturers.

7 JUDGE COLLE: Dr. Kochar, I'm having trouble hearing  
8 you. Could you move the microphone more to you?

9 BY MR. MILLER:

10 Q In each instance, Dr. Kochar, it's correct these have  
11 been assembly line operations of one sort or another, is that  
12 right?

13 A Assembly line or batch manufacturing. There's a  
14 little difference between the two, but these are basically  
15 in manufacturing environments, that is correct.

16 Q But it's your opinion that the inspection tasks  
17 at a nuclear power plant and the inspection tasks that you  
18 have observed, in the various assembly line or batch operations  
19 that you have observed, are -- for all practical purposes --  
20 the same in that they are both monotonous tasks?

21 A I would say similar, not the same. And the  
22 reasons are simply that an inspection task is one which  
23 requires the individual to make a decision as to the  
24 acceptability or otherwise of the characteristics of the  
25 product or the item being inspected at hand. The similarity



mm151b6

1 is indeed in that specific area, in that the task or the  
2 elements of the nature of the task is very similar.

3 A person at the power plant is making a decision  
4 as to whether or not a particular weld is acceptable. A  
5 person in a small batch manufacturing facility is making a  
6 similar decision, and that is whether or not a particular  
7 item is acceptable or not acceptable, according to some  
8 criteria.

end15

9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

T16 MM/mm1

Q Now, Dr.Kochhar, turn for just one second to  
2 question and answer 15, you have done, have you not, extensive  
3 laboratory experiments with respect to inspections by an  
4 individual, is that correct?

A That is correct.

Q Would you describe for the Board and the Parties,  
6 what the nature of those experiments is?

A The nature of the experiments was to determine how  
8 some of the factors that are known to affect the human  
9 activity of inspection can be examined, can be researched  
10 such that one may then utilize this information to design an  
11 inspection situation or inspection job better.  
12

The laboratory research involved simulating  
13 different products, or something that could be construed as  
14 being a product on a television monitor, and scrolling this  
15 particular product from one side to the other side of the  
16 screen at controlled rates, controlling or manipulating other  
17 factors such as the number of faults or defects that appeared  
18 on the screen, and then determining what defect detection  
19 rates could be found by individuals.  
20

So basically the nature of the experiments was  
21 such as to enable the experimenter to manipulate some of  
22 the variables in question, and then determine how these  
23 affected the human decision process.  
24

Q By that you mean there were images on the screen  
25

mm2

1 that were passed in front of the eyes of the subject of the  
2 experiment, and that individual was then asked to determine  
3 whether those objects met certain criteria or not, is  
4 that right?

5 A That is correct. And this was a less expensive  
6 method, a more controllable method than actually putting in  
7 a conveyor belt in the laboratory and identifying different  
8 pieces that could then be moved at a controlled rate in front  
9 of this particular individual.

10 By using a screen, one is better able to  
11 manipulate the kind of data and the kind of product that one  
12 wishes to show.

13 Q Was one of the important variables in these  
14 experiments the rate at which these items moved across the  
15 screen in front of the subject?

16 A Yes, it was in at least one or two of the  
17 experiments.

18 Q Do you know whether at the Byron station there are  
19 any quotas on the number of inspections that a quality control  
20 inspector is expected to accomplish?

21 A I'm not aware of them.

22 Q In answer 15, Dr. Kochhar, you state in the  
23 third sentence that the impact of various human factors can  
24 be studied more precisely in a controlled laboratory setting  
25 than the workplace. Then it goes on to say "where many more

mm3

1 variables are present that affect observation, but not  
2 performance."

3 What variables are you referring to in that  
4 answer?

5 A The variables that I am referring to are  
6 variables such as the psychological factors that relate to  
7 an individual actually being on a job site, knowing that he  
8 has to bring a check home. Variables, for example that  
9 could be best described as social dynamics that develop  
10 between people who happen to be working together, or for the  
11 same company, or within the same office environment.

12 Some of these, of course -- well, I would say  
13 those that I have described are very difficult to quantify  
14 and to measure, but their presence must indeed be acknowledged.  
15 These variables are present and they do affect human  
16 performance.

17 Q Is there any way of quantifying the effect of  
18 these variables which affect observation, but not performance?

19 A There are no known methods that I am aware of.

20 Q Dr. Kochhar, have you had the opportunity to  
21 review any of the inspection procedures that are used by  
22 Hatfield or Hunter at the Byron station?

23 A I did take a look at them, yes.

24 Q Do you recall which ones you looked at, sir?

25 A If I can describe that procedure to you, one that

mm4  
1 required insulation first of whatever construction activity  
2 was going on. Then that is followed by a review by the  
3 inspector. This then was followed by a reporting on a travel  
4 card or a travelling card of any observed errors, which would  
5 have been prepared. These then would have been preinspected  
6 as part of the usual procedure.

7 And then that basically was a procedure that was  
8 followed in this sequence.

9 Q Did you understand that these were visual weld  
10 inspection procedures that you were dealing with?

11 A Yes.

12 Q Do you recall for which contractor, sir?

13 A I do not recall which contractor.

14 Q Did you review any of the inspection procedures  
15 for other objective inspection attributes?

16 A I did not, because these were perhaps less  
17 subject to the human factor that was of concern to me.

18 MR. MILLER: Could I have just one second?

19 (Counsel for Applicant conferring)

20 BY MR. MILLER:

21 Q Dr. Kochhar, I believe you have stated in your  
22 testimony that there are three human factors issues that  
23 present at least the potential for biasing the results of  
24 the Byron reinspection program, and I would like to discuss  
25 each one of them with you separately.



mm5

1           The first is your opinion, which is based on your  
2 background and experience, that inspectors perform at their  
3 highest proficiency level in the period following the  
4 completion of the training.

5           Is that correct?

6           A     That is correct.

7           Q     And you expressed that in answer 19 at page 9 of  
8 your prepared testimony, right?

9           A     That is correct.

10          Q     And therefore, on the basis of your experience  
11 the selection of the first 90 days by Commonwealth Edison  
12 Company, concurred in by the NRC Staff as being the suitable  
13 period to judge when inspectors would be performing at their  
14 least proficient, was incorrect.

15          Is that right?

16          A     That's correct.

17          Q     In the third full paragraph on page 9, the very  
18 last sentence you talk about the likelihood that the reinspec-  
19 tion program results reflect an opposite bias. In other  
20 words, a nonconservative bias by having chosen the first 90  
21 days as a sample period.

22          Is that right?

23          A     That's right.

24          Q     Is there any way, Dr. Kochhar, that you can  
25 quantify for us the amount of bias that has been introduced

mm6

1 into the results because of this phenomenon that you  
2 describe in that answer 19?

3 A No, I cannot.

new bu

4 Q In the first full paragraph on page 9, you refer to  
5 numerous research studies which demonstrate the effect of an  
6 inspector being most proficient in the time period immediately  
7 following the completion of his training.

8 Is that right?

9 A Let me review the paragraph preceding it.

10 Q Sure.

11 A I am referring to the fact that human research  
12 studies demonstrated the effect of human factors on human  
13 performance in that you are looking at the fact that  
14 inspection is a very monotonous task, and this has been  
15 acknowledged in many human factors studies.

16 The fact that it is monotonous and provokes little  
17 sensory interest, has been acknowledged in many human factors  
18 studies. And that is what I am referring to, the  
19 acknowledgement that indeed the inspection process is a  
20 fairly monotonous and dull task.

21 Then, when you refer to it in terms of arousal,  
22 it is such that the novelty of the task after you have learned  
23 it, makes an individual -- or is reflected in an individual's  
24 performance, that shows some increment in the period that  
25 follows the end of training and then begins to taper off as

mm7

1 time goes by, simply because of the fact that you are looking  
2 at something that is dull, repetitive and monotonous.

3 And this is reflected in a significant number --  
4 many of them studies that have looked at sharp performance  
5 periods. Basically laboratory studies can only do that,  
6 that is take a look at a sharp performance period.

7 Again, in that respect I am not aware of any that  
8 are longitudinal.

9

end 16

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

sy171b1

1 JUDGE SMITH: Dr. Kochhar, I'm having a little  
2 trouble. You speak quite clearly, but the volume is not  
3 sufficient. Could you use the microphone?

4 BY MR. MILLER:

5 Q Dr. Kochhar, if I understand your preceeding  
6 answer, it is that we can expect that the highest performance  
7 from an inspector is shortly after he begins his employment  
8 as an inspector, because then he is new to the job and  
9 before tedium and monotony sets in, which causes a fall off  
10 in his performance. He is likely to perform better in this  
11 initial stage than he is at some later stage of his work  
12 experience?

13 A Yes. Let me clarify that, if I may. This could  
14 best be viewed as a graph which begins to show an improvement.  
15 That is, if you being the graph at a time when the training  
16 is stopped and the individual is left on his own or her own.  
17 Then the graph begins to go up a little and then come down.  
18 So there is some amount of learning involved, which is  
19 reflected in improvement.

20 And then, when monotony begins to set in, that  
21 reflects in a detriment in performance. Now where the graph  
22 peaks, we don't know.

23 Q Excuse me. In fact, you do know, with respect  
24 to experiments that you've conducted yourself, do you not?

25 A We know that -- again, for a very short term

sy171b2

1 experiments, the effect of monotony can be observed, even  
2 within a period of about an hour and a half.

3 But these are, again, very short term experiments  
4 that extended over a period of two hours or three hours.

5 Q And in fact, you are not aware of any experiments  
6 which have observed this affect, that you have just described,  
7 this sort of peaking and then a falling off, as monotony  
8 sets in, that has extended beyond a couple of days. Isn't  
9 that right?

10 A That is correct. I'm not aware of any studies  
11 that have taken a look at this phenomenon over an extended  
12 period of time.

13 In fact, any studies that have longitudinally  
14 examined inspection performance over extended periods of time.

15 JUDGE SMITH: I would like to hear that. Would you  
16 repeat your answer after the words "As a matter of fact?"

17 THE WITNESS: I will have to rephrase it.

18 JUDGE SMITH: Could you read it back?

19 (The reporter read the record as requested.)

20 JUDGE SMITH: I would like you to explain that  
21 second answer, "In fact, any studies that have longitudinally  
22 studied the effect over a long period of time."

23 THE WITNESS: My answer was I was not aware of any  
24 that had studied inspection performance as a part of a  
25 longitudinal study. I am not aware of any that have been done.



sy171b3

1 JUDGE COLE: None more than a few days?

2 THE WITNESS: That is correct.

3 BY MR. MILLER:

4 Q Dr. Kochhar, returning to your testimony at the  
5 top of page 9, that first paragraph, then the sentence  
6 that begins with the words "Ever though --" and so forth.  
7 And then it states "The results obtained may well be applied  
8 to inspector performance over longer time periods --." You  
9 are really just speculating there, aren't you?

10 A Not so. Let me explain. The reason is, again,  
11 if you look at the basic structure of the inspection task and  
12 it is quite different from many of the tasks that you and I  
13 perform as part of our normal activity or are performed by  
14 people in industry, you and I have the option very often of  
15 introducing a lot of variety into what we do. Some tasks  
16 do not afford that opportunity and inspection is one such  
17 task.

18 So what you are looking at, whether it is in the  
19 short term or the long term, is the fact that the decision  
20 making of yes this is good, or no this is not good, does  
21 not change whether you look at five minutes, or you look at  
22 several months. The decision making that is involved is still  
23 a bindary decision. Yes, this is acceptable, or no, this is  
24 not acceptable does not change.

25 So that is why I mention that you can look at a

syl71b4

1 short term task, which is all you can do within a laboratory  
2 setting, and from there we often try to then see how informa-  
3 tion gained from these experiments is applicable or can be  
4 useful to something that is likely to occur over a longer  
5 period of time. This is not uncommon.

6 Q Yes, but Dr. Kochhar, based on your laboratory  
7 experiments, you would have expected this heightened  
8 interest, heightened arousal, to have worn off by the end  
9 of, at the most, a couple of days? Isn't that right?

10 MR. LEARNER: Objection. I don't think that's a  
11 fair characterization of his testimony. I think he has  
12 testified as to a pattern.

13 JUDGE SMITH: As a matter of fact, I think that  
14 is fair to the witness, rather than unfair.

15 MR. LEARNER: Well, there was a characterization,  
16 in his testimony, that I don't think was quite accurate.  
17 I'm objecting to the characterization of the testimony.

18 JUDGE SMITH: Well, in what respect do you believe  
19 he has mischaracterized the testimony?

20 MR. LEARNER: I believe that Dr. Kochhar testified  
21 that the pattern observed in the short term experiments could  
22 be applied to the long term situation, not that the two hours  
23 found in the short term experiment applies, per se, to the  
24 long term situation. I believe that the latter description  
25 is how Mr. Miller characterized the testimony.

sy171b5

1 MR. MILLER: The distinction that counsel has  
2 drawn is not immediately apparent from Dr. Kochhar's testimony  
3 at all. But I think my question was not a characterization  
4 of his testimony --

5 JUDGE SMITH: It stands on its own.

6 MR. MILLER: Yes, sir.

7 JUDGE SMITH: Yes, he can accept it as standing  
8 on its own.

9 MR. LEARNER: Okay, with that clarification, then.

10 BY MR. MILLER:

11 Q Do you have my question in mind?

12 A Oh, it is indeed the pattern that I'm referring to.  
13 In other words, if you are looking at performance over  
14 a short period of time or a longer period of time, you will  
15 find that indeed the pattern is such that there is some  
16 learning associated with time on task. But again, because  
17 of the nature of the task itself, monotony sets in and  
18 that reflects in the performance being not as good as what it  
19 was earlier on.

20 Q Let me see if I understand your testimony,  
21 Dr. Kochhar. Is it your testimony that throughout the 90  
22 day period that was chosen to sample inspector's work, in  
23 the Byron Reinspection Program, there was this heightened  
24 interest that you described, which you observed in your  
25 laboratory experiments for a couple of hours, and which the

sy171b6

1 literature reports has extended for a couple of days?

2 A Throughout the 90 day period, that is the period  
3 following training. What I'm saying is that individual  
4 performance in this period will show a positive trend. That  
5 is, it will show an improvement because of the fact that a  
6 person is new on the job. He has learned something that  
7 is new and different. And then, over a period of time  
8 extended beyond perhaps even that 90 day period, there is  
9 likely to be a tapering off of the performance.

10 So I am really indicating that this trend is  
11 likely to be observed.

12 Q Now I'm trying to identify, Dr. Kochhar, which  
13 trend it is that we're talking about. Do you believe that  
14 the trend of an inspector's performance at the Byron nuclear  
15 power plant will be ascending for the entire 90 day period,  
16 on the basis of your laboratory experiments and the literature  
17 that you have reviewed?

18 A No.

19 Q Isn't it a fact that based on what you have seen  
20 in the literature that it is likely that there will be  
21 a down turn in inspector attentiveness -- if I could use that  
22 term -- after a couple of days?

23 A Yes.

24 Q Okay, thank you.

25 I would like to move on to the second human factors.

syl7LL7

1 JUDGE SMITH: If you're going to move on, I  
2 think this would be a good time to break for lunch.

3 MR. LEARNER: Judge Smith, I know that we came  
4 in fairly late this morning, at 11:00 o'clock and I  
5 think that Mr. Cassel, as suggested, we are trying to get  
6 Dr. Kochhar back to a plane. So without duly constricting  
7 lunch, if we could use a middle time period for lunch, rather  
8 than an extended lunch, we would appreciate it, in terms  
9 of accomodating the witness scheduled.

10 JUDGE SMITH: Okay, we're adjourned.

11 (Whereupon, at 12:20 p.m., the hearing was recessed,  
12 to resume at 1:30 p.m. this same day.)

13  
14 endl7  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25



## 1 AFTERNOON SESSION

2 (1:30 p.m.)

3 JUDGE SMITH: You may proceed, Mr. Miller.

4 Whereupon,

5 DEV S. KOCHHAR,

6 the witness on the stand at the time of recess, resumed the  
7 stand and, having been previously duly sworn, was examined  
8 and testified further as follows:9 MR. MILLER: Unfortunately, over the lunch break  
10 I did think of a few additional questions with respect to  
11 the issue of the first 90 days as being representative of  
12 a sample of an inspector's work experience for purposes of  
13 the Byron Reinspection Program, and I would like to return  
14 to that topic briefly.15 MR. LEARNER: Excuse me for interrupting. There  
16 was a question and answer earlier on this matter, and  
17 Mr. Kochhar informed me at lunch that a misunderstanding  
18 may have been created as to what his answer was. I had  
19 intended to save that for redirect, given the assumption  
20 that you were moving on to another area.21 Might it be useful for us to clarify that now,  
22 so as to avoid confusion in these issues?23 JUDGE SMITH: Well, so that Mr. Miller can  
24 include the clarification in his cross examination, I think  
25 it would be logical to put it in now.

1 MR. LEARNER: That's my suggestion -- if you had  
2 been planning to move on to another area. Otherwise, I  
3 could ask just a couple of very quick questions.

Index

4 FURTHER DIRECT EXAMINATION

5 BY MR. LEARNER:

6 Q Earlier you were asked a series of questions by  
7 Mr. Miller concerning the general trend over the course of  
8 inspector performance with respect to the first year  
9 an inspector is at his job. Would you please describe the  
10 overall general trend?

11 A The overall trend is one of detriment to  
12 performance, and if you could visualize it as a curve, it  
13 would appear to be something of this nature (indicating).

14 Q So that the record is clear, would it be accurate  
15 to describe that as analogous to if we had a clock going from,  
16 say, 12:00 o'clock to 3:00 o'clock, as reflecting your  
17 hand motion?

18 A Yes. I think it would be of that nature.

19 A Yes, I think it would be of that nature.

20 JUDGE SMITH: And indeed, as I have seen him make  
21 this gesture several times, it never seems to flatten out.

22 BY MR. LEARNER:

23 Q Would you like to describe the overall pattern of  
24 performance?

25 A Yes. The overall pattern of performance over a

1 long period of time is one that reflects a fairly well-  
2 maintained consistency of performance in the initial stages.  
3 And then when fatigue and monotony begin to set in, the  
4 curve would provide an indication of a decrease in  
5 performance. And, of course, gradually it begins to flatten  
6 out or settle, as we say.

7 So the pattern is one which reflects that perform-  
8 ance is good initially, and then over a period of time it  
9 will begin to decrease and then flatten out.

10 Q Mr. Miller had asked you a question regarding the  
11 pattern of performance after the first few days of inspector  
12 performance. Did you mean to imply that performance would  
13 decrease substantially after the first few days on the job?

14 MR. MILLER: I'm going to object to the question.  
15 It's both leading and vague with the use of the term  
16 "substantially." Dr. Kochhar is here to testify as an expert,  
17 and it seems to me that on direct examination he should be  
18 asked non-leading questions by his counsel.

19 MR. WILCOVE: I agree.

20 MR. LEARNER: Let me rephrase the question.

21 BY MR. LEARNER:

22 Q Dr. Kochhar, in response to one of Mr. Miller's  
23 questions, did you mean to indicate that inspector performance  
24 could be expected to decline after the first two days  
25 following the conclusion of training?

1           A     No. Can I explain?

2           Q     Please do.

3           A     Let me explain that further. You see, what happens  
4 is that at the beginning of the day or the beginning of any  
5 performance period, typically that studied in the laboratory,  
6 a few hours or several hours, performance would be high and  
7 then begin to taper off. And then you would observe a  
8 similar pattern during the next day and the next day and the  
9 next day and so on.

10                     But in general, performance at the beginning of an  
11 extended period would be higher than performance at the  
12 end of this extended period. An analogy can be drawn with  
13 daily work. When you get to work in the morning, you're  
14 fresh, your performance goes up, and then at the end of the  
15 day you are tired. And then you begin the same pattern the  
16 next day, and the same pattern is exhibited the following day  
17 until you reach a stage where you are in a position of fatigue  
18 or boredom.

19                     What I'm referring to as the overall trend is to  
20 indicate that performance at the beginning of this period  
21 could be better than the performance at the end of this  
22 extended period.

23           Q     Finally, if we were to, say, take the first year  
24 of an inspector's job performance, would you expect his  
25 performance to be most proficient during the first three months

1 or the last three months of that year?

2 A The trend would be to reflect that performance  
3 would be better in the initial period than in the following  
4 period, than in the latter period.

5 Q And with respect to the assertions of Edison and  
6 the NRC Staff that they expected the inspector's performance  
7 to be at its lowest level of proficiency during the first  
8 three months, what is your reaction, please?

9 A Well, I find that difficult to accept.

10 MR. LEARNER: Thank you. I think we have  
11 clarified Your Honor's question.

12 JUDGE SMITH: Actually, I think that was more likely  
13 to be re-redirect at the end. However, it is done, and you  
14 may proceed.

15 FURTHER CROSS EXAMINATION

16 BY MR. MILLER:

17 Q Dr. Kochhar, this discussion of the overall trend  
18 that you just gave in response to one of your counsel's  
19 questions, that is a trend, is it not, that you base on an  
20 analogy to daily performance, correct?

21 A Analogy to short-term performance, yes.

22 Q And you have not conducted any experiments, have  
23 you, which test that analogy for a one-year period?

24 A That is correct.

25 Q And you are not aware of any reports in the



1 literature of any tests that have extended for a one-year  
2 period; is that also correct?

3 A That's correct.

4 Q Now, in these daily studies, Dr. Kochhar, how  
5 soon after report for work did the subject of these studies  
6 reach his plateau of boredom, or reduced attention?

7 A Let me again describe the pattern of work here.

8 JUDGE SMITH: You have identified a plateau of  
9 boredom, or reduced attention.

10 MR. MILLER: Well, perhaps he has not testified  
11 to a plateau. I had better back up. Let me withdraw  
12 that question and ask Dr. Kochhar --

13 BY MR. MILLER:

14 Q In the studies that you performed in your  
15 laboratory, or your experiments directly, did the  
16 performance fall off at a fairly even rate over the --  
17 after this period of heightened attention at the beginning?

end 18

18

19

20

21

22

23

24

25

1           A     That is indeed the pattern that is observed.  
2     In fact, if you look at performance over an eight hour period,  
3     interspersed with a lunch break, or a break of an hour or  
4     whatever, approximately mid-day, the pattern is one, to  
5     reflect an improvement in performance as the person begins  
6     to warm up. And then it begins to taper off until a point in  
7     time when the individual takes a break. And then when you  
8     resume activity at the end of this break, it picks up  
9     again, increases -- although not to the extent that it was  
10    in the morning -- and then tapers off again toward the end  
11    of the day.

12           Q     I take it that there would also be a corresponding  
13    increase after the lunch break and after the mid-afternoon  
14    break, as well? Is that correct?

15           A     That is correct, although the increase is not  
16    as much as it is in the morning for the average individual.

17           Q     Is there anything analogous to a mid-morning  
18    break, a lunch break, or an afternoon break, in a one year  
19    time period, Dr. Kochhar?

20           A     Well, the one year time period is made up of  
21    several of these small curves, if you will. And basically,  
22    for example, what happens is when you go off on vacation, it  
23    is simply to refresh yourself of this chronic fatigue that  
24    has crept in when you are performing activity of any kind.

25                   This is what is called long-term fatigue or

sy191b2

1 long-term boredom, which manifests as chronic fatigue. And  
2 that's why you feel the need to either change jobs or take  
3 a vacation.

4 Q Dr. Kochhar, I believe it is in answer 14, where  
5 you state your understanding of the purpose of the  
6 Reinspection Program, which was to "evaluate the adequacy  
7 of the training and certification of various Quality Control  
8 inspectors."

9 Wouldn't one want to look at a period of performance  
10 prior to the time experience would mask any inadequacies  
11 in training, if the task at hand was to evaluate the adequacy  
12 of training?

13 A Would you rephrase that, please?

14 Q Sure. Isn't it correct that if the purpose of  
15 the Reinspection Program is to evaluate the adequacy of the  
16 training, you reinspect a period of an inspector's work  
17 prior to the time that his experience on the job would or  
18 might mask any lack of acceptable training?

19 Does that make sense to you?

20 A Yes, yes it does.

21 Q Dr. Kochhar, the experiments that you referred to  
22 -- in your experiments, that you conducted in your laboratory  
23 with subjects where you observed this heightened interest  
24 and then the fall-off over time, had these individuals ever  
25 performed any inspection function prior to the time they

sy191b3

1 acted as subjects in your experiment?

2 A Yes, they had. In fact, they were regular  
3 inspectors who held jobs in local industries. They were  
4 not college students. They were people who were actually  
5 inspectors in industry who had come to participate in the  
6 experiments.

7 Q Was that also true of the inspectors that -- well,  
8 do you know of any experiments in industry that indicate --  
9 well, let me strike the question.

10 Do you know of any literature which reports on  
11 experiments in industry or studies in industry where the  
12 inspectors have not had previous experience as inspectors  
13 prior to the time that they took this inspection task on?

14 A Only to the extent of answering specific questions  
15 that may have been the object of the experimenter.

16 If the objective of the experimenter called for  
17 looking at novice inspectors in determining what  
18 effects the particular inspection task design had on their  
19 performance, then yes, novice individuals would have  
20 participated in the experiment.

21 Q Isn't it a fact that one would expect a novice  
22 inspector to have a more heightened interest than a person  
23 who had been performing inspection tasks in the past?

24 A To an extent, yes.

25 Q Are you familiar with the categorization of

sv191b4

1 inspectors subject to the Reinspection Program into Level I,  
2 Level II, Level III?

3 A No.

end19

4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25



1 Q Dr. Kochhar, I want to show you an attachment  
2 of testimony of a man named Alan Koca, who testified in this  
3 proceeding back in August of 1983, August 10th. His  
4 testimony is found following transcript 7418. And I'm going  
5 to ask you to turn to Exhibit A to Mr. Koca's testimony.

6 First of all, I want to ask you --

7 MR. LEARNER: If we could take a moment to look at  
8 that?

9 MR. MILLER: Sure. Just for the record, the title  
10 of that is Hatfield Electric Company Procedure Number 17,  
11 qualification and training of inspection and audit personnel.

12 (Intervenor and Staff counsel approaching the  
13 witness.)

14 MR. MILLER: You need not look at the whole  
15 document. I would like to call particular attention to  
16 Level II inspector qualification requirements and capabilities

17 BY MR. MILLER:

18 Q For purposes of my question, you have to assume --  
19 as has been established on this record -- that all of the  
20 welding inspectors subject to the Reinspection Program are  
21 Level II inspectors.

22 A Okay.

23 Q All right. Now can we agree that the Level II  
24 inspector qualification requirements established by Hatfield  
25 in that document call for at least six months of related

mm201b2

1 experience in equivalent inspection activities?

2 MR. LEARNER: I'll object at this point. The  
3 witness has never seen the document before. I think he will  
4 admit that. The document speaks for itself, in terms of  
5 what it requires and what it does not require.

6 JUDGE SMITH: How do you propose that the question  
7 be put to him, then, that is going to be put?

8 MR. LEARNER: If there's going to be a series of  
9 questions on this document, which the witness is not familiar  
10 with, the document not being part of these proceedings but  
11 a part of the earlier proceedings -- August of 1983 -- why  
12 don't we first at least take a break and let the witness  
13 review the entire document?

14 JUDGE SMITH: He could put it to him as a  
15 hypothetical, if he wanted to. This is just the direct way.  
16 It's efficient, it actually focuses on the evidence received  
17 in the hearing.

18 MR. LEARNER: I withdraw my objection on this point.

19 MR. MILLER: All I want to do is establish that  
20 the inspector qualification requirements require at least  
21 six months of related experience in equivalent inspection  
22 activities.

23 BY MR. MILLER:

24 Q Can we agree that that's what appears to be the  
25 requirement?

mm201b3

1           A     If that's what the document says, yes.

2           MR. LEARNER: Again, I think the document speaks  
3 for itself.

4           JUDGE SMITH: The document speaks for itself, but  
5 what he's trying to do is make sure the witness understands  
6 what the document says because it would affect the accuracy  
7 of his next series of questions.

8           MR. LEARNER: With due respect, that's why I'm  
9 suggesting that perhaps we take a moment so that we can read  
10 the document.

11          JUDGE SMITH: All right. Let's take a moment and  
12 read the document.

13          MR. LEARNER: It's an eight page, single-spaced  
14 document that's not been seen by the witness.

15          MR. MILLER: Look, I'm not the one that has to  
16 catch an airplane at 5:30. All he needs for my questions are  
17 those paragraphs, but take whatever time you need, Dr. Kochhar.

18                 (Pause.)

19          MR. LEARNER: May I join the witness here?  
20 Apparently this is the only copy of the document.

21          JUDGE SMITH: All right.

22                 (Counsel and witness reading document.)

23          JUDGE SMITH: Go ahead.

24          MR. MILLER: Thank you.

25

mm201b4

1 BY MR. MILLER:

2 Q All I want to do is -- do you agree, Dr. Kochhar,  
3 that for a Level II inspector Hatfield's requirements, in that  
4 document, require at least six months of experience of a  
5 related inspection activity?

6 A Yes.

7 Q And some of the alternative forms of qualification  
8 require as much as a year of inspection experience, as a  
9 Level I inspector in the same inspection discipline if you  
10 will? Isn't that correct?

11 A Yes.

12 Q So that if we have a Hatfield Level II welding  
13 inspector who has qualified on the basis of having been a  
14 Level I inspector, according to that document he has to have  
15 had at least a year of experience as a Level I welding  
16 inspector. Is that correct?

17 MR. LEARNER: Objection. That's not what this  
18 document says.

19 JUDGE SMITH: Okay.

20 MR. LEARNER: Unless I misheard the question,  
21 Mike has said that he's had a least a year of experience.  
22 Here it refers to six months.

23 MR. MILLER: I said the six months -- perhaps  
24 it would help the record, because this is quite -- it's not  
25 located, in any proximity in the record, to what we're dicussing

mm201b5

1 now, if I just read the alternative methods of qualification  
2 into the record.

3 JUDGE SMITH: All right.

4 MR. MILLER: Level II inspector qualification  
5 requirements. One year of satisfactory performance as  
6 Level I inspector in a corresponding inspection category  
7 or class, or high school graduation plus three years of  
8 related experience in equivalent inspection activities, or  
9 a completion of college level work leading to an associate's  
10 degree in a related discipline plus one year of related  
11 experience in equivalent inspection activities, or completion  
12 of college level work leading to a Bachelor's degree plus  
13 six months of related experience in equivalent inspection  
14 activities.

15 I am referring, Dr. Kochhar, to the person who  
16 is qualified on the basis of his experience as a Level I  
17 inspector.

18 BY MR. MILLER:

19 Q According to this document, that individual is  
20 required to have one year of satisfactory performance as a  
21 Level I inspector? That's what the document says, right?

22 A Yes, it says that.

23 Q Okay.

24 A And it says or six months plus the other --

25 MR. LEARNER: Again, if I can object. Mike, the



1 question you have phrased is he's required to have one year  
2 of satisfactory performance as a Level I inspector. The  
3 document phrases that. In the alternative, there can be other  
4 combinations.

5 JUDGE SMITH: That's clear.

6 MR. MILLER: Yes, that's understood.

7 BY MR. MILLER:

8 Q If the individual is qualified, on the basis of  
9 experience, as a Level I inspector and has performed one year  
10 of welding inspections prior to the time that he is certified  
11 as a Level II inspector, wouldn't you agree that his boredom,  
12 the monotony of the task, and everything else, has occurred  
13 to some extent in the first one year period, when he was  
14 acting as a Level I inspector?

15 MR. LEARNER: I'm going to object again, just  
16 for clarification. I'm sorry, but from this document we  
17 can't tell, when it refers to corresponding inspection  
18 category, is that referring to inspections at a nuclear power  
19 plant or other nuclear -- or other construction inspections?

20 MR. MILLER: It's a shame we don't have Mr. Forny  
21 here so he can tell you, at great length, what he does.  
22 I will ask you to assume, for purposes of the question, that  
23 is true, and I believe it's established on the record.

24 MR. LEARNER: That what is true?

25 MR. MILLER: That it is, in fact, Level I welding

mm201b7

1 inspection at a nuclear power plant.

2 MR. LEARNER: For this question, that's the assump-  
3 tion. I mean, we're somewhat shooting in the dark because  
4 we're looking at a document that --

5 JUDGE SMITH: Let's assume that he's a Level I  
6 welding inspector someplace else, too. Is it really going  
7 to materially affect the doctor's opinion? But go ahead,  
8 make the assumption. I don't believe his opinion is that  
9 finely tuned.

10 BY MR. MILLER:

11 Q Dr. Kochhar, do you have the question in mind?

12 A Yes.

13 Q Wouldn't you expect that the heightened attention  
14 and the boredom that you described in response to some  
15 questions from your counsel and from me this afternoon, would  
16 have occurred when he was performing his inspection tasks as  
17 a Level I welding inspector?

18 A That depends. Is he at the same facility or has  
19 he changed jobs, because the stimulation provided by a job  
20 change, to another environment, to where you have different  
21 kinds or different people to work with, can indeed present a  
22 new environment for the individual and to bring in that sense  
23 of novelty in there, again.

24 When you refer to whether or not his boredom  
25 and fatigue has already set in, simply because he's been at the

1 job for a year, to an extent I guess if he has been at the  
2 job for that length of time -- that is, the whole year -- yes  
3 indeed, to a certain extent his performance would have begun  
4 to show a degradation.

5 Q Now Dr. Kochhar --

6 JUDGE SMITH: Is that responsive, begin to show a  
7 degradation?

8 MR. MILLER: I wanted to follow up on it, Judge  
9 Smith, and ask because we've been talking about degradation  
10 of performance, does the performance continually degrade  
11 over time to a point where the man is obviously not doing his  
12 job and should be dismissed? What is -- at what level does  
13 the -- or is there a level that you know of where the  
14 performance flattens out or plateaus?

15 THE WITNESS: I don't know what that level is.  
16 What I am referring to you and showing to you, or at least  
17 indicating to you, what the trend of performance is, in  
18 general.

19 JUDGE SMITH: So that your answer then is you do  
20 not know whether there is a flattening out? Is that your  
21 testimony?

22 THE WITNESS: No, I am saying there is indeed a  
23 flattening out, but we don't know when it occurs.

24 JUDGE SMITH: You don't know?

25 THE WITNESS: Yes, that's correct.

mn201b9

1 JUDGE COLE: Did you observe it in any of your  
2 experience, sir?

3 THE WITNESS: The flattening out of the performance?

4 JUDGE COLE: Yes.

5 THE WITNESS: No, we didn't.

6 JUDGE COLE: How do you know it occurs?

7 THE WITNESS: It occurs because you read about  
8 performance in the literature and it occurs because of the  
9 fact that the degradation procedure never really hits the  
10 X axis or the zero level. So it certainly tapers off.

11 It occurs -- I'm indicating this from my reading  
12 of the literature, not from personal experimentation.

13 JUDGE COLE: I thought you said there wasn't  
14 anything in the literature that went more than a few days, with  
15 studies of this type?

16 THE WITNESS: Yes, but I'm talking about performance  
17 at any kind of a task, industrial tasks, which shows a trend  
18 that the level of output will decrease with time and can be  
19 expected to taper off at some point in time, and we don't  
20 really know when that happens.

21 The fact that it happens is established. When it  
22 happens, we don't know.

23 JUDGE CALLIHAN: Can you put some bounds on time,  
24 when it might occur? Within a day or a week?

25 THE WITNESS: A bound on time, as to when the

1 degradation might occur? Well, the degradation occurs on  
2 a daily basis, as I have indicated. The pattern is one that  
3 reflects slight improvement as the day progresses and then  
4 a decrement. And this pattern has been observed to extend  
5 over a period of time in tasks in industry, in human  
6 performance in general, however the inspection situations  
7 have only been studied for short term.

8 JUDGE CALLIHAN: I've accumulated a number of  
9 questions. At the risk of being repetitious, I'd like  
10 to explore this curve plot, the curve plotting that you  
11 have alluded to. Suppose inordinately you talk about  
12 capability, goodness of product, and whatever. And time,  
13 of course, is the abscissa.

14 Suppose that we run our ordinate from zero to  
15 ten. As I have understood the verbal plotting that we have  
16 done up to this point, and we are doing more of it now, at  
17 the beginning of some period -- and I'll say it's at the  
18 beginning of a work day. The point on the accomplishment  
19 scale is eight arbitrary.

20 Let's let the morning go by, to the morning break.  
21 By that time where is the ordinate value? What's happened  
22 to the curve in that period?

23 THE WITNESS: It's probably at about seven.

24 JUDGE CALLIHAN: Within that period, has it been  
25 monotonic?



mm201b11

1 THE WITNESS: It has exhibited -- well, it's been  
2 I think unimodal.

3 JUDGE CALLIHAN: The reason I ask the question is  
4 I understood a while ago, someone implied at any rate, as  
5 one gets warmed up, proficiency increases. And therefore, I  
6 would expect this curve to increase within the initial  
7 period.

8 THE WITNESS: Yes. From eight it might go to  
9 nine and then it might come back to seven.

10 JUDGE CALLIHAN: An impossible question, no doubt,  
11 but in terms of an eight hour day, where does this peak?

12 THE WITNESS: In general, again, so we can talk  
13 about what happens in general to individuals, it would peak  
14 for most people during the morning. If you begin work at  
15 eight o'clock, it will be at approximately between 10:00 and  
16 10:30.

17 JUDGE CALLIHAN: Thus far my time period is only  
18 covered from the beginning of the day until the morning  
19 break.

20 THE WITNESS: Right.

21 JUDGE CALLIHAN: Which, let's say, is ten o'clock.  
22 Has a peak occurred in that period?

23 THE WITNESS: Yes, I would say. Yes.

24 JUDGE CALLIHAN: So by ten o'clock the curve is  
25 waning a bit?

mm201b12

1 THE WITNESS: Yes.

2 JUDGE CALLIHAN: Is there a discontinuity at  
3 that point, where you find that efficiency increases now  
4 after the morning break?

5 THE WITNESS: There would be -- again, I have  
6 to indicate clearly, when we talk about human performance and  
7 measures, you cannot identify them with the precision of  
8 let's say testing material or something. Indeed, there is --  
9 the effect of a break is to cause a discontinuity in that  
10 curve and it would begin with a kink in the curve, if you will.

11 In other words, if you take that break into  
12 consideration, what you have got is a discontinuity and the  
13 point at which it begins would be at about the level where you  
14 left off, prior to the break.

15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
end20

T21 MM/mm<sup>1</sup>

1 JUDGE CALLIHAN: You have foreseen my question, but  
2 let me ask it anyhow.

3 As I understand what you have said in the last  
4 few minutes, one starts at an arbitrary 8. We notice there  
5 is an increase in proficiency to 9. Then there is the  
6 beginning of a decline.

7 Then let's jump ahead. Let's talk about the whole  
8 day. Overall will there have been within the arbitrary eight  
9 hours, a -- not necessarily a smooth decrease, but nonetheless  
10 a continuing decrease over that period?

11 THE WITNESS: No. Because after the break for  
12 example, after the lunch hour you would again find a minor  
13 hump in the curve, and then again a decrement.

14 JUDGE CALLIHAN: All right. Now we start off  
15 with 8. By noontime the proficiency overall now, minor  
16 perturbations as we have gone along, but by noontime we are  
17 down to maybe 5, let's say?

18 THE WITNESS: No, I wouldn't say that. I would  
19 say more like about 8 where you started off at, because after  
20 the afternoon time it might begin at 8 and go up to about  
21 8.5, and then come down to about 6, 5, thereabouts.

22 JUDGE CALLIHAN: At noontime?

23 THE WITNESS: It would be 5 or 6 at the quitting  
24 time.

25 JUDGE CALLIHAN: By the end of the day. All right.

mm2

1 Has the curve been flattening over that period?  
2 Has the slope been changing?

3 THE WITNESS: No, it hasn't been. Well again, you  
4 know, these are -- no, it has not been flattening.

5 JUDGE CALLIHAN: Now, come back to the next day.  
6 Do we go back to our 8 where we were this morning?

7 THE WITNESS: Probably, if it is day two.

8 But, if it is day two hundred, he may not be at  
9 8. If it is day two you are still starting off at 8.

10 JUDGE CALLIHAN: So the recovery is marked, but  
11 not complete over an extended period of time?

12 THE WITNESS: That's correct.

13 JUDGE CALLIHAN: And now, let's come to another of  
14 my questions to which you have alluded.

15 What is an overall timescale? Now we talked about  
16 day one and day two. You have said that after some period,  
17 the overnight recovery, if I may so characterize this, has  
18 not been complete, and there is a slight decrement from day  
19 to day.

20 At what rate does that decrease occur? When does  
21 one find that his capability "burns out" and he doesn't  
22 recover to 8?

23 THE WITNESS: This is different for different  
24 people, obviously.

25 JUDGE CALLIHAN: Yes.

um3

1 THE WITNESS: And the term that you have  
2 observed is indeed true for the average individual. But,  
3 at what point in time you find out that you are, A, burnt  
4 out, or feel the need for a break, or to change a job,  
5 or to refresh yourself, would indeed vary from individual to  
6 individual.

7 Some people like to take several short breaks.  
8 For example, they have worked three days, they will take a  
9 day off. Some people like to pack everything into an  
10 extended period of time and take all their recovery period  
11 at that particular time.

12 So, in answer to your question at what point in  
13 time you determine that particular need for a break, the  
14 answer is that it varies from individual to individual. And  
15 we don't know where it would be for a class of individuals.

16 JUDGE CALLIHAN: This is certainly a subjective  
17 performance.

18 THE WITNESS: Yes.

19 JUDGE CALLIHAN: Thank you.

20 Mr. Miller, I apologize for interrupting.

21 JUDGE SMITH: Mr. Miller, while you are  
22 interrupted, before you get away from the Level II inspector  
23 at Hatfield, I would like to ask a few questions about that.

24 MR. MILLER: Please?

25 JUDGE SMITH: I mean at an appropriate time for



mm4 ±

1 you.

2 MR. MILLER: Go right ahead.

3 JUDGE SMITH: Dr. Kochhar, in preparing your  
4 testimony, did you make any effort to evaluate the actual  
5 duties of the inspectors that we are concerned with in this  
6 hearing, in transferring your laboratory results?

7 THE WITNESS: No, I didn't take a look at the  
8 precise duties of the individuals.

9 JUDGE SMITH: What assumptions did you make about  
10 their duties?

11 THE WITNESS: I assumed that they were performing  
12 inspection tasks which were inspection of welds, which  
13 required subjective judgments that were based on criteria that  
14 were used, and basically their decisions were yes, a  
15 particular weld is acceptable, or no, it is not acceptable.

16 JUDGE SMITH: Did you make any assessment of,  
17 for example, any change that might occur in the variety of  
18 their work because of different development of the plant?

19 THE WITNESS: I had, I hope, made the correct  
20 assumption that the kind of work that they performed is  
21 varied, in that they look at different kinds of welds. And  
22 this is likely to change with time. It does provide some  
23 variety of what they do.

24 JUDGE SMITH: Different kinds of welds and  
25 different places in the plant?

mm5

1

THE WITNESS: Yes.

2

JUDGE SMITH: Did you make any effort to determine

3

other aspects of their work that they might enter into?

4

For example, gaining access to a weld, the difficulty of

5

that, the problems that have to be solved before they

end 21

6

can actually inspect the weld?

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

1 THE WITNESS: I am aware of those. I have  
2 visited the Fermi plant and I have seen how difficult it is  
3 to gain access to some places.

4 JUDGE SMITH: Would that have an effect on  
5 breaking up some of the tedium that an inspector might  
6 experience in just having an assembly line type of  
7 inspection, you believe?

8 THE WITNESS: I agree with you. What I was looking  
9 at basically is the inspection task itself; the fact that  
10 they would require some effort or some variety in gaining  
11 access to a particular point in the plant where they need to  
12 make the inspection. It would simply make for the fact that  
13 they are now inspecting fewer welds, if you will.

14 But it's the inspection procedure itself which  
15 is to classify a weld as being acceptable or unacceptable  
16 which is the monotonous procedure.

17 JUDGE SMITH: Did you take into account in  
18 transferring your results a Level 2 inspector may have to  
19 compare the results of his inspection or another inspector's  
20 inspection with the design requirements?

21 THE WITNESS: That is to compare the quality of  
22 the weld? To specify to criteria?

23 JUDGE SMITH: Yes.

24 THE WITNESS: Yes. That is, indeed, what is  
25 the criterion that the individual would use to determine

1 whether or not a weld is acceptable; that's my understanding.  
2 Does it conform to specifications.

3 JUDGE SMITH: Does that have any effect of  
4 breaking up the tedium?

5 THE WITNESS: To a certain extent, yes.

6 JUDGE SMITH: All right. So what you know about,  
7 for example, Level 2 inspectors, welding inspectors, do you  
8 compare them with the assembly line type of inspectors?

9 THE WITNESS: The comparison is only to the  
10 extent that the inspection task is similar. The environments  
11 are different.

12 JUDGE COLE: Dr. Kolchhar, while we have  
13 interrupted, Dr. Callihan asked you a lot of questions about  
14 the daily pattern, and then you got to some questions  
15 concerning a longer-term pattern.

16 Now, are you saying, sir, that we would get the  
17 same pattern over a period of several months that we would  
18 get on a daily basis? And if not, what would be the  
19 difference as you perceive it in the pattern of job  
20 performance versus time?

21 THE WITNESS: The overall pattern over a long  
22 period of time would, in fact, be basically a super-position  
23 of the daily pattern.

24 In other words, the daily pattern indicates a  
25 decrease in trend from the beginning of the day until the

1 end, and that is, indeed, the pattern that one would observe  
2 over a long period of time.

3 JUDGE COLE: I see. The daily pattern, though,  
4 you indicate has a peak in it. You start out at a certain  
5 level, you rise to a certain peak value, and then you degrade  
6 from that point. Did you not, sir?

7 THE WITNESS: That's correct.

8 JUDGE COLE: Now, that's not the pattern you  
9 described for the longer-term job performance versus time,  
10 is it?

11 THE WITNESS: The reason is because where do you  
12 draw that particular gap in there? Besides, as I have  
13 indicated, longitudinal studies have really not been  
14 performed.

15 JUDGE COLE: All right, sir.

16 Now, I want to get more to your basis of making  
17 the statement that the pattern exists as you say it exists  
18 over the longer term, and those studies have been performed.

19 THE WITNESS: The basis for my statement is  
20 mention of this fact in the open literature, which discusses  
21 the need for -- or an examination of fatigue and boredom  
22 in tasks which are of the nature that can impose tedium and  
23 boredom on individuals.

24 JUDGE COLE: Okay. Well, you mentioned fatigue,  
25 tedium and boredom. Would you agree, sir, that fatigue would



1 be a larger factor in the daily pattern rather than the  
2 longer-term pattern, and which would be more affected by  
3 boredom and tedium?

4 THE WITNESS: Well, there's a very fine line  
5 between fatigue and boredom, and what I was referring to  
6 that applies to the longer term is that chronic fatigue,  
7 which is the equivalent of a combination of fatigue and  
8 boredom.

9 The analogy that I used is when a student comes  
10 to campus in September to make up for classes, and on the  
11 first day there's a lot of excitement; at the end of the day  
12 they're tired, but they're ready again for it the next day.  
13 But come December, they are tired. That is chronic fatigue.  
14 Some length of time has elapsed between the time they came  
15 to campus and it's time to take a break. And that's what  
16 I'm referring to as chronic fatigue. It's the repetition  
17 of that pattern of activity.

18 JUDGE COLE: Do you have any information as to how this fatigue  
19 might manifest itself either in quantity of work produced  
20 or quality of work produced, or both?

21 THE WITNESS: Both.

22 JUDGE COLE: What is your basis for that, sir?

23 THE WITNESS: Again, in the literature it has  
24 been cited that one of the manifestations of fatigue is,  
25 in fact, a look at the quality and quantity of work. And

1 in fact, there is no known method of truly measuring fatigue,  
2 for example, like one would measure length or width or  
3 torque. And in fact, fatigue manifests itself in a decrease  
4 in the quality and quantity of output. That's how you know  
5 that you're fatigued.

6 JUDGE COLE: All right, sir. In response to a  
7 question sometime ago about being able to quantify this  
8 difference, you indicated that you could -- you indicated that  
9 you could not do that; you could not quantify the effect  
10 over time. And in your readings of the literature on these  
11 longer-term trends, did they provide any indication as to  
12 the level of change that one observes over time? And of  
13 course, my question is geared towards at what point do you  
14 get down to a level that's unacceptable for the job that  
15 they're doing. And do you have any information on that?

16 THE WITNESS: The answer to that is really, I  
17 don't know because we don't know at what point they reach --  
18 when you would find them unacceptable. Or at least the  
19 quality and quantity of job performance is unacceptable.

20 That depends upon your criteria for acceptability.  
21 But you don't know. I don't know at what point.

22 JUDGE COLE: I see. In your two or three-day  
23 studies, you have established certain criteria to determine  
24 job performance, did you not, sir?

25 THE WITNESS: Yes.

sy6

1 JUDGE COLE: Could you give me an example of  
2 what you used as job performance?

3 THE WITNESS: Yes. We used the number of faults  
4 that were identified correctly on a screen that had a  
5 certain number of faults that were pre-known or known in  
6 the computer program, and determined that with time, the  
7 correct defect detection rate would go down.

8 JUDGE COLE: All right, sir. And did you use  
9 your knowledge of that as a basis for responding to  
10 Dr. Callihan's questions on a scale going from 8 to 9, 7 and  
11 6 and then possibly 5 by the end of the day? Is this the  
12 range that you observed in your one, two, three-day studies?

13 THE WITNESS: Yes, that is the trend. Yes,  
14 that's correct. You see, in human factors we try to get an  
15 understanding of how humans perform and behave in a length  
16 of time or during a period of experimentation. And from  
17 there, attempt to draw some conclusions which are based on  
18 observations.

19 JUDGE COLE: These studies, could they be properly  
20 characterized as assembly line type inspections?

21 THE WITNESS: You could say that, yes.

22 JUDGE COLE: Did you conduct any studies that were  
23 not of that type where the inspector that was trying to  
24 observe the discrepancies had all the time that he wanted  
25 to look at that tire or whatever he was looking at to

1 determine the number of defects that were on it?

2 THE WITNESS: Yes, we did.

3 JUDGE COLE: And what were the results of those  
4 studies, sir?

5 THE WITNESS: The difference between all the time  
6 and a very little time was manifested in -- more in how many  
7 defects one had to look for. In other words, beyond a  
8 certain point in time it didn't matter how much time you  
9 gave them; the performance didn't improve or drastically  
10 change from what it was. For example, if you give an  
11 individual approximately two seconds or three seconds to  
12 observe a particular screenful of parts to examine, and  
13 then ask for an indication of the number of defects observed,  
14 and it is given as X, and if X is correct, then if you  
15 increase the time to four seconds, X is still X. It  
16 doesn't change. And you can continue to increase the time  
17 without any equivalent increment in performance.

18 JUDGE COLE: All right, sir. Now, the people  
19 that you had in your particular studies, you indicated that  
20 they had experience in inspection work.

21 THE WITNESS: Yes, sir.

22 JUDGE COLE: Were they doing the same kind of  
23 inspection in their regular jobs as they were doing in your  
24 laboratory?

25 THE WITNESS: Some were doing similar inspections;

sy221b1

1 some were more like roving inspectors, who would go from one  
2 part of the plant to another.

3 JUDGE COLE: But looking at the same items?

4 THE WITNESS: Similar items, yes.

end22

5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25



sy231b1

1 JUDGE COLE: Did this bias your results, in any  
2 way, do you think, sir?

3 THE WITNESS: Well, the idea behind getting people  
4 who had had experience to come participate in our experiments  
5 was to take a look at people who were already doing something  
6 similar in industry, rather than to have naive, inexperienced  
7 people participate and then try to draw some conclusions, which  
8 would be a little more difficult to justify than if you were  
9 to look at people who were already performing similar  
10 tasks in industry and have them come and participate in  
11 experiements.

12 Thence, the rationale for getting people from  
13 industry.

14 JUDGE COLE: Well, what was the purpose of your  
15 study, sir?

16 THE WITNESS: The purpose of the studies was to  
17 determine how fault information, time for viewing, density  
18 of the display, how many items are to be inspected, how  
19 that correlates to the correct detection.

20 JUDGE COLE: I thought you said false information.

21 THE WITNESS: Fault information. Fault, pardon  
22 me.

23 JUDGE COLE: Okay, thank you.

24 BY MR. MILLER:

25 Q Professor Kochhar, in response to a question from

sy231b2

1 Dr. Callihan, you said that the hypothetical inspector that  
2 you and Dr. Callihan were discussing would not be starting  
3 at the same level that he had on day one. Do you recall  
4 that line of examination?

5 A Yes.

6 Q I believe you also said that the rate at which  
7 performance of an individual inspector would degrade over  
8 an extended period of time would vary from individual to  
9 individual? Is that correct?

10 A Yes, that's correct.

11 Q And a lot would depend on when that individual  
12 took his vacations, if he had any sick leave or anything like  
13 that. It would have to take account of that, too, is that  
14 correct?

15 A I guess breaks, when they take the breaks. Yes  
16 you are right.

17 Q So in order to take account of this factor,  
18 assuming that it exists, for a study such as the Byron  
19 Reinspection Program, we would have to both know the precise  
20 work history of every inspector who was subject to the  
21 Reinspection Program, in terms of when he took his breaks over  
22 time during the year, and other factors that were idiosyncratic  
23 to that individual inspector, in terms of attention span,  
24 intelligence, and so on. Right?

25 A Well, that is perhaps an extreme situation. It's

sy231b3

1 good to have as much information as you can on every  
2 individual, but it's not necessary to do that.

3 Q Well, how else could we determine the rate at  
4 which the performance of these inspectors, as a group,  
5 degraded over time?

6 A The fact that performance of an inspection task,  
7 or performance of any task, would degrade with time is well  
8 established. Now, what you're talking about is the detail  
9 as to how that curve is moving with time. Is that what you're  
10 referring to?

11 Q Yes, sir. We have to establish or quantify  
12 the amount of bias that has been introduced into this  
13 program because we looked at the first 90 days.

14 A Yes, well what I'm saying is that I don't think  
15 anybody could quantify that bias. The fact is that if you  
16 had taken a period of time that was longer and then sampled,  
17 it may have been more reflective of the actual working span.

18 Q Dr. Kochhar, let's say we get to year two in an  
19 inspector's tenure at Byron Station. Will his performance, in  
20 year two, be generally lower than his performance in year one?

21 A If he is at the same job, I would expect that it  
22 would be lower.

23 Q And that trend would continue over his entire work  
24 history at Byron, if he were in the same job? As far as you  
25 know, is that correct?

sy231b4

1 A Yes, you could say that.

2 Q Well, I'm not the one to say it. The question is,  
3 is that your opinion?

4 A Yes, I would say that, yes.

5 JUDGE SMITH: Dr. Kochhar, this phenomenon that  
6 you're describing, the inspector tedium and fall-off of  
7 performance, wasn't first discovered in a laboratory, was it?  
8 I mean, it's something that industry has recognized over the  
9 years?

10 THE WITNESS: Yes, that's correct.

11 JUDGE SMITH: How do they compensate for that?

12 THE WITNESS: They compensate for that by moving  
13 people around within the plant.

14 JUDGE SMITH: Is that the only way?

15 THE WITNESS: That's one way. They compensate  
16 by assigning people to different jobs so that a person who  
17 has been working as an inspector could go and work in another  
18 department which is completely unrelated. Simply because what  
19 happens is they want to make sure that they can account, to  
20 some extent, for the tedium that invariably sets in, especially  
21 in this kind of a job because just the nature of the job  
22 itself.

23 JUDGE SMITH: They don't have any other controls  
24 over inspector fall-off of quality?

25 THE WITNESS: They have another method. For

sy231b5

1 example, a reinspection. They may reinspect something that  
2 has already been inspected. But basically the most effective  
3 method is to move people around.

4 JUDGE SMITH: Okay. I think that we're going to  
5 have to change Dr. Kochhar's travel plans because I don't  
6 see how he is going to wind up in time to leave here to  
7 catch a 5:30 airplane.

8 MR. LEARNER: If I could ask, Mr. Miller, what do  
9 you anticipate in terms of the next couple areas?

10 MR. MILLER: I don't know. I thought they would  
11 be relatively brief. They may be as brief as an hour total.  
12 I do have one more question in this area.

13 JUDGE SMITH: Well, maybe it's premature for me  
14 to be concerned about it.

15 MR. LEARNER: If need be, we will make the  
16 necessary arrangements. Obviously, we would like to avoid  
17 that, but not at the expense of justice.

18 MR. MILLER: Or at the expense of my ability to  
19 cross-examine, which is the same thing by me.

20 (Laughter.)

21 BY MR. MILLER:

22 Q Dr. Kochhar, just so we are clear on this, you  
23 don't know -- as you sit here today -- whether the reinspection  
24 results have been overstated by a half a percent or 20 percent  
25 because of the selection of the first 90 days?



sy231b6

1           A     That's correct. I do not know.

2           Q     Now let me move on to the second area. The second  
3 human factors issue that you discuss in your testimony is  
4 found in answer 21, I believe. And that is at page 10.  
5 And that refers to the fact that the reinspector, in many  
6 instances, knew the identify of the original inspector.

7                     Now once again, the second line of answer 21 says  
8 that the "reinspector's knowledge of the identify of the  
9 original inspector can lead to a bias." That is stated  
10 conditionally. You don't know for sure that it led to a  
11 bias in this instance, do you, Dr. Kochhar?

12          A     That's correct.

end23

13

14

15

16

17

18

19

20

21

22

23

24

25

T24 MM/mmp

2 Q Once again, is it possible to quantify the amount  
3 of bias that knowing the name of the original inspector  
4 introduced into the Byron reinspection program?

5 A No, it does not.

6 Q Now, the second sentence of answer 21 talks about  
7 workplace dynamics and social associations can influence  
8 the reinspector's decisionmaking criteria.

9 By that, Dr. Kochhar, do you mean that if you  
10 have a friend whose work you are reinspecting, you will be  
11 more lenient in grading his inspections?

12 A You may be more lenient and you may be more  
13 strict. Either way.

14 Q If you have an enemy, you may be more strict in  
15 your criteria?

16 A That is correct.

17 Q Now you know, do you not, that some of the inspectors  
18 who were subject to the reinspection program, have left the  
19 Byron site. That is correct, isn't it?

20 A That's correct.

21 Q Do you know, Dr. Kochhar, how the scores in the  
22 reinspection program of the inspectors who had left the  
23 site, compare with those inspectors who are still on the  
24 Byron site?

25 A What are these scores?

Q Well, how well they did in the reinspection

mm2

1 program?

2 A No, I don't know their scores.

3 Q Well --

4 MR. LEARNER: If I could just ask, Mike, are you  
5 referring to statistical analysis of those scores?

6 MR. MILLER: No, just what their passing or  
7 failing percentage was as reported in the reinspection  
8 program report.

9 THE WITNESS: That's what I understood, yes.

10 BY MR. MILLER:

11 Q Would one expect to find generally that the  
12 scores of the inspectors who were still on the site were  
13 higher than those of the inspectors who had left the site?

14 A I don't know what you mean by score. Maybe you  
15 can clarify that for me.

16 Q I think the only way I can do that is to show you  
17 the reinspection program report.

18 Let me show you, Dr. Kochhar, Appendix B to the  
19 reinspection program report.

20 (Document handed to witness)

21 Calling your specific attention to Table B-5,  
22 which is the detailed inspector results for Hatfield Electric.  
23 And you can see that there is a ratio expressed in that table  
24 of the number of reinspections conducted, and the number of  
25 reinspections conducted that agree with the original

mm3

1 inspections.

2 Is that correct?

3 A Yes.

4 Q And from that one can derive a percentage,  
5 correct?

6 A Surely.

7 Q Would you expect, Dr. Kochhar, that that percentage  
8 would be higher for inspectors who were still on the Byron  
9 site as opposed to inspectors who were no longer employed on  
10 the Byron site?

11 A I don't know. There are inspectors who are still  
12 on the Byron site, and some who have left. I don't know.

13 Q What I am really trying to understand, Dr. Kochhar,  
14 is in which direction this bias that you describe in  
15 answer 21 operated. Did it tend to overstate an individual  
16 inspector's results, or did it tend to understate them?

17 A Well, in most cases it would tend to overstate  
18 the results. In some cases it would tend to understate the  
19 results. Without looking at the data, what I am saying is  
20 that if it is known that the identify of the individual who  
21 performed the initial inspection is known by the person who  
22 is doing the reinspection, then there is some bias introduced  
23 which, in most cases, would tend to be a lenient bias; and  
24 in some cases tend to be a nonlenient bias.

25 JUDGE SMITH: I wonder if Dr. Kochhar understood

mm4

1 the significance that you placed in the inspectors who  
2 left the site compared to the inspectors who remained on  
3 the site. He gave the impression he did not.

4 BY MR. MILLER:

5 Q Dr. Kochhar, if an inspector has left the site,  
6 can we assume that the reinspector does not have the  
7 workplace dynamics that you have referred to in answer 21  
8 with that individual?

9 A If the inspector is no longer on the site, and  
10 never knew the reinspector, and never knew who -- if the  
11 reinspector never knew who the original inspector was, then  
12 I would say that there is no bias.

13 Q Well, if the original inspector has left the site --

14 A It is not clear to me if he or she left the site  
15 without ever knowing the reinspector or did he or she at some  
16 time know the reinspector.

17 Do you see what I am saying?

18 Q Yes, sir.

19 A Okay.

20 Q So in other words, it is not a question of whether  
21 the individual is still on the site. It is a question of  
22 whether there was any personal association between the  
23 inspector and the reinspector?

24 A That's correct.

25 JUDGE SMITH: You speak of the industry practice



mm5

1 of taking an inspector and putting the inspector to work  
2 among his coworkers from time to time to break the tedium.

3 What effect does that have upon the inspector's  
4 impartiality when he returns or she returns to the  
5 inspector's post?

6 THE WITNESS: It probably is not very good at all.  
7 But the industry that I am referring to, for example the  
8 auto industry, or small parts manufacturer, has never viewed  
9 that as being very serious.

10 BY MR. MILLER:

11 Q Dr. Kochhar, on page 11 of your -- the sentence  
12 actually begins at the bottom of page 11 and then carries  
13 over to the top of page 12. You say, preventing the  
14 reinspectors from knowing the names of the original inspectors  
15 would lessen the potential for nonconservative bias resulting  
16 from reinspectors being more lenient.

17 MR. CASSEL: I'm sorry, Mike, where is that?

18 MR. MILLER: Bottom of page 11, top of page 12,  
19 in answer 21.

20 BY MR. MILLER:

21 Q Dr. Kochhar, I would like to show you a document  
22 that I marked as Applicant's Exhibit R-2 and R-3.

23 (The documents referred to were  
24 marked as Applicant's Exhibit  
25 R-2 and R-3 for identification.)

JUDGE SMITH: Are you in the middle of a question?

mm6

1 MR. MILLER: No, sir.

2 JUDGE SMITH: I wanted to follow up on his  
3 last remark.

4 Given your last statement that industry does not  
5 think it is an important aspect that the inspector works  
6 with the people whose work he inspects from time to time,  
7 knows and works with the people whose work he inspects from  
8 time to time, how important do you feel this factor is?

9 You don't give it any quantity, but what is your  
10 feeling? Is this an important matter we are talking about  
11 here?

12 THE WITNESS: I understand.

13 In the auto industry and the small parts industry,  
14 traditionally, this has really not been viewed as being so  
15 severe as to create too many defective parts or components.

16 Basically, what I would like to state is that it  
17 does introduce a bias. What is the extent of the bias, I  
18 don't know.

19 JUDGE SMITH: Do you think it is important?

20 THE WITNESS: The bias that is introduced?

21 JUDGE SMITH: Yes.

22 THE WITNESS: I think it could be important for  
23 some industries, perhaps not all of them.

24 Yes, I think it is something that should be  
25 taken into consideration.

mm7

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21
- 22
- 23
- 24
- 25

JUDGE SMITH: At a nuclear power plant?

THE WITNESS: I think so.

end 24

mn251b1

1 BY MR. MILLER:

2 Q Dr. Kochhar, let's look at these two exhibits.  
3 Exhibit R-2 is headed up Hatfield Electric; Exhibit R-3 is  
4 headed up Hunter Corporation. Let me just explain the  
5 columns.

6 The first column is the name of the individual  
7 inspector. The second column are the letter designations for  
8 that inspector that correspond to the letter designations in  
9 the Reinspection Program Report. The next column is the  
10 date on which that inspector terminated his or her status  
11 as an inspector. The next column indicates whether or not  
12 that person is still on the site. That is, if a transfer to  
13 another position on the site, even though it was not an  
14 inspector at Hatfield or Hunter that is indicated.

15 The next two columns are a recordation of the  
16 percentage scores. That is, how close these individuals came  
17 to meeting or exceeding the acceptance criteria for subjective  
18 and objective inspections.

19 Now looking at this data, can you tell whether  
20 or not simply being on the site at the time of the Reinspection  
21 Program introduced a bias one way or the other in the  
22 Reinspection Program?

23 A Just by looking at the data?

24 Q Yes, sir.

25 A I cannot tell.

nm251b2

1 Q What else would you have to know?

2 A Let me explain --

3 MR. LEARNER: Objection. This strikes me as being  
4 beyond the scope of his direct testimony. It's irrelevant.  
5 He's testified as to this earlier and we don't even know that  
6 these figures are accurate.

7 JUDGE SMITH: That's another matter.

8 MR. LEARNER: He's being shown something. I have  
9 some background research, that we undertook, that shows  
10 somewhat different figures and correlations here. I'm not  
11 even sure if this is correct, in terms of the information  
12 being shown to him.

13 In any event, my objection stands. The witness  
14 has testified that he doesn't know, that he couldn't do it  
15 simply on the basis of the assessment. Asked and answered.

16 MR. MILLER: First of all, with respect to the  
17 authenticity of these exhibits, that will be established by  
18 witnesses who will take the stand on rebuttal testimony.  
19 Mr. Learner will have his chance to cross-examine them on the  
20 accuracy of the exhibits.

21 But if I might just press on for one second, with  
22 Dr. Kochhar, on this.

23 BY MR. MILLER:

24 Q If you would look at Exhibit R-2, which is the table  
25 that relates to Hatfield Electric. Can we agree that the lowest



mm251b3

1 score for subjective inspections was recorded at 88.5 percent  
2 for the inspector indicated as Inspector C, and that that  
3 individual is still on the Byron site?

4 MR. LEARNER: Objection. Once again, I believe  
5 it's irrelevant to the point here. Again, we don't have the  
6 accuracy ascertained for this chart at this time.

7 JUDGE SMITH: Don't worry about the accuracy. That  
8 is Mr. Miller's risk. His cross-examination will be without  
9 value if he doesn't establish the accuracy. Let's talk  
10 about the relevance. I don't know. It seems relevant to me.

11 As he pointed out, a fellow inspector, in which  
12 they have apparently up to the moment, contact is still on the  
13 site. That's relevant.

14 MR. LEARNER: But what Professor Kochhar has  
15 testified is that the critical factor here is not just  
16 whether someone was just on or off the site, but the associa-  
17 tions between the reinspector and the inspector. He testified  
18 as to that about ten minutes ago. And this chart doesn't go  
19 to that factor. It doesn't go to the exact argument that  
20 Professor Kochhar made.

21 We don't know, from this chart, who knew who.

22 JUDGE SMITH: His testimony was that -- he didn't  
23 say, as I understand it, and there's a chance for him to clear  
24 it up in a while -- he didn't say -- he said the overall  
25 relevance was whether the reinspector knew the inspector. And

mm251b4

1 that effect would not be wiped out because the inspector left  
2 the site. That's the limit of that testimony on that point.

3 MR. LEARNER: But this chart does not go to which  
4 inspector knew which other inspector. It goes to the timing  
5 of when someone was onsite or offsite.

6 For example, there may have been certain individuals  
7 who were reinspectors who were certified on the same day as  
8 one of the inspectors. So they knew each other, but this  
9 chart would then show that the inspector was offsite later.

10 MR. MILLER: Judge Smith, the point that I'm trying  
11 to address is Professor Kochhar's statement, in his prepared  
12 testimony, that keeping the reinspector from knowing the names  
13 of the original inspectors would lessen the potential for a  
14 non-conservative bias resulting from reinspectors being more  
15 lenient.

16 And it seems to me that what this chart shows is  
17 that to the extent one can discern anything from the Hatfield  
18 data, it is that the person who did the work was a person who  
19 was still onsite and whose name was presumably known, in  
20 Dr. Kochhar's instance, to the reinspector. And I believe that  
21 it demonstrates that the theory may be fine. But as far  
22 as Hatfield was concerned, in practice, it just didn't happen.

23 JUDGE SMITH: Overruled.

24 MR. MILLER: Does anybody remember the question?

25 JUDGE SMITH: The question is isn't it a fact that

bu s2

1 the inspector who received the 88.5, the lowest on the  
2 subjective, was a person who was still there?

3 MR. MILLER: Right.

4 BY MR. MILLER:

5 Q Would you agree that's what the Table R-2 shows?

6 A Yes.

7 Q Doesn't that indicate that, at least for that one  
8 individual, the non-conservative bias resulting from  
9 reinspector being more lenient, which you testified to at  
10 pages 11 and 12 of your prepared testimony, did not take place?

11 MR. LEARNER: Objection. What Dr. Kochhar has  
12 testified to is that in most cases they would be more lenient.  
13 He said earlier that in some cases they might be stricter.  
14 Mr. Miller is characterizing the testimony inaccurately.

15 MR. MILLER: You know, Judge Smith, I don't know  
16 what to make of this testimony. I don't see how, given its  
17 general nature, and the qualifications that are put on all these  
18 conclusions, how it's going to be of any use to the Board at  
19 all.

20 JUDGE SMITH: Right. Looking at the narrow question  
21 and answer and objection, I think that the objection is  
22 sustainable on the basis that you had suggested. An even  
23 greater basis than that hasn't been established, even who the  
24 reinspector was, but who the inspector is. But that's a minor  
25 point. The major point is the one that you're making now,

mna25ln6

1 Mr. Miller.

2 This is beginning to concern me. And that is we  
3 are triers of the fact here. Everyone in this room,  
4 participating in this hearing, has had a rather wide  
5 experience. We've had friends, and we've worked with them,  
6 and we've had enemies that we've worked with. And we have had  
7 to have interfaces with them and deal with them.

8 And I just don't believe that this testimony is  
9 going to overwhelm our own experiences and have a big effect  
10 on our decision. I think it's a lot of time to spend at it.  
11 More time than is suitable for inspectors knowing each other.

12 He says he can't quantify it. I think we ought to  
13 move on to something else.

14 MR. MILLER: I'm happy to do so.

15 end25  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

MM mml

T26

1 BY MR. MILLER:

2 Q Let me turn to the last of the factors that you  
3 have identified as an issue that could lead to bias in the  
4 results. That is that the reinspector knew the original  
5 inspection record, correct?

6 A That's correct.

7 Q Now, Dr. Kochhar, you understand, do you not, that  
8 in the reinspection program by definition every inspection  
9 that was subject to reinspection, was an inspection that  
10 had found the item conforming to requirements?

11 A Yes.

12 JUDGE SMITH: I think that statement for the  
13 purpose that you have asked is true. But in itself -- I  
14 mean, every inspection. Some were as-builts, did you --

15 MR. MILLER: That's correct.

16 JUDGE SMITH: Are you going to come to that?

17 MR. MILLER: I wasn't thinking of dealing  
18 specifically with as-builts.

19 What I was trying to establish, Judge Smith, was  
20 that there were no items put before the reinspector that had  
21 been found by the original inspector to be non-conforming to  
22 the requirements.

23 JUDGE SMITH: Is that correct?

24 MR. MILLER: I believe that to be the case.

25 JUDGE SMITH: All right.



mm2

1 I was inferring that as-builts were reinspected  
2 too, and that the as-builts might be a situation where there  
3 might be idscrepancies, but they have been approved as built.

4 MR. MILLER: Yes, sir. But when the reinspector  
5 went out, he was simply asked to measure the dimensions of  
6 the component as built. And that was compared with the  
7 original inspector's measurements.

8 JUDGE SMITH: Yes. So he did not know in those  
9 instances --

10 MR. MILLER: In those instances, what the  
11 original inspection --

12 JUDGE SMITH: So he did not know that the  
13 original inspector had done correctly or incorrectly, and  
14 it had been accepted?

15 MR. MILLER: That's correct.

16 BY MR. MILLER:

17 Q For as-builts, Dr. Kochhar, there was no  
18 bias introduced by knowledge of the first inspection's  
19 result, is that correct?

20 A Well, it is because we view as-builts as being  
21 primarily the objective measure, anyway. And it is less  
22 amenable to the human factor.

23 Q Let's just focus on subjective inspections.  
24 Perhaps that would be easier.

25 Do you understand, Dr. Kochhar, that all of the

mm3

1 subjective inspections that were a part of the reinspection  
2 program were inspections that had found the welds to be  
3 acceptable?

4 A My understanding is that when the welds were  
5 given for reinspection, the reinspector knew that that weld  
6 had been inspected before.

7 Q And in fact he knew that the original inspector  
8 had determined that the weld was acceptable, isn't that  
9 correct?

10 A Yes.

11 Q Now, you referred to the possible bias that  
12 might be introduced as a result of the reinspector knowing  
13 this fact as a mimic effect; that is found in answer 23 on  
14 page 12.

15 Am I correct that this mimic effect has never been  
16 observed by you personally in any of your laboratory  
17 experiments?

18 A That's correct.

19 Q And this discussion here is rather based on your  
20 review of some literature? Correct?

21 A That's correct.

22 Q Okay.

23 Now it is a fact, is it not, that if an inspector  
24 doing a reinspection function is instructed to be very  
25 thorough and very rigid in his reinspection, that those

mm4

1 instructions would result in a situation where this mimic  
2 effect is lessened?

3 MR. LEARNER: Objection. Is that in the record?

4 Is that phrase, Mike, in the hypothetical, or is  
5 that phrase based on the record in this case?

6 MR. MILLER: Mimic effect?

7 MR. LEARNER: Your question regarding the  
8 instructions.

9 MR. MILLER: It will be in just a second. Yes, it  
10 is in the record.

11 MR. CASSEL: Judge, I don't believe that is in  
12 the record. The testimony by Mr. Teutken was that the  
13 contractors themselves orally provided instructions directly  
14 to the inspectors.

15 We have no documentation concerning any written  
16 instructions to be thorough, and I don't recall any oral  
17 testimony that would lay that foundation either. It is a  
18 helpful assumption from Edison's point of view to assume that  
19 all the inspectors were told to go out there and be thorough,  
20 but it is not in the record that I know of.

21 MR. MILLER: Well, let me modify the question.

22 BY MR. MILLER:

23 Q Dr. Kochhar, if the inspectors in fact were very  
24 thorough and very rigid in their reinspection, would that  
25 result in a lessening of the mimic effect that you testified to?

mm5

1 A Yes.

2 Q And it is, in fact, possible under such  
3 circumstances, that the reinspectors may have found non-  
4 conforming items that had been previously passed by the  
5 original inspector, correct?

6 A That is certainly possible, yes.

7 Q Isn't that, indeed, what happened in the reinspection  
8 of welds at the Byron station?

9 A I'm sorry, would you rephrase that, please?

10 Q Isn't that in fact what happened in the reinspection  
11 of welds at the Byron station, that the inspectors were  
12 so thorough and so rigid that they found non-conforming items  
13 that had previously been passed by the original inspectors --

14 MR. LEARNER: Objection.

15 Mr. Miller is seeking to inject testimony as to  
16 how thorough and how rigid they were.

17 If the question is, did they find non-conforming  
18 results, I think Dr. Kochhar could clearly answer it. But  
19 that is not the question as stated.

20 MR. MILLER: Mr. Learner is quite right. That is  
21 not the question as stated.

22 I would like to stand on that question, Judge  
23 Smith, because I believe that the testimony in this proceeding  
24 establishes just the factual predicate for my question, and  
25 I will get to that in just one second.

end T26

1 JUDGE SMITH: Well, the difficulty with the  
2 question is that it requires him to accept perhaps a  
3 colloquialism so thorough and so rigid in their inspection.  
4 That implies a great amount of thoroughness and discipline,  
5 as compared to a sufficient amount to find the discrepancies.

6 I mean, if he can accept the premise, that's fine.  
7 But the question means it was a great amount of thoroughness.

8 BY MR. MILLER:

9 Q Dr. Kochhar --

10 MR. LEARNER: I have an objection pending, Your  
11 Honor, to the question as it's phrased.

12 JUDGE SMITH: Well, the ruling -- the objection  
13 is overruled. However, I think that we should make sure that  
14 the witness understands what the questions means and determine  
15 whether he can accept the precise.

16 MR. LEARNER: If I understand the premise of the  
17 question, Your Honor, it is that since the reinspectors  
18 found some non-conforming items, namely items that had  
19 previously been found acceptable that are now found to be  
20 unacceptable, then the reinspectors must have been unusually  
21 rigid and thorough.

22 And of course, we would assume the reinspectors  
23 would find some non-conforming items --

24 JUDGE SMITH: Now wait a minute. You're telling  
25 your witness how he should answer. If he can accept the



sy271b2

1 premise of that question, if he believes that the results  
2 do demonstrate that, he can testify to it. If he doesn't  
3 believe that, then he can reject the question.

4 But the point that I'm concerned about, does he  
5 understand the implications of the question, the premise  
6 of the question. If he can't accept that premise, then he  
7 can reject it.

8 Do you understand what is meant by the question?

9 THE WITNESS: Yes, I understand. Are you referring  
10 to the data here? Are you referring to the reinspection data?

11 BY MR. MILLER:

12 Q Yes, sir, on subjective weld examinations.

13 A I accept the premise that, in some cases, you would  
14 have what we call a false alarm, essentially, or false accept  
15 or false reject partly, in that a good component or a  
16 conforming component is found to be non-conforming. That  
17 is one error that any inspector can make at any time.

18 That can be made during the reinspection or it can  
19 be made during the initial inspection.

20 Q Do you know whether or not, to use another  
21 colloquialism, the reinspectors were so gun-shy about passing  
22 borderline welds that they called welds unacceptable which  
23 were, in fact, acceptable?

24 A Yes, I know that they did.

25 Q And did you read the testimony of Mr. Kevin Ward,

sy271b3

1 in this proceeding?

2 A I did not.

3 Q Well, to the extent that reinspectors at Byron  
4 were gun-shy and were calling acceptable welds unacceptable,  
5 don't you agree that that offsets the mimic effect that you  
6 testified to in answer 23 on page 12 of your prepared  
7 testimony?

8 MR. LEARNER: Objection, Your Honor. The question  
9 -- Mr. Miller is asking a question of degree here, to what  
10 extent is he referring to. Dr. Kochhar has testified that he  
11 is not familiar with Mr. Ward's testimony. Therefore, the  
12 offset that's being asked about --

13 JUDGE SMITH: He said he was aware. He was  
14 aware of acceptable welds being rejected on reinspection. You  
15 are aware of that. To the extent that you are aware of that,  
16 do you agree that that is an offset of the mimic effect?  
17 I think that's the question.

18 MR. MILLER: That's correct.

19 THE WITNESS: To some extent, yes. It would do  
20 that. But to what extent, I don't know.

21 JUDGE SMITH: Along that line, there is a song,  
22 I guess, that fish got to swim and birds have to fly. And  
23 inspectors have to inspect. Isn't there a tendency of  
24 inspector, when he goes out with his flashlight, and his  
25 various devices, to want to find defects, even though

sy271b4

1 objectively he wishes they weren't there? But isn't there  
2 that tendency to justify your own existence and justify your  
3 own job?

4 THE WITNESS: I agree that there is, but --

5 JUDGE SMITH: Does that tend to offset any of the  
6 biases?

7 THE WITNESS: What I'm saying is that this tendency  
8 will decrease with time. It, indeed, could offset some of the  
9 biases, yes, it could.

10 JUDGE SMITH: That, too, cannot be quantified, however

11 THE WITNESS: That's correct.

12 BY MR. MILLER:

13 Q Dr. Kochhar, it is also a fact that if an inspector  
14 knows that he is inspecting a safety related component, an  
15 inspector is likely to be more careful, isn't that correct?

16 A Yes.

17 Q And you base that opinion, do you not, on your  
18 own engineering judgment?

19 A Yes.

20 Q And we have had a lot of discussion of engineering  
21 judgment. I was wondering whether you could define that  
22 term, as you have used it in your preceding answer?

23 A Have I used this before?

24 Q Yes, sir.

25 A In my testimony?

sy271b5

1 Q Well, it appears in your deposition, and I would be  
2 happy to read that definition into the record and then simply  
3 ask you if you agree with it. It's found at page 47 of  
4 Professor Kochhar's deposition -- no. I gave the wrong page  
5 reference, one second. Page 38 of Professor Kochhar's  
6 deposition.

7 "Engineering judgment is a combination of experience  
8 and knowledge and the judgment is made taking into account all  
9 available data, but which data are inadequate or incomplete."  
10 Well, I have not read his answer accurately. Let me strike  
11 that.

12 The question to Dr. Kochhar's deposition is "Under  
13 what set of circumstances would you apply engineering judgment  
14 to a situation before you?" The answer was "If engineering  
15 judgment is a combination of experience and knowledge, and  
16 the judgment is made taking into account all available data,  
17 but which are inadequate or incomplete, under those circumstances  
18 I would make an engineering judgment."

19 A I would stand by it.

20 MR. MILLER: Okay. I have no further questions of  
21 Dr. Kochhar.

22 JUDGE SMITH: Staff?

23 Shall we take a -- let's see, it's ten after three.  
24 Shall we take an afternoon break before you begin your cross-  
25 examination? Are you concerned?

sy271b6

1                   MR. WILCOVE: I would prefer, if we could, to take  
2 a break. I think that may even cut down the number of  
3 questions I have.

4                   JUDGE SMITH: All right. Ten minutes.

5                   (Recess.)

end27

6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25



Index

1 JUDGE SMITH: Back on the record.

2 BY MR. WILCOVE:

3 Q Dr. Kochhar, if you could turn to page 7 of  
4 your testimony, that is Answer 15, Mr. Miller asked you  
5 about the sentence that goes, "In fact, the impact of various  
6 human factors can be studied more precisely..." and so on.  
7 Do you have that sentence, Dr. Kochhar?

8 A I do.

9 Q And correct me if I'm wrong, but you were asked  
10 about what you meant by the "variables" in the line that  
11 says, "Many more variables are present..." And I believe you  
12 gave examples of these variables as the fact that the  
13 inspector has to earn a paycheck and the social dynamics.  
14 Am I right?

15 A Yes.

16 Q What I'm confused on is, "These variables affect  
17 observation." What do you mean by "affect observation"?

18 A Well, perhaps I can best illustrate that through  
19 an example. For example, some experts who have studied  
20 inspector performance in the laboratory have used what is  
21 called a payoff matrix. In other words, there's a reward  
22 associated with a correct identification of a defective  
23 part, and a penalty associated with an incorrect identification  
24 of a good part.

25 If you look at the real life that an award in a

1 laboratory might be brownie points or a dollar or two  
2 or whatever, but in real life what we are looking at is the  
3 individual's job with the company, status, possibility for  
4 promotions, those kinds cannot truly be studied in the  
5 laboratory.

6 But in terms of observation you can see, or you  
7 can take a look at it and the payoff matrix or the tradeoff  
8 that the individual associates with a correct decision as  
9 compared to an incorrect decision can be observed on the  
10 job site, or even in the laboratory. That's what I was  
11 referring to. You can observe this. Is that clear?

12 Q But out in the real world, the fact that a  
13 variable such as the fact that a QC inspector will receive  
14 a bonus if he does a good job -- that is something that is  
15 going to affect his performance; am I right?

16 A Could you rephrase that question, please? I  
17 didn't hear the latter part.

18 Q It is your testimony that if a company, let's say,  
19 is going to give QC inspectors raises or monetary bonuses  
20 if they inspect well, if they identify items correctly, that  
21 would affect the performance of the inspector?

22 A Well, what's likely to happen from the perspective  
23 of the human factors is when you say performed well, it goes  
24 two ways. One, identification of faulty, defective, non-  
25 conforming parts correctly; and finding non-conforming

1 something that is conforming. In other words, you are  
2 increasing the hit rate as we call it. So if the bonus is  
3 tied to how many he can separate as being defective, and if  
4 it's tied to the number of defective, then you are likely to  
5 get an erroneous result simply because you're tying the  
6 monetary reward to how many are determined to be non-  
7 conforming. Obviously, that would not be a good way to do it.

8 But if, indeed, what you're saying is that there's  
9 a monetary reward associated with being a good inspector,  
10 and by a good inspector you mean is he thorough, his  
11 supervisor thinks he's doing a good job, when his work is  
12 reinspected it is, indeed, found to be quite accurate, then  
13 yes, indeed.

14 Q By yes, indeed -- yes, it will affect the  
15 inspector's performance?

16 A Yes.

17 MR. WILCOVE: Mr. Chairman, I don't have any  
18 further questions.

19 BOARD EXAMINATION

20 BY JUDGE COLE:

21 Q Dr. Kochhar, I have just one or two questions.  
22 On pages 12 and 13 of your testimony, particularly at  
23 page 13, -- well, let's take page 13. In response to  
24 question 24 you state that, "In most cases, the reinspectors  
25 knew the names of the original inspectors." Do you see

Index

1 that, sir?

2 A Yes, I do.

3 Q What is your basis for making that statement,  
4 sir? On what do you rely?

5 A It was a summary statement provided to me by  
6 Mr. Learner.

7 MR. LEARNER: Judge Cole, if it would be helpful,  
8 we provided him with a copy of Commonwealth Edison's answers  
9 to our second set of interrogatories. That testimony by  
10 Dr. Kochhar I believe is based upon Edison's response.

11 If it would be useful, I would be glad to read  
12 that response into the record.

13 JUDGE COLE: Okay. Well, that's not currently  
14 in the record. Do you have the response there?

15 MR. LEARNER: Yes. Would you like me to read --  
16 it's about a page and a half.

17 JUDGE COLE: Well, I don't know whether all that  
18 is necessary.

19 MR. LEARNER: I think we can state that the  
20 testimony of Dr. Kochhar is fairly close to identical to  
21 Edison's interrogatory responses.

22 JUDGE COLE: All right. Well, let me state the  
23 reason why I asked the question. I had certain recollections  
24 about the percentage of reinspectors whose work was inspected  
25 in the Reinspection Program, and I had certain impressions

1 that the percentage was somewhere around 50 percent or less.  
2 And you used the word "most", and I was questioning the  
3 basis because of my recollection about the number of  
4 inspectors who were no longer around by the time the  
5 Reinspection Program came along.

6 But if that's a response, then, fine. That's  
7 your basis. Okay, thank you.

8 BY JUDGE CALLIHAN:

9 Q On that same page, Dr. Kochhar, in that same  
10 response at the bottom of page 3 -- I beg your pardon, the  
11 bottom of page 13, Answer 24, you hint at any rate that more  
12 meaningful information might come out of the Reinspection  
13 Program than you consider has come out thus far.

14 A Yes.

15 Q Well, how might one -- in my interpretation of  
16 your words -- how might one salvage that additional insight?

17 A Some of these biases, of course, are all after  
18 the fact, and one may not be completely able to eliminate  
19 them. However, I think in any reinspection program it would  
20 certainly help a great deal if the program were so designed  
21 that there was no knowledge of the fact that work had  
22 already been inspected, no knowledge. And from that it  
23 follows no knowledge of who did it.

24 And if the period of observation had been longer,  
25 all of these would have helped.

Index



- 1 Q Longer than the maximum 90 days?
- 2 A That's correct.
- 3 Q I'm sorry, longer than the 90 days; 30 or 90 days.
- 4 A Yes.
- 5 Q Is there any way in which one might compensate
- 6 for or correct for the knowledge of previous inspectors?
- 7 A I think Dr. Erickson will address this issue,
- 8 but I believe it can be done by taking more samples, taking
- 9 a greater sample of the work. That tends to mitigate some
- 10 of the biases.
- 11 But Dr. Erickson will address that issue
- 12 tomorrow, I believe.
- 13 Q Well, this is more a removal of a bias than
- 14 correcting any biases which might be present at the moment.
- 15 A Not --
- 16 Q I understand your answers to be addressed to
- 17 that.
- 18 A Yes. Not a removal, but certainly mitigation
- 19 of some of the biases.
- 20 JUDGE CALLIHAN: That's all I have, thank you.
- 21 MR. LEARNER: Thank you, Judge Smith. I have
- 22 very quick redirect.
- 23 REDIRECT EXAMINATION
- 24 BY MR. LEARNER:
- 25 Q Dr. Kochhar, in response to several of

1 Mr. Miller's questions you referred to basing some of your  
2 judgments on the literature. Could you please explain briefly  
3 what you meant by the literature?

4 A The literature is papers, books, journals, written  
5 by other experts in the field. We collectively refer to that  
6 as the literature.

7 Q Also in response to several of Mr. Miller's  
8 questions you talked about your extensive laboratory research  
9 experience. How much time on the average each week do you  
10 actually spend in an industrial or manufacturing plant setting?

11 A About a day and a half each week. That is spent  
12 out in industry, or industry settings.

13 Q So would it be typical that over the course of a  
14 year you would spend, oh, roughly 75 days in actual  
15 manufacturing plants?

16 A That's correct.

17 MR. LEARNER: Thank you. I have no further  
18 questions.

19 RE CROSS EXAMINATION

20 BY MR. MILLER:

21 Q Dr. Kochhar, the one and a half days each week  
22 you spend in an industrial setting is not, however, spent  
23 or involved with the inspection process, is it?

24 A It is spent involved with visual problems normally  
25 encountered in industry and inspection falls into that

Index

1 category. Lately, I have been looking at control panel  
2 designs for other companies.

3 Q In the production process, correct?

4 A Yes.

5 Q And the 1½ days each week that you spend in  
6 the industrial site is that for, what, calendar year 1983,  
7 1984?

8 A Calendar year 1983. Calendar year 1984 is now  
9 running at about that level.

10 Q Of those 1½ days each week, how much of your  
11 time is spent involved with problems of production, and how  
12 much is spent with problems of inspection?

13 A Basically, we look at human problems in industry,  
14 and I would say that lately, they have been mostly related  
15 to problems of how the human interacts with industry;  
16 problems of production.

17 Q In response to --

18 MR. CASSEL: I don't know that the witness had  
19 completed his answer.

20 THE WITNESS: Let me finish. I would say lately,  
21 approximately about 85 percent of the time in production  
22 type, and 15 in general problems of inspection.

23 BY MR. MILLER:

24 Q And that 15 or so percent includes these very  
25 brief consulting assignments that you referred to earlier

SY/mml

1 in my examination, is that correct?

2 A Yes, it is.

3 Q In response to a question from Dr. Callihan, you  
4 said that one way to remove all these biases would be to  
5 get reinspectors into the power plants who had no knowledge  
6 that the original inspections had been done.

7 Is that correct?

8 A The word I used was to "mitigate" rather than to  
9 "remove."

10 Q All right.

11 Do you know whether it is practical and feasible  
12 to find qualified inspectors, bring them to the Byron  
13 station, and to have them conduct reinspections without  
14 knowing that an original inspection has taken place?

15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
end  
T28

sy291b1

1 A It's very difficult, I understand.

2 MR. MILLER: No further questions.

3 MR. WILCOVE: I have just a couple of questions.

4 BY MR. WILCOVE:

5 Q Dr. Kochhar, in these one and a half days a week,  
6 when you are looking at inspection matters, inspection  
7 problems, do you interview inspectors?

8 A Yes, indeed. It is part of the entire process  
9 because when you are designing for humans and you have humans  
10 involved, you have to talk them, yes.

11 Q Have you ever interviewed any of the inspectors  
12 who did the Reinspection Programs?

13 A No, I have not.

14 Q And in these one and a half days, or during the time  
15 when you are in a manufacturing setting, working on other  
16 inspection matters, do you also talk with management?

17 A Yes, I do, routinely.

18 Q Did you talk to any of the management involved with  
19 the reinspection program at Byron?

20 A No, I did not.

21 MR. WILCOVE: No further questions.

22 JUDGE SMITH: Anything further?

23 MR. LEARNER: No, sir.

24 MR. MILLER: No, sir.

25 JUDGE SMITH: Dr. Kochhar, we appreciate very much

INDEX



sy291b2

1 your coming here and you are excused, sir.

2 THE WITNESS: Thank you for this opportunity.

3 (Witness Kochhar excused.)

4 MR. LEARNER: We would like to thank the Board  
5 for their graciousness in helping us get him back to his  
6 flight. Thank you very much.

7 (Pause.)

8 JUDGE SMITH: Mr. Learner, we have this letter about  
9 the Bondo. It's not going to be offered into evidence?

10 MR. WRIGHT: Your Honor, we have not yet offered  
11 it into evidence, but we do anticipate making reference to  
12 that document.

13 JUDGE SMITH: All right.

14 Shall we hear the arguments on Stokes?

15 MR. CASSEL: Were you expecting, Judge, to state  
16 the reasoning on the Bleuel motion today?

17 JUDGE SMITH: I suppose we can. I would prefer to  
18 give a higher priority to Stokes and see if we can resolve that,  
19 so we know exactly where we are. I see no particular urgency  
20 on Bleuel. I mean, it's either today or tomorrow morning.  
21 I would probably prefer tomorrow morning. If we have time,  
22 we'll do it today.

23 Just take the priority first. Are you ready for  
24 Stokes?

25 MR. CASSEL: Yes, we are, Judge.

sy291b3

1 (Discussion off the record.)

2 JUDGE SMITH: On the record.

3 MR. LEWIS: Mr. Chairman, I believe that the  
4 motion is in writing and Staff has not put a position on the  
5 record. I don't know how you want to proceed. I assume that  
6 Mr. Wright or Mr. Cassel is going to respond.

7 But I thought maybe it would be appropriate, before  
8 they did, if they were to hear the Staff's --

9 JUDGE SMITH: Probably, yes. I think so. It  
10 would save one round.

11 MR. LEWIS: Right.

12 Well, then I would like to briefly state our  
13 position on the motion. I think that the most useful way  
14 for the Staff to understand the motion and its effect upon  
15 the testimony of Mr. Stokes is to look at those items which  
16 would be left in the testimony under the motion and to get  
17 an understanding and a characterization of what it is about  
18 those answers, or those questions and answers, that relates  
19 them to this proceeding. And I have done that.

20 And what I find is that starting with question and  
21 answer 24, which is the first of the substantive questions and  
22 answers, as to which there is not a motion to strike, that  
23 item deals with so-called flare-bevel grooved welds and  
24 there is an assertion, in that question and answer, that there  
25 could be a potential effect on Hatfield Electric Company conduit

sy291b4

1 and cable trays and on Hunter pipe supports if the concern  
2 raised by Mr. Stokes were to be demonstrated to have merit.

3 Question and answer 25 concerns welds in the  
4 Reinspection Program. It's a question and answer which is  
5 based upon an inspector's report or one of the contractor  
6 inspector's reports, I believe, or a log. I believe it was  
7 a Hunter Quality Control inspector.

8 And there is an assertion that the discrepant  
9 welds that are identified in that log did not appear on the  
10 list of those reviewed by Sargent & Lundy.

11 Question and answer 26 dealt with pipe supports  
12 subject to fatigue, and it made an assertion regarding an  
13 element called convexity that should have been considered in the  
14 analysis by Sargent & Lundy.

15 Question and answer 27 raised the question as to  
16 which version of AWS Code D1.1 was the version, or is the  
17 version, to which Commonwealth Edison Company is committed and  
18 raised a question regarding whether that is the 1983 version  
19 or not.

20 Question and answer 28 followed on from that.

21 Question and answers 34 and 35 related to Systems  
22 Control Corporation. And question and answer 36 related to  
23 Hunter Corporation ASME welds.

24 Now the attachments, to which there was not a  
25 motion to strike, were in addition to the resume which is

sy291b5

1 Attachment number 1. Attachments 7 through 16, which I  
2 believe to be attachments that are either directly referenced  
3 in or are related to those questions and answers in the  
4 text of the testimony which -- as to which there is not  
5 a motion to strike.

6 The reason I've gone through it this way, Mr.  
7 Chairman, is that I believe there is a logical theme in those  
8 questions and answers that does relate them to the subject  
9 matter of this proceeding.

10 As to the ones that are on Systems Control, they  
11 are raising questions about certain concerns he has, with  
12 respect to the adequacy of Systems Control equipment.

13 As to welding concerns, or pipe support concerns,  
14 they are raising questions related to the contractors in this  
15 remanded proceeding and are raising questions as to what codes  
16 are committed to by Commonwealth Edison with respect to the  
17 analysis of welding.

18 Now by contrast, the other questions and answers  
19 in the testimony of Mr. Stokes, predominantly deal with issues  
20 of design criteria. Also, there's a series of questions that  
21 deal with a subset of that, having to do with seismic  
22 responses.

23 And although there is, in some of those answers,  
24 a very brief statement that the design criteria for Byron, as  
25 set forth in a Sargent & Lundy document, play some role in



sy291b6

1 the Reinspection Program engineering evaluations conducted by  
2 Sargent & Lundy.

3 Staff was unable to find any sufficient elaboration  
4 of that point to really understand what the connection  
5 was between the design criteria discussed in the testimony,  
6 in those other questions and answers, and the Reinspection  
7 Program engineering evaluations.

8 In the absence of that type of an indication of  
9 the interrelationship between the design criteria and the  
10 Sargent & Lundy engineering evaluations, the Staff finds those  
11 categories of questions and answers to relate to a separate  
12 issue than is before this Board, namely to an issue more related  
13 to original design criteria. I don't even know if I want  
14 to characterize it as a Quality Assurance issue. If it is  
15 a Quality Assurance issue, it is certainly a design Quality  
16 Assurance issue, which is a significantly different topic than  
17 the construction Quality Assurance issues that we are  
18 considering in this proceeding.

19 But basically, the Staff did not detect a Quality  
20 Assurance bent to the question, so we rather viewed it as a  
21 question on raising a number of concerns regarding the  
22 adequacy of design criteria.

23 And having reviewed the motion of the Applicant,  
24 we've considered each of the bases put forward and we find  
25 ourselves in agreement with the Staff's motion.



sy291b7

1 JUDGE COLE: You mean with the Applicant's motion?

2 MR. LEWIS: Oh, I'm sorry. I mean the Applicant's  
3 motion.

4 I would make some very minor points. On page 5  
5 of the Applicant's motion, in paragraph D, there is a  
6 discussion about question and answers 15 through 17 and the  
7 objection that is raised is that they relate to the design  
8 of embedded plates erected by Blount Brothers Corporation.  
9 And we would think that same reasoning would also apply to  
10 question and answer 18, which is simply a continuation of  
11 that discussion.

end29

12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

T30 MM/mml1

2 So we would support the portion of that motion as  
3 it relates to questions and answers 15 through 17. But we  
4 would add question and answer 18 to that.

5 On page 6 of the Applicant's Motion --

6 JUDGE SMITH: On that point, Mr. Gallo, what is  
7 your view of the Staff's comment on 15 and 17? Do you feel  
8 18 should be included?

9 MR. GALLO: Yes, it should be included. It was an  
10 error on our part.

11 JUDGE SMITH: So we will just adjust it.

12 MR. GALLO: Yes.

13 MR. LEWIS: On page 6 of the Motion, in paragraph  
14 5 there is a discussion of whether or not Mr. Stokes is  
15 qualified to testify as an expert on matters concerning the  
16 seismic design of the Byron station.

17 The Staff would certainly agree that based upon  
18 what we learned at the two depositions of Mr. Stokes, that  
19 he would not be in a position to offer an opinion as to  
20 whether or not -- he does not have the degree of site-specific  
21 knowledge regarding the seismology or the acceleration  
22 factors at the site to offer an opinion as to whether or not  
23 particular equipment would or would not be able to withstand  
24 a seismic event at the Byron site.

25 It may be that in his experience applying seismic  
input from other experts, he might have some basis for a

mm2

1 generalized point as to whether or not certain factors had  
2 been improperly neglected in the seismic analysis.

3 In any event, the Staff would rely in supporting  
4 the motion to strike, would rely more upon the fact that  
5 these are design considerations unrelated to the issues  
6 before this Board or to the particular contractors before  
7 this Board, rather than upon whether or not Mr. Stokes  
8 might have some degree of knowledge to come before this  
9 Board to speak with respect to certain seismic considerations.  
10 And he may have some qualifications in that limited sense.

11 The Applicant also attached some importance to the  
12 fact that Mr. Stokes had not studied seismic analysis as  
13 part of his college curriculum.

14 The Staff would not particularly attach any  
15 importance to this. It is our understanding this is not  
16 normally a part -- in any event, an undergraduate curriculum,  
17 but would more particularly be picked up in further studies  
18 as one is in the workforce.

19 But, in any event, that does not affect our view  
20 that this -- this is still with respect to paragraph 5, and  
21 we still find that whole discussion to relate to design  
22 issues which are not before this Board.

23 Thank you.

24 JUDGE SMITH: There was a preliminary matter on  
25 this, before going into discussion.

mm3t

1 We had difficulty, Mr. Gallo, with aspects of  
2 Mr. Stokes' affidavit.

3 MR. GALLO: Kostal's affidavit?

4 JUDGE SMITH: Kostal's affidavit. On page 2,  
5 paragraph number 4, twice the sentence, "the criticisms of  
6 the design criteria are in no way tied to any of the  
7 evaluations performed by Sargent & Lundy and discrepancies  
8 discovered during the conduct of the reinspection program."

9 MR. GALLO: I think, perhaps, Judge Smith the  
10 words that are missing from that sentence "that are in no  
11 way tied to Mr. Stokes."

12 JUDGE SMITH: I am also beginning to see words  
13 in that sentence that I didn't recognize when I was reading  
14 it.

15 Yes, I see. Criticisms. Yes, all right.

16 MR. CALLIHAN: Do you wish to make an addition,  
17 Mr. Gallo?

18 MR. GALLO: No. This was just by way of  
19 clarification to answer Judge Smith's question.

20 JUDGE SMITH: As I read it now I understand it.  
21 We had a rather extended discussion before, and  
22 it really didn't pop out.

23 Okay.

24 (Board conferring)

25 JUDGE SMITH: I think now we should hear from

mm4

1 who is going to argue the motion.

2 MR. WRIGHT: I shall, Judge Smith.

3 At the expense of being double-teamed, I shall  
4 go forward.

5 JUDGE SMITH: Mr. Wright, the first thing I should  
6 like for you to address, if you will, is having heard,  
7 having read the motion and heard the motion and read the  
8 affidavit, is there any aspect of the testimony that you wish  
9 to alter?

10 MR. WRIGHT: Yes. As a preliminary matter, Judge  
11 Smith, I was going to raise the point of Attachment 6 that  
12 I think is in Mr. Gallo's motion. It was also referred to  
13 by the Staff.

14 We found out in the deposition of Mr. Stokes,  
15 that -- we were going to correct this. We thought it pertained  
16 to flared bevel welds. And we now understand that it pertains  
17 to fillet welds.

18 And with that we would acquiesce in the removal of  
19 Attachment 6. But also state that Mr. Stokes' allegation with  
20 respect to that Attachment 6 and 7 stands on its own and in  
21 conjunction with Attachment 7.

22 JUDGE SMITH: You are not withdrawing 6?

23 MR. WRIGHT: We are withdrawing 6, but for the  
24 record, his allegation stands on its own.

25 JUDGE COLE: 6 is two pages, is that right?



mm5

1 MR. WRIGHT: That is correct, Dr. Cole.

2 JUDGE COLE: Pages F-1 and F-13?

3 JUDGE SMITH: It is out.

4 Is that all?

5 MR. WRIGHT: That's all, Judge.

6 JUDGE CALLIHAN: Was it bound, Mr. Wright, between  
7 Attachments 5 and 7?

8 MR. WRIGHT: Yes, it was.

9 JUDGE CALLIHAN: It is missing from my copy.

10 MR. CASSEL: We were alert early to removal it  
11 from your copy, Judge Callihan. I don't know how we didn't  
12 foresee that for everyone else's.

13 (Laughter)

14 JUDGE SMITH: So it was in the customary place  
15 for 6, that is between 5 and 7?

16 MR. WRIGHT: That's correct, Judge Smith.

17 Unless you have any further questions, I will  
18 go on.

19 With respect to the question of relevance in the  
20 design criteria not directly affecting Hatfield and Hunter,  
21 Mr. Stokes is not testifying conclusively on hardware issues.  
22 He is calling for an engineering analysis.

23 The point to which he testifies is relevant to  
24 that recommendation.

25 Now at the outset, I think in Mr. Gallo's motion,

mm6

1 he indicates that Mr. Stokes is calling for an independent  
2 design investigation and review.

3 Now the independent design review was not in his  
4 prefiled testimony. He was asked this question at his  
5 deposition and he agreed. Mr. Stokes does call for an  
6 independent engineering analysis of the reinspection program  
7 discrepancies, which is quite different from an independent  
8 design review, and his testimony supports that call or that  
9 recommendation.

10 Mr. Stokes' testimony in full goes to the  
11 credibility of the Sargent & Lundy engineering evaluation  
12 that was performed. He recommends that there be an  
13 independent engineering analysis.

14 Mr. Stokes testifies that Sargent & Lundy has  
15 not been as sterile, as careful and as objective as  
16 deserved by the importance of this issue. To the extent that  
17 he points out flaws in the analysis, he is supporting those  
18 basic points in his testimony.

19 Now, even if there were no other relevant grounds,  
20 if there were no other grounds, this point, that of  
21 credibility would justify the admission of his prefiled  
22 testimony. The inference of plant quality and safety to  
23 the extent made in the testimony of Mr. DelGeorge and  
24 Mr. Keppler -- Mr. Stokes' testimony raises doubts about  
25 that inference as to the safety of equipment at the Byror.

um7

1 station. And to that extent is relevant and probative.

2 Now, some of the hardware -- although some of the  
3 hardware he in here addresses may not be Hunter or Hatfield  
4 hardware, it has a direct effect on the Hunter or Hatfield  
5 hardware. A prime example is the question of embedded plates.  
6 These embedded plates are attached to conduit supports and  
7 pipe supports, and these things were constructed and  
8 inspected by Hatfield and Hunter.

9 And the integrity of the pipe supports and the  
10 conduit supports that he testifies to, has a direct relation  
11 to the embedded plates. And, for that matter, the safety  
12 of the design or the inspection of the embed plates is  
13 certainly relevant to that testimony.

14 Now the reinspection program -- my comments now  
15 really go to the Motion to strike questions 29 and 33,  
16 talking about the adequacy of the Sargent & Lundy evaluation  
17 of certain welds inspected by PTL.

end 30

18  
19  
20  
21  
22  
23  
24  
25

1                   Now, in that sense, the Reinspection Program  
2 relies on the engineering evaluations performed by Sargent  
3 & Lundy to indicate that there are no safety significant  
4 problems at the Byron Station in the discrepancies that they  
5 analyze.

6                   Now Sargent & Lundy looked at discrepancies from  
7 Hunter, Hatfield, and PTL and they evaluated those discrepancies.  
8 In this proceeding the engineering evaluations performed by  
9 Sargent & Lundy are at issue and it is a proper subject for  
10 Mr. Stokes' testimony.

11                   Now to the extent that PTL did not actually perform  
12 the welds, I think is of little consequence because they  
13 inspected that weld and Sargent & Lundy looked at the  
14 discrepancies in their inspections and determined that there  
15 was no safety significance. To that extent, 29 and 33 are  
16 relevant.

17                   Also, the safety impact of equipment, although  
18 not classified as safety related equipment -- for example,  
19 the turbine foundation that is the subject of question and  
20 answer number 12. Now even though this is not classified,  
21 per se, as safety equipment, it was certainly qualified to  
22 some seismic load and it has an impact on the integrity of  
23 the safety equipment in that turbine building. And as the  
24 defective turbine foundation fails, so goes the turbine  
25 building and related safety equipment, specifically we're



1 talking in terms of diesel generation, the batteryrackroom.

2 These things are affected by the integrity of that  
3 turbine foundation, so the turbine foundation may not be  
4 safety related in and of itself. But the impact and the  
5 effect that it has on the surrounding equipment makes that  
6 relevant and that should be considered in this proceeding.

7 Now Mr. Stokes testifies on matters concerning the  
8 seismic design of the Byron station. Now Mr. Stokes is not  
9 a seismic expert and he is not testifying as such. As the  
10 Staff has pointed out, there are certain experiences of his  
11 years in nuclear engineering that directly relate to the  
12 introduction of torsional effect or things that would be  
13 deemed left out of a seismic response structure.

14 Mr. Stokes is a nuclear engineering witness and  
15 an expert in particular aspects of seismic knowledge. He has  
16 a working knowledge in the work and development of seismic  
17 loads. And to that extent, his insight into that area is  
18 relevant. He is qualified and he has looked and perceived --  
19 well, he has looked at the design criteria and saw where there  
20 was a lack of torsion effect and a lack of other effects not  
21 taken into account in design of the seismic criteria.

22 Now the lack of torsional effect has a direct  
23 effect on the reinspection calculations as performed by  
24 Sargent & Lundy and it has a direct effect on their finding  
25 of no safety significance with respect to those calculations.



1           Now I think, as Staff counsel has also pointed out,  
2 a college curriculum does not normally, at the  
3 undergraduate level, include such things. Seismic experience  
4 is garnered from many years of engineering work, out there  
5 in the engineering field. Mr. Stokes has such knowledge.  
6 He has such experience. He has continuing and ongoing  
7 training in those torsional effects that would be included in  
8 the seismic response spectra.

9           He has worked at many nuclear plants in the past.  
10 And as a result of that experience, he can give that type of  
11 evidence with respect to the issues in this proceeding.

12           And furthermore, I would say that to the extent that  
13 Mr. Stokes' testimony raises new issues or issues outside  
14 of the scope of this proceeding, these issues -- and we  
15 believe these issues are relevant and should be addressed.  
16 The Board has authority, under the Appeal Board decision, to  
17 hear what it thinks is relevant to the assurance of reasonable  
18 safety of the Byron Station.

19           Now some of Mr. Stokes' points, for example the  
20 embedded plates that I raised earlier, I mean even if it is  
21 deemed to be not relevant under the existing issues here  
22 before this Board -- and I would say we adamantly believe that  
23 they are relevant to this issue. I mean, they are so significant  
24 to the safety of the Byron Station that they should be  
25 admitted to the evidence before this Board.

1           To the extent that Mr. Stokes' testimony covers  
2 design areas that may yet ripen into an issue before this  
3 Board, we think that they are relevant. The independent  
4 design review, by Bechtel, has been expressly reserved by  
5 this Board, in the June 6th order.

6           It was initially determined that this issue was  
7 premature. At the start of these proceedings, of the July  
8 proceedings, counsel for Intervenors again expressly reserved  
9 the issue of the independent design review. Now just  
10 yesterday we received four hefty volumes representing the  
11 final report of the independent design review conducted by  
12 Bechtel.

13           Now Mr. Stokes has had an opportunity to review the  
14 final report and he is not yet complete. Now we would expect  
15 that we would prepare a motion to include the issue of the  
16 independent design review and bring that motion before this  
17 Board tomorrow. Mr. Stokes' testimony is certainly relevant  
18 to the independent design review and we would ask the Board  
19 to deny the motion by the Applicant and, in addition, the  
20 motion by the Staff that they agreed to.

21           JUDGE SMITH: Mr. Wright, you began by saying that  
22 the testimony does not seek an independent design review. Then  
23 you ended up by in the opposite direction.

24           MR. WRIGHT: No, I didn't say that. I said  
25 initially, in his prefiled testimony, Mr. Stokes did not ask

mm311b5

1 for an independent design review. That was a question that  
2 was put to him by Mr. Gallo, in his deposition, and he agreed  
3 with that. What he did ask for was an independent engineering  
4 analysis and what I ended up with is that since we were  
5 given the four volumes of the independent review, by  
6 Bechtel, it is our collective opinion that that is an issue  
7 that we may want before the Board.

8 JUDGE SMITH: But didn't you say that Mr. Stokes'  
9 testimony supports or justifies forthwith bringing that issue  
10 into the hearing?

11 MR. WRIGHT: That is not precisely what I was  
12 attempting to represent, Judge. What I am saying is that  
13 in the event that you deem that his testimony is not relevant  
14 to the issues now before this court, I would add that his  
15 review of the design criteria of the Byron Station would be  
16 relevant in the event that the independent design review becomes  
17 an issue before this Board.

18 JUDGE SMITH: Okay, so what you're saying is  
19 that say we grant the motion to the extent that he is  
20 perceived to be attacking the design criteria of the plant.  
21 That same testimony, you would say, would be reserved for  
22 offering again, in support of a motion for an independent  
23 design review?

24 MR. WRIGHT: I would think that would -- that could  
25 be done, yes, Judge. That is certainly a possible solution for

mm311b6

1 that. But I would also state initially we feel it is relevant  
2 to the issues before this Board. And in the event that the  
3 Board deems that it is not, then we also assert that it would  
4 be relevant in the event that the independent design review  
5 becomes an issue before this Board.

endt31

6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

T32 MM

mmI?

1

JUDGE SMITH: Mr. Gallo?

2

MR. GALLO: Thank you, Judge Smith.

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

What I hear Mr. Wright saying is that we have testimony for all seasons here. It is testimony that goes to the Sargent & Lundy evaluation of the discrepancies under the reinspection program. And it also equally goes to justifying or issues that might arise under a motion to be filed involving the independent design review, which issue has been conceded is not before us as of this point in time.

It is Applicant's position that the testimony of Mr. Stokes, which is the subject of the motion -- albeit couched in terms of challenging the judgments made and the engineering evaluations made by Sargent & Lundy for discrepancy evaluations under the reinspection program -- really is a direct challenge to the general design criteria used by Sargent & Lundy in the design of the Byron station.

Now, what makes me say that? There is a couple of indicators. Mr. Wright states that at the deposition Mr. Stokes agreed that an independent design review would be appropriate, but he was answering a question that I asked, not necessarily connected with the purpose of his testimony. So, let's exclude that for the moment.

If I look at Mr. Stokes' testimony, the ubiquitous Palladino letter arises in question 6 and 7, or answer 6 and 7, and that letter quite clearly goes to the question of the



mm2

1 need for an independent design review.

2 If I take at face value the assertions in  
3 answers 6 and 7 that the design questions raised by  
4 Mr. Stokes go to the evaluations of the discrepancies under  
5 the reinspection program, and then I go further and look  
6 at the design errors, or the errors in equations and errors  
7 in design criteria and assumptions cited by Mr. Stokes, I  
8 see that none of them go to work performed by Hatfield or  
9 Hunter, and work that was captured in the reinspection  
10 program.

11 This leads me to conclude -- this and the other  
12 factors I mentioned -- that really the purpose of this  
13 testimony is to introduce the so-called IDI issue, and the  
14 need for an independent design review.

15 The only argument that I heard Mr. Wright advance  
16 that might be recognized as some sort of basis for this  
17 testimony, was his argument that it attacks the credibility  
18 of the Sargent & Lundy witnesses. As I understand the law  
19 in this area, so-called impeachment testimony must first  
20 be predicated on some factual basis. And, if I look at  
21 Mr. Stokes' testimony, all I see are stated potential  
22 concerns, incomplete analyses which he admits he either hasn't  
23 had time to evaluate completely, or he has insufficient  
24 information upon which to draw final conclusions.

25 So many of his concerns and assertions of design

mm3

1 error are really just stated as potential concerns. They  
2 are not realized as final judgments on his part. So I  
3 think there is no factual basis for assertion relying on  
4 the proposed testimony of Mr. Stokes that indeed it is  
5 proper to challenge the adequacy of these general design  
6 criteria.

7 A second leg of the argument, as I understand it  
8 with respect to impeachment testimony, is there has to be  
9 some reasonable nexus between the matters sought to be used  
10 for impeachment and the substance of the testimony.

11 Matters concerning the turbine building, diesel  
12 generators which, by the way, are located in the auxiliary  
13 building, non-safety-related equipment, simply do not go  
14 to what is the essence of this proceeding, which is the  
15 safety-related work and work quality performed by Hunter  
16 and Hatfield.

17 Now what do we have. We have worked performed  
18 by a contractor named William A. Pope involving buried piping.  
19 This buried piping is not safety related.

20 Now, during the course of the deposition of  
21 Mr. Stokes, he was asked whether or not he had reviewed the  
22 approximately 356 AWS weld discrepancy evaluations testified  
23 to by Mr. McLaughlin. And he stated in his deposition at  
24 page 154, that he had.

25 I asked him, could he recall any disagreement with

mm4

1 those evaluations, and his answer is:

2 "I am sure there have got to be a few in there.  
3 I had disagreements with quite a few of his calculations,  
4 but I didn't have enough time to include absolutely  
5 every calc that I looked at that I had a question on."

6 So, I summed up for him to say:

7 "You are telling me that you noted disagreement  
8 with certain Sargent & Lundy evaluations of its 356  
9 Hatfield AWS welds, but you didn't note those in  
10 your testimony that you filed in that case, is that  
11 correct" -- "that you filed in this case, is that  
12 correct?"

13 Answer: "That's correct. I didn't have time,  
14 I'm sorry."

15 I submit, Judge Smith, that if there is to be  
16 impeachment, indeed total disagreement with respect to  
17 evaluation performed on matters that is relevant to this  
18 proceeding this was it. But Mr. Stokes didn't have time to  
19 address this pertinent, relevant matter and include it in  
20 his testimony. Instead, he embarked on a general attack  
21 on the design criteria.

22 I think this demonstrates that the questions and  
23 answers that really appears from the beginning on question  
24 and answer 6, that run through about question and answer  
25 18, are nothing more than a direct attack on the general

mm5

1 criteria themselves, and not offered as impeachment per se.  
2 And I don't believe they can be accepted as such, because  
3 there is simply no nexus between those examples listed in  
4 Mr. Stokes' proposed testimony and the evaluations that  
5 were performed by Sargent & Lundy on the reinspection program.

6 Indeed, under the thousands of evaluations  
7 performed by Sargent & Lundy, both objective and subjective,  
8 that were under the reinspection program, Mr. Stokes  
9 testifies with respect to six of them. And of those six,  
10 four involved work performed by Blount. So, he has only  
11 identified two calculations, two evaluations that he  
12 questions and disagrees with in his proposed testimony.

13 So, I cannot see, based on that type of testimony,  
14 that his other testimony, which is really a direct attack on  
15 the general criteria used for the design of the Byron station  
16 have any connection whatsoever to the credibility of the  
17 Sargent & Lundy witnesses.

18 While I'm on the point of the four of the six,  
19 Mr. Wright addressed specifically the objections to questions  
20 and answers 29 through 33, which are for example, four  
21 evaluations of inspections performed by PTL.

22 It is true that PTL is a subject of this proceeding.  
23 That is, the qualification of their inspectors is the subject  
24 of this proceeding.

25 As the affidavit of Kostal shows, those particular



1 four evaluations involve work performed by Blount. And  
2 Blount work quality issues is not a part of this proceeding.

3 Indeed, the testimony of Mr. French and the  
4 testimony of Mr. Branch were very careful to delineate,  
5 when they talked about Hunter work and Hatfield work, to  
6 add the concrete expansion anchor work, which was installed  
7 by Hunter and Hatfield respectively, but inspected by PTL.

8 So, those four questions and answers, and the two  
9 preceding questions and answers -- I guess just the one  
10 preceding question and answer -- that introduces this subject  
11 to be Q and A's 28 through 33, are objectionable on the  
12 ground that they involve a contractor, albeit within the  
13 reinspection program but not within the purview of this  
14 remanded proceeding.

15 JUDGE SMITH: I guess I am missing that point.

16 For example, question 31, I would like to have you  
17 make that point again. Question 31, what is your concern  
18 with Section 21, pages 77, 78 and 78(a). These two relate  
19 to a PTL inspected weld.  
20  
21  
22  
23  
24  
25

end 32



mm331b1

1 MR. GALLO: Yes.

2 JUDGE SMITH: Is that statement correct?

3 MR. GALLO: That statement is correct.

4 JUDGE SMITH: Would you tell me again why you  
5 don't believe that that is within the scope of a reopened  
6 hearing?

7 MR. GALLO: Because the evaluation of the  
8 discrepant condition of that weld goes to work quality. So it  
9 is not enough to know who inspected the weld. We have to know  
10 who produced the weld. And as Mr. Kostal's affidavit  
11 demonstrates, that particular weld was produced by Blount.

12 And for that reason, is not within the purview of  
13 the remanded proceeding. And that same point is accurate  
14 with respect to 30, 31, and 32 and 33.

15 JUDGE SMITH: Will these actions, Mr. Gallo then,  
16 part of a nominal reinspection program?

17 MR. GALLO: I'm sorry, sir. Could you repeat  
18 that question?

19 JUDGE CALLIHAN: Were the welding and the actions  
20 that you attribute to Blount, were those nominally a part of  
21 the reinspection program?

22 MR. GALLO: It's my understanding that the four  
23 welds that are the subject of question 31 through 33 were  
24 captured in the Reinspection Program and the objection to  
25 the admissibility and discussion of these four welds stems

1 that these are welds not produced by Hatfield and Hunter,  
2 the only two contractors whose work is the subject of the  
3 work quality issue in the case. Whether or not these four  
4 welds are design significant, in terms of their discrepant  
5 condition will not advance the findings of this Board one  
6 iota with respect to the work quality of either Hatfield or  
7 Hunter because the work was produced by Blount.

8 As far as the seismic qualification issue goes,  
9 in the motion filed, we catalogued a number of what Applicant  
10 believes are qualification shortcomings of Mr. Stokes to  
11 do seismic evaluation. If I look at question 21 and the  
12 answer 21, which is on page 14 of Mr. Stokes' proposed  
13 testimony, the answer refers to a general -- strike that.

14 The answer refers to a response spectra design  
15 criteria for Byron and Braidwood. And Mr. Stokes, in his  
16 answer, proceeds to evaluate that criteria. And indeed,  
17 identifies Section VB and quotes from it and emphasizes  
18 those parts of that section which he believes are essential  
19 to the point he's making in this answer.

20 Yet on deposition, he responded that he had never  
21 performed a response spectra analysis for any reinforced  
22 concrete facility. Indeed, for any facility.

end33

23

24

25

1                   In that position he indicated a lack of  
2 general knowledge with regard to seismic matters generally.  
3 I fail to see, based on those answers, how he could be  
4 qualified to interpret a design criteria for Byron and  
5 Braidwood which deal specifically with response spectra  
6 design, and then to be critical of those response spectra  
7 design.

8                   So I would submit in addition to the objection  
9 that Answer 21 represents a general challenge to Sargent  
10 and Lundy's design criteria not a subject to this proceeding.  
11 It is not competent testimony because he is not qualified to  
12 so testify.

13                   I think I will rest at that point, Your Honor.

14                   MR. LEWIS: The Staff doesn't have anything  
15 to add at this point, Mr. Chairman.

16                   MR. CASSEL: Could we have a moment, Judge?

17                   JUDGE SMITH: Yes.

18                   (Pause.)

19                   MR. GALLO: Judge Smith, I've been reminded  
20 by my co-counsel that I forgot a point, and after they've had  
21 a chance to consult, I'd like to add that one point.

22                   (Pause.)

23                   MR. GALLO: Judge Smith, I appreciate your  
24 indulgence. In questions and answers 15 through 18,  
25 Mr. Stokes talks about the design basis for the so-called

1 embedded plates. Mr. Wright, in his argument pointed out  
2 that even though those plates may have been erected by  
3 Blount, and therefore under my formulation the arguments  
4 are relevant for that reason among others, Mr. Wright makes  
5 a point that Hunter and Hatfield hangers and pipe supports  
6 are attached to these plates; and therefore, there is a  
7 relevance.

8 To borrow your suggestion, there is that song  
9 about the kneebone connected to the hip bone, et cetera.  
10 Indeed, we could question the safety of the entire design  
11 of the L<sub>2</sub>ron Station plant simply on that rationale, because  
12 a relevant piece of hardware is connected to something that  
13 is connected to something else that eventually gets us into  
14 an evaluation of the entire plant.

15 And I would submit that the relationship pointed  
16 out by Mr. Wright simply is not justification for expanding  
17 this proceeding and should not be admitted on that basis.

18 JUDGE COLE: Are you saying that the kneebone is  
19 not connected to the hip bone, Joe?

20 (Laughter.)

21 MR. GALLO: Did I miss a bone? I guess anatomy  
22 was not my strong suit.

23 JUDGE SMITH: Mr. Wright, do you have any response?

24 MR. WRIGHT: Well, I would say that number one,  
25 Mr. Gallo is attempting to say that the design criteria has



1 no relationship to the Reinspection Program, and the  
2 calculations and the intervening calculations performed by  
3 Sargent & Lundy.

4 JUDGE SMITH: Is that what you heard him say?

5 MR. WRIGHT: I believe that's what he was saying;  
6 that they are irrelevant to this proceeding, and that this is  
7 a general attack on the design criteria, and was not related  
8 to the issues before this Board.

9 JUDGE SMITH: I didn't understand him to say --  
10 My view of your position and my view right now of what is  
11 relevant is that inasmuch as the discrepancies were evaluated  
12 against the design criteria, the design criteria form the  
13 outer boundary of relevance, but they are relevant. But  
14 the design criteria as such without something more from you  
15 would not be subject to litigation.

16 MR. WRIGHT: Well, Judge Smith, I share your view.

17 JUDGE SMITH: Do you agree with that?

18 MR. GALLO: I agree with that formulation.  
19 Materiality is the real objection.

20 MR. WRIGHT: And in addition to that, Judge,  
21 I would say that for example, the torsional effects in the  
22 design criteria relate to each and every calculation performed  
23 in the Reinspection Program. They relate to the flaws in  
24 the Reinspection Program. They are relevant and they provide  
25 a basis for impeachment.



1           Reading through the Reinspection Report, I've  
2 seen a number of instances where the observed discrepancies  
3 as you stated were evaluated for their significance to the  
4 design of the plant.

5           Now, torsional effects have an impact on that.  
6 In addition to that, the embedded plates that I have spoken  
7 about and which Mr. Gallo referred that they weren't somehow  
8 connected, or if we open this open, we would open it up to  
9 examining everything at the Byron Station -- well, I think  
10 the embedded plates are very critical because critical  
11 equipment was hung off of that.

12           In order to justify that there was no safety  
13 significance they evaluated that critical equipment.

14           In addition, Judge, I really think there's no  
15 question with respect to, for instance, 29 through 33, about  
16 their relevance to the Reinspection Program. PTL may not have  
17 performed the work, but Sargent & Lundy evaluated that work.  
18 They did an engineering evaluation, and they determined  
19 that there was no safety significance to the discrepancies  
20 found.

21           Now, to that extent, it borders on the credibility.  
22 I mean, it impacts the credibility of Sargent & Lundy. And  
23 I really don't think there's any question of relevance.

24           JUDGE SMITH: Okay. Is that your sole basis for  
25 relevance; because they are hooking that over our order

1 following the prehearing conference in which we defined the  
2 issues. We did not in so many words say that we will bring  
3 Pittsburgh Testing Laboratory into the reopened hearing  
4 limited to their inspection activities at Systems Control  
5 and Hatfield.

6           What we said is that their activities with respect  
7 to Systems Control highlights the relevance of their work,  
8 and of course, Pittsburgh's work with Hatfield was important.  
9 And then we went on to say that we expect a general showing  
10 and a discussion of whether the Reinspection Program has  
11 provided reasonable assurances that the Pittsburgh work  
12 presents no safety problems. And we did not specifically  
13 require a particular showing; a very general showing.

14           And then most importantly, we stated that the  
15 Intervenor intend to discover vigorously on Pittsburgh's  
16 activities, and we authorized a broad discovery effort. But  
17 we remind the Intervenor of the Board's admonition during  
18 the conference that the nature of the evidence applicable to  
19 be required on Pittsburgh Testing would depend largely on  
20 the advance notice it has received about particular concerns.

21           I am of the opinion that the Applicant was quite  
22 correct in interpreting what could have been a better, clearer  
23 order on our part, that they did have to particularly address  
24 Pittsburgh involvement with Systems Control and Hatfield.  
25 We should have written that better.

1                   Now, you are not arguing that they had a duty  
2 to come forward and analyze Pittsburgh's inspection work with  
3 other people. You're just saying that errors, or perceived  
4 errors by Sargent & Lundy in their evaluation of Pittsburgh  
5 inspection work of other contractors raises questions as to  
6 the competence of Sargent & Lundy. Is that your route to  
7 relevance?

8                   MR. WRIGHT: Yes, Your Honor.

9                   JUDGE SMITH: You're not saying that Pittsburgh's  
10 inspection activities are relevant in themselves, are you?

11                  MR. WRIGHT: No, I'm speaking of Sargent & Lundy  
12 and their evaluation of those discrepancies, and their  
13 finding of no safety significance. And that's the competency  
14 issue.

15                  JUDGE SMITH: All right. So we don't have an  
16 issue here that the Applicant in this proceeding --  
17 bringing Pittsburgh into the Board's order. That's not --  
18 you don't have any position like that, do you?

19                  MR. WRIGHT: I'm not taking that position at this  
20 moment, Judge.

21                               (Laughter.)

22                               But again, Judge, --

23                  JUDGE SMITH: You say this is your second trial?

24                  MR. WRIGHT: There have been other trials, Judge,  
25 just not in the courtroom.

                                 (Laughter.)

1                   Now let me wrap up my position with this, Judge.  
2     There's no question that to the extent Sargent & Lundy  
3     reviewed the design criteria in reaching their evaluations  
4     of those discrepancies in the Reinspection Program, that  
5     then it is relevant. They are outer bounds, as you have  
6     stated. And we feel that those outer bounds would include  
7     the design criteria to the extent that Sargent & Lundy has  
8     utilized it in making their engineering judgment.

9                   In addition, we also feel that on the question of  
10    credibility, that there's a sufficient foundation laid, and  
11    that in fact, the question of not including torsional effects,  
12    of disregarding embedded plates, is sufficient enough to  
13    bring into issue the objectivity, bring into issue the  
14    care which Sargent & Lundy exercised in the Reinspection  
15    Program.

16                  And that is the basis of our request to deny  
17    their motion to strike.

end 34

18  
19  
20  
21  
22  
23  
24  
25



1 JUDGE SMITH: Anything further?

2 MR. GALLO: Mr. Wright just indicated that  
3 Sargent & Lundy disregarded embedded plates. Really, the  
4 controversy in that piece of testimony is whether or not  
5 they are sized properly, not whether or not they have been  
6 disregarded.

7 I just would close with one thought. I find it  
8 incredible that Mr. Stokes crafted testimony for the purpose  
9 of attacking the credibility of these witnesses, of the  
10 Sargent & Lundy witnesses, by pointing out extraneous examples  
11 of what he perceives to be design errors, when by his own  
12 testimony on deposition, he thought he discerned errors in  
13 calculations of the 356 welds testified to with respect --  
14 by Mr. McLaughlin.

15 I just believe that if there's any matter of  
16 credibility of witnesses that was involved, that was the  
17 relevant and pertinent testimony that should have been  
18 explored. I've heard no explanation on that point.

19 JUDGE SMITH: Mr. Lewis?

20 MR. LEWIS: Mr. Chairman, I would subscribe to  
21 your general statement that the design criteria have a  
22 general relevance to the Sargent & Lundy process in terms of  
23 evaluation of discrepancies. But I really think the question  
24 has to be resolved more on a different level than whether or  
25 not there's a general relevance.



1           It seems to me the question has to be asked  
2 whether or not the various assertions here of certain errors  
3 in the design calculations or calculations done by Sargent  
4 and Lundy, or formulas of Sargent & Lundy, have any relevance  
5 to the engineering evaluations done in the Reinspection  
6 Program. And perhaps what we didn't state clearly before  
7 but what we really meant to indicate is that we have looked  
8 for such an articulation of interconnection and we have been  
9 unable to find it.

10           So I would agree with your general concept that  
11 the design criteria are not irrelevant to the Sargent & Lundy  
12 engineering evaluation question, but I havenot been able to  
13 find in this testimony set forth any relationship articulated  
14 that raises an issue for the engineering evaluations of  
15 Hunter & Hatfield work.

16           Now, there were certain questions which have not  
17 been objected to, and for those there is some relationship  
18 to the question of evaluation of discrepancies for Hunter  
19 and Hatfield. And that, of course, is the matter of SCC.

20           But we were not able to find any interconnection  
21 in the testimony -- and just stepping back from it and looking  
22 at it from the perspective of our own understanding of the  
23 situation, it just does not appear to us that there was such  
24 a connection.

25           JUDGE SMITH: Okay. I think we have heard enough.

1 I see no other course than for the Board to recess, sit down,  
2 take the testimony paragraph by paragraph, apply the  
3 standards that we think should be applied, and then rule on  
4 that basis. So it's going to take some homework, and we  
5 might as well get at it.

6 MR. CASSEL: Judge, Mr. Wright mentioned in his  
7 argument -- and I don't know whether it will have any impact  
8 on your deliberations -- it is our hope to be ready to have  
9 a motion with respect to the Independent Design Review by  
10 the morning.

11 MR. LEWIS: Mr. Chairman, let me say just a  
12 couple of things about that. First of all, the Board has not  
13 yet received, I believe, their copies of the Independent  
14 Design Review. At least, that's my understanding.

15 JUDGE SMITH: This member has not.

16 MR. LEWIS: I don't know if it has even been  
17 formally submitted around to the service list, but the Staff  
18 did get their copy on Friday, and it was provided to  
19 Mr. Cassel because he had expressed his interest in that  
20 issue.

21 It certainly is correct, Your Honor, that the  
22 Intervenors did reserve argument on whether or not design  
23 issues should be admitted into this proceeding until they  
24 had received the IDR. And subject to looking back at the  
25 specific statement in the Board's earlier order, it is my

1 recollection that the Board agreed that the matter was  
2 premature until the Independent Design Review had been issued.

3 But I think that is --

4 JUDGE SMITH: Well, wait a minute. What we said --  
5 let's put that in context so you'll have it in mind in your  
6 argument when you file your motion -- that was Intervenor's  
7 proposed issue No. 9, and it might be a good idea to have  
8 this in mind.

9 We said that it was a proposed issue, and it's  
10 outside the mandated scope of the reopened hearing, and no  
11 basis has been identified or advanced to convince the Board  
12 to accept the issue.

13 However, we note that it's an open item with the  
14 Staff, and it is premature to rule that the IDI may never  
15 become an issue. And that is not -- that does not fall  
16 somewhat short of leaving the door open for that to be an  
17 issue. I mean, you know, a showing is going to have to be  
18 made that it is a matter that meets all the tests that we've  
19 alluded to. You know. If it's outside the scope of the  
20 hearing, you're going to have to make a convincing argument  
21 that it should be brought in. There's nothing we've said  
22 that invites it. Our language did not intend that.

23 MR. LEWIS: Yes, thank you very much for that  
24 clarification. I didn't have that right in front of me and  
25 I was going on my recollection of your earlier ruling, and

1 I appreciate that.

2 What I really am trying to point out is that  
3 number one, the Board doesn't even yet have the IDR.

4 JUDGE COLE: You say it's a four volume --

5 MR. LEWIS: Four volumes, yes.

6 JUDGE COLE: Oh, I'm sure I don't have that.

7 MR. CASSEL: It was Attachment 6 to Dr. Callihan's  
8 copy of Charlie's testimony.

9 MR. LEWIS: I think that the matter of the Stokes  
10 testimony really should be taken on its own merits at this  
11 time, and I question whether or not the Board is going to be  
12 in a position to integrate into its ruling on the Stokes  
13 proposed testimony a consideration of the IDR at this time.

14 JUDGE SMITH: Yes, I have doubts that we can  
15 function as sort of a walk-in decisionmaker quite that  
16 easily. It's going to be a big problem I could see, unless  
17 it is a very capturing report. I don't know, let's wait  
18 and see. Try. It's up to you, but it's going to be very  
19 hard for us, given the schedule and given all our homework  
20 and everything, to be in a position to consider a motion of  
21 that magnitude so soon.

22 MR. CASSEL: If that's the case, Judge --

23 JUDGE SMITH: I don't know if it is or not, but it  
24 seems to me this is a very important matter to you.

25 MR. CASSEL: It certainly is, and it was only



1 because of my impression about the need for urgency here  
2 that we were, frankly, rushing to get a motion ready for  
3 tomorrow morning on a four-volume document we just got  
4 yesterday.

5           If what you're saying is that realistically,  
6 the Board would need time to consider that and review the  
7 document as well, it might make more sense for us to take  
8 more time and present you with a motion at a time when you  
9 would have the opportunity to consider it in conjunction with  
10 the report.

11           JUDGE SMITH: If Bechtel says look, the design  
12 is all wrong and they were designing a battleship and they  
13 made a mistake, then you might have an easier burden. I  
14 don't expect that's what you're going to be arguing. You're  
15 going to be taking aspects of it and you're going to be  
16 pointing things out and it's going to take analysis. I don't  
17 know how much time we have.

18           MR. LEWIS: Mr. Chairman, I think there's one  
19 other point I didn't mention, and this perhaps is relevant  
20 to your consideration as well.

21           The Staff has been in a position to argue the  
22 legal merits of the question of the Independent Design  
23 Investigation or Independent Design Review that grew out,  
24 in part, of the Staff's IDI, since the first day it was  
25 raised by Intervenors as something they intended at some



1 point to move into this proceeding to make a motion on. And  
2 we believe the same legal principles apply whether it's in  
3 respect to the Staff's Independent Design Inspection, the  
4 IDI, or the Bechtel Independent Design Review that was  
5 undertaken in response to that IDI.

end 35

6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

1                   And we are prepared to argue that legal question  
2 at any time this week. I just wanted you to understand that.  
3 So it's not as though the Staff is not prepared to go forward.

4                   JUDGE SMITH: There may be a middle ground. It  
5 may be that -- I agree that the timely disposition of it is  
6 something worth achieving, if it can be. It may be that you  
7 may try to argue it, or we may just throw up our hands and  
8 say too much, we need more preparation. And it may be that  
9 we don't need it. I don't know.

10                  MR. MILLER: Judge Smith, I'm not sure. Obviously,  
11 we haven't seen the motion, that given everything else that  
12 is happening in this hearing room and in preparation for these  
13 hearings, that we are going to be prepared to respond in an  
14 intelligent and forceful way if we are expected to simply get  
15 up and respond orally to a written motion.

16                  JUDGE SMITH: I guess I can look, for the moment,  
17 at your strong interest in the issue. We will certainly take  
18 that into account. We will just wait and see what you decide.  
19 We've discussed it and that's all we can do.

20                  All right then. With that, if there is nothing  
21 further -- what will be the plan tomorrow? To start out with  
22 Mr. Stokes?

23                  MR. CASSEL: I would hope we could start with  
24 an explanation on the Bleuel ruling.

25                  JUDGE SMITH: Right. Tomorrow we will rule on the

1 motion with respect to Stokes' testimony and your motion  
2 with respect to Bleuel. And then we will take the next witness.  
3 And I guess the next witness would be whom?

4 MR. CASSEL: It would be Mr. Stokes. It's my  
5 understanding that Professor Erickson will be ready to  
6 testify first thing Thursday morning. We are, this evening,  
7 taking the deposition of Edison's proposed -- and I emphasize  
8 proposed -- rebuttal witness to Dr. Stokes. And depending  
9 on the results of that deposition, we may or may not be moving  
10 to exclude his testimony.

11 JUDGE SMITH: Is the rebuttal of Mr. Stokes  
12 dependent upon the Board's ruling? I imagine it is, to some  
13 respect.

14 MR. CASSEL: Is the rebuttal of Mr. Stokes --

15 JUDGE SMITH: Excuse me. Didn't you say you are  
16 deposing the Staff's proposed rebuttal witness to Mr. Stokes?

17 MR. CASSEL: No, no, Judge. If I said that, I  
18 misspoke. This evening, it's my understanding, we are  
19 deposing Edison's proposed rebuttal witness to Professor  
20 Erickson, because Professor Erickson will be here and  
21 available to begin testifying first thing Thursday morning.

22 JUDGE SMITH: All right, I did hear you say Stokes.

23 MR. CASSEL: I'm sorry.

24 JUDGE SMITH: I don't know that you did, but I  
25 heard it.

361b3

1                   Okay. then it looks like there is some possibility  
2 that we may finish up Thursday.

3                   MR. MILLER: Well, Judge Smith, I wanted to discuss

4 --

5                   JUDGE SMITH: I think perhaps we can adjourn for  
6 now, until 9 a.m. tomorrow, and discuss scheduling off the  
7 record.

8                   (Whereupon, at 5:05 p.m., the hearing was recessed,  
9 to resume at 9:00 a.m. on Wednesday, August 22, 1984.)

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

CERTIFICATE OF PROCEEDINGS

1  
2  
3 This is to certify that the attached proceedings before the  
4 NRC COMMISSION

5 In the matter of: COMMONWEALTH EDISON COMPANY  
6 Date of Proceeding: (Byron Station, Units 1 & 2)  
7 Place of Proceeding: Tuesday, 21 August 1984  
Rockford, Illinois

8 were held as herein appears, and that this is the original  
9 transcript for the file of the Commission.

10  
11 Mimie Meltzer  
Official Reporter - Typed

12  
13   
14 Official Reporter - Signature

15  
16 Suzanne Young  
Official Reporter - Typed

17  
18 Official Reporter - Signature  
19  
20  
21  
22  
23  
24  
25