

1 UNITED STATES OF AMERICA  
2 NUCLEAR REGULATORY COMMISSION

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4 In the matter of: :  
5 METROPOLITAN EDISON COMPANY : Docket No. 80-289  
6 (Three Mile Island Unit 1) : (Restart)  
7 - - - - - :

8  
9 25 North Court Street,  
Harrisburg, Pennsylvania

10 Wednesday, December 24, 1980

11 Evidentiary hearing in the above-entitled  
12 matter was resumed, pursuant to adjournment, at 8:32 a.m.

13 BEFORE:

- 14 IVAN W. SMITH, Esq., Chairman,  
Atomic Safety and Licensing Board  
15  
16 DR. WALTER H. JORDAN, Member  
17 DR. LINDA W. LITTLE, Member

18 APPEARANCES:

19 On behalf of the Licensee, Metropolitan Edison  
Company:

- 20 GEORGE F. TROWBRIDGE, Esq.  
THOMAS A. BAXTER, Esq.  
21 DELISSA A. RIDGWAY, Esq.  
22 Shaw, Pittman, Potts and Trowbridge,  
1800 M Street, N.W.,  
23 Washington, D. C.  
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1 On behalf of the Commonwealth of Pennsylvania:

2 ROBERT ADLER, Esq.  
3 Assistant Attorney General,  
4 505 Executive House,  
5 Harrisburg, Pennsylvania  
6 WILLIAM DORNSIFE,  
7 Nuclear Engineer

8 On behalf of Union of Concerned Scientists:

9 ELLYN WEISS, Esq.,  
10 ROBERT D. POLLARD  
11 Harmon & Weiss,  
12 1725 I Street, N.W.  
13 Washington, D. C.

14 On behalf of the Regulatory Staff:

15 JAMES TOURTELLOTTE, Esq.  
16 Office of Executive Legal Director,  
17 United States Nuclear Regulatory Commission,  
18 Washington, D. C.

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WITNESS DIRECT CROSS REDIRECT RECROSS BOARD ON BOARD

Paul Shippen, Jr.

Joseph Torcivia

By Mr. Pollard 9320

By Mr. Adler 9341

By Mr. Dornsife 9355

By Mr. Tourtellotte 9372

By Dr. Jordan 9378

E X H I B I T S

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P R O C E E D I N G S

1  
2 CHAIRMAN SMITH: On the record.

3 MR. TROWBRIDGE: Yesterday, both Dr. Jordan and  
4 yourself showed considerable interest in the loading of the  
5 diesel. We talked about this last night among ourselves and  
6 concluded that we would save a great deal of hearing time  
7 and probably confusion by making up several tables, since we  
8 are going to be back here, obviously, on this Contention  
9 after New Year's. I would suggest that the Board defer  
10 questions in that area until we come back with our tables  
11 which of course we will make available to everybody.

12 MS. WEISS: We would be happy to see the tables.  
13 We think that would indeed be useful to the record, but we  
14 would like to see the underlying calculations as well. I  
15 think that becomes even more important if the tables are  
16 going to be introduced in evidence.

17 MR. TROWBRIDGE: I am talking about the loads on  
18 the diesel and building up to something less than 3000 KW.  
19 The underlying calculations are relatively simple.

20 CHAIRMAN SMITH: We may proceed.

21 MS. WEISS: I have two preliminary matters.

22 First, the Chairman asked me last week to consult  
23 with Mr. Jordan about whether he thought it was necessary to  
24 have the Board issue an order. I have done that, and he  
25 believes that it would be desirable and possibly necessary



1 to have the Board issue an order on the PANE Contentions.

2 MR. TROWBRIDGE: On that point, Licensee has an  
3 interest in this question. I would ask the Board to defer  
4 an order on this. It is not that clear to me that we have a  
5 final decision in this proceeding. I would like an  
6 opportunity to talk to that point. I am sorry that I simply  
7 have not had -- I meant to do it over the weekend, but the  
8 bug got me. I have to have time to discuss it with others  
9 in my office.

10 Where do we stand on this? I did not have a  
11 chance to discuss with others in my office where we stand on  
12 this point.

13 CHAIRMAN SMITH: The request was not so much what  
14 the parties want, but I just wanted to bring to their  
15 attention that there is a possibility that it could be  
16 viewed two ways, and we want comments on which way it should  
17 be viewed, and you have suggested a third possibility.

18 MR. TROWBRIDGE: As I read the transcript of your  
19 remarks, Mr. Chairman, of your request through Ms. Weiss to  
20 Mr. Jordan, you seemed to start with the assumption that we  
21 have -- that the issue has been decided. It is just a  
22 question of whether we stand on the Commission order or  
23 whether this Board should issue an order.

24 I think there is a third question whether or not  
25 we have a final decision at all. I would ask the Board to

1 defer its ruling long enough for us to comment on that.

2 CHAIRMAN SMITH: All right.

3 MS. WEISS: It occurs to me that Mr. Jordan,  
4 having heard what you said, may also want to comment on  
5 that, and perhaps the best thing to do would be to set a  
6 date for it.

7 CHAIRMAN SMITH: So as we have, as far as I can  
8 see, the Board has to decide among three alternatives: do  
9 nothing because we regard the action of the Commission as  
10 not being final; do nothing because we regard the action of  
11 the Commission as being final in itself; or issue an order  
12 executing the intent of the Commission's -- of the effect of  
13 the Commission's ruling that we cannot accept those  
14 Contentions.

15 MR. TROWBRIDGE: Why don't I undertake, Mr.  
16 Chairman, to be in touch with Mr. Jordan before we come back  
17 after New Year's, and if -- then we needn't set any dates  
18 for discussion. If I am not -- and I am sure Ms. Weiss is  
19 right -- there should be an opportunity for both of us to  
20 talk to the Board.

21 CHAIRMAN SMITH: Very good.

22 MS. WEISS: I have also had a chance to look  
23 through yesterday's transcript and have noticed that on I  
24 think six or eight places bus 1S as in Sam is transcribed as  
25 bus 1F as in Frank. I would like to move, therefore, to

1 correct the transcript in the following places, to change it  
2 from bus 1F as in Frank to bus 1S as in Sam, and let me read  
3 the places that I found it. I can't say that it is  
4 exhaustive. I found it in a number of spots in the  
5 transcript. It may appear other places as well.

6 Page 9267, line 20, page -- change from 1F to 1S  
7 as in Sam; page 9274, line 12.

8 CHAIRMAN SMITH: These transcripts will be  
9 replaced.

10 MS. WEISS: Because it is missing pages at the end.

11 CHAIRMAN SMITH: They will be replaced on January  
12 6.

13 MS. WEISS: On page 9274, on line 12, it should  
14 read bus 1S and delete the "1-F." Page 9281, line 17, 1F  
15 should be 1S. Page 9290, line 4 should read bus 1P or 1S,  
16 and line 12 that same page should also read, "can be powered  
17 from 1P or 1S. And the last page that I found it is on the  
18 next page, 9291, line 17 should read "from either bus 1P or  
19 1S."

20 CHAIRMAN SMITH: Anything further? Any other  
21 business before we proceed?

22 Then you can proceed when you are ready.  
23 Whereupon,

24 PAUL SHIPPER, JR.

25 JOSEPH TORCIVIA

1 resumed the stand, having been called as witnesses by  
2 Counsel for Licensee Metropolitan Edison, and having  
3 previously been duly sworn, were further examined and  
4 testified as follows:

5 CROSS EXAMINATION -- Resumed

6 BY MR. POLLARD:

7 Q Mr. Torcivia, two short questions from yesterday.  
8 When you were talking about the fault assumed on  
9 the pressurizer heaters and the effect that fault would have  
10 on the voltage on bus 1P, you answered 460 volts, it would  
11 go down to 460 volts and then back up to 480 rather quickly.

12 Was that answer 460 volts based upon some  
13 calculations you had done before you took the witness stand,  
14 or did you try and do that on the stand?

15 A (WITNESS TORCIVIA) If I recall, I said in my  
16 opinion it would drop about 460 volts. We made no  
17 calculations specifically for that fault on the pressurizer  
18 heaters on the bus itself.

19 Q One final question.

20 Is the fault that you have postulated, which I  
21 understood to be a bolted line to line fault, is that the  
22 worst fault in terms of generating fault current, or would a  
23 bolted line to ground fault be more severe?

24 A (WITNESS TORCIVIA) The fault which was at that  
25 time pointed out, which was a bolted fault, is a three-phase

1 fault, somewhat equivalent to a line to line fault in that  
2 area. The ground fault current was found to be slightly  
3 less than that 4000 figure. So we accepted the highest  
4 value which was around 4000. It was less than 4000. We  
5 used 4000 as our basis.

6 Q I don't know who to direct the question to, so  
7 either party can answer.

8 Can you give me all of the accident or transient  
9 sequences which would result in the pressurizer heaters --  
10 result in the need to connect the pressurizer heaters to the  
11 on-site power supply?

12 MR. TROWBRIDGE: Mr. Chairman, perhaps Mr. Pollard  
13 might explain where he is going a little bit. It is not at  
14 all apparent that this is within the scope of the testimony  
15 or the Contention, or for that matter the expertise of the  
16 witnesses.

17 CHAIRMAN SMITH: Would you read the question back,  
18 please?

19 (The Reporter read the pending question.)

20 CHAIRMAN SMITH: It seems obvious --

21 MR. TROWBRIDGE: Mr. Chairman, I did not object at  
22 this point, whether we could not have a further explanation  
23 as to where we were going. It wasn't apparent here to us  
24 that it was within the scope. I don't now where Mr. Pollard  
25 is going. I have at this point no objection.

1           CHAIRMAN SMITH: Would you care to accommodate  
2 him, Mr. Pollard?

3           MR. POLLARD: I would prefer not to.

4           CHAIRMAN SMITH: I think you should, unless you  
5 are representing that it is an essential part of your cross  
6 examination, that you not reveal the purpose of it. In that  
7 event, we will wait and see what develops. If it is an  
8 important part of your cross examination plan and strategy,  
9 we will allow you to defer explaining. If it goes too far,  
10 we will excuse the witness and have you explain.

11           MS. WEISS: We would be happy to explain it to the  
12 Board at the bench. He would prefer not to have the  
13 witnesses hear it.

14           MR. TROWBRIDGE: Does this imply the Board does  
15 not have a cross examination plan covering this subject?

16           MR. POLLARD: This is the last question on the  
17 written cross examination plan. I think the Board, by  
18 reading that, could see where we are going. If we wish to  
19 show Mr. Trowbridge the cross examination plans, I would  
20 prefer not to do that and simply approach the bench and  
21 explain for Mr. Trowbridge's benefit.

22           MR. TROWBRIDGE: It may be that the Board, from  
23 the cross examination plan, can see the relevance for itself.

24           CHAIRMAN SMITH: The subject matter is clearly  
25 covered by the cross examination plan, although it is not

1 obvious to the Board where it is ultimately leading. I  
2 think we should proceed, and if there is any question, if it  
3 doesn't become apparent soon, then we will excuse the  
4 witnesses and ask for additional explanation.

5 MR. TROWBRIDGE: Very well.

6 WITNESS SHIPPER: The question was do I know all  
7 of the accident or transient sequences that required  
8 pressurizer heaters, require pressurizer heaters to be  
9 connected to the on-site power supply. I think -- I know my  
10 answer to that is no, I don't.

11 BY MR. POLLARD: (Resuming)

12 Q That was not the question. Can you simply tell me  
13 all of the accident sequences or transient sequences that  
14 you know of where we would wind up with the pressurizer  
15 heaters connected to the on-site power supply?

16 For example, would loss of off-site power be a  
17 particular event that might lead to having the heaters  
18 connected to the bus 1P or 1S?

19 A (WITNESS SHIPPER) It is conceivable that a loss  
20 of off-site power would require pressurizer heaters to be  
21 connected to the on-site power supply.

22 Q And might another sequence be if we had a failure  
23 in the pressurizer level instrumentation circuits which cut  
24 off all of the pressurizer heaters automatically on low  
25 pressurizer level, that that might lead to connecting either



1 Group 8 or Group 9 to the on-site power supply, in which  
2 case that low level trip would effectively be bypassed?

3 A (WITNESS SHIPPER) I would like to state for the  
4 record that I am not a nuclear engineer. I am an electrical  
5 engineer. As far as the answer to your question, I would  
6 say it is conceivable to my knowledge of the operation that  
7 this may occur.

8 A (WITNESS TORCIVIA) May I also say we in the  
9 electrical department very often get requests from the  
10 mechanical people to add loads onto a certain -- in certain  
11 areas, and ask us whether they can get a certain amount of  
12 power. The only thing we make the request from them is how  
13 much of a load are you planning to put on? Will you require  
14 this power during normal operation or during an accident and  
15 so forth, and we are not very often familiar as to exactly  
16 why they want that power. So we accommodate them by  
17 providing the required power, and I for one do not feel that  
18 I am qualified to answer that question.

19 Q With respect to this heater cutoff on low  
20 pressurizer level, would you please refer to page 12 of  
21 Emergency Procedure 1202-29, which is UCS Exhibit 19?

22 A Am I correct, Mr. Torcivia, that it is this  
23 emergency procedure or at least an earlier revision of this  
24 emergency procedure which you were addressing in your August  
25 11, 1980 memo, which is now UCS Exhibit 28



1           A       (WITNESS TORCIVIA) I'm sorry, is that the  
2 question?

3           Q       Yes. This is the same procedure?

4           A       (WITNESS TORCIVIA) I am sorry, I was waiting for  
5 a question. I lost sight of it.

6           Q       This is the procedure that you were referring to  
7 in your August 11, 1980 memo, isn't that correct?

8           A       (WITNESS TORCIVIA) That is correct. That is the  
9 procedure used.

10          Q       There is a caution on page 12 which states, "There  
11 is no automatic cutoff on low level for heater while powered  
12 from ES bus. Heaters will burn out if uncovered."

13                 My question is, when you simply transfer the power  
14 for the heaters from, for example, bus 1B as in boy, I  
15 believe to bus 1P, how does that affect this low level  
16 heater cutoff?

17          A       (WITNESS TORCIVIA) In the pressure control  
18 circuitry for that? Nothing was touched, to the best of my  
19 knowledge.

20          Q       Excuse me?

21          A       (WITNESS TORCIVIA) Nothing was touched in the  
22 control circuitry to the best of my knowledge. I would like  
23 to point out again, as I have previously stated, that the  
24 control circuitry is very often handled by the  
25 instrumentation people, and what I state is based on the

1 best of my knowledge.

2 Q You do understand the source of my confusion? If  
3 the modification which is occurring is only a change in the  
4 source of electrical energy for the pressurizer heaters, I  
5 see no obvious reason why switching the power supply from  
6 one bus to another should interfere with the control  
7 circuits for that heater group.

8 A (WITNESS TORCIVIA) The trip that would take place  
9 -- and I am making this assumption on the basis of the trip  
10 that would take place, in my opinion, would be in terms of  
11 that bus of that breaker, on the BOP bus to the left hand.  
12 I can't read it, 1B, to the BOP bus which is shown on the  
13 left hand where the pressurizer heaters are normally  
14 connected, so that the low level connection, it is possible,  
15 may trip out that breaker up there. I do not recall. I am  
16 not sure at this stage.

17 MR. TROWBRIDGE: I suggest the transcript would  
18 show that Mr. Torcivia was referring to Figure 1.

19 WITNESS TORCIVIA: Figure 1, yes.

20 BY MR. POLLARD: (Resuming)

21 Q Let's assume now -- we will start a new line of  
22 questioning. Let's assume that the heaters are connected to  
23 bus 1P, and the power to bus 1P is coming from off-site  
24 power.

25 My question is, if a fault occurs in the

1 pressurizer heaters, what signals are available and can be  
2 relied upon to trip the main feeder breaker?

3 A (WITNESS TORCIVIA) For clarification in my mind,  
4 did I understand you to say, Mr. Pollard, that if the  
5 pressurizer heater were connected to bus 1P and we had  
6 off-site power?

7 Q Pressurizer heater group 8 is being powered from  
8 bus 1P, and bus 1P is receiving power from off-site power.

9 A (WITNESS TORCIVIA) I know of no reason why the  
10 pressurizer heaters were connected to bus 1P if we are  
11 receiving off-site power.

12 Q I thought we had gone through that yesterday, so  
13 for the purposes of today, just assume that that is the case.

14 Can you also do that?

15 A (WITNESS SHIPPER) We are assuming at this time  
16 that the plant is in a shutdown condition.

17 Q Your option. I don't care if it is operating or  
18 shut down. My question is simply if the heaters are  
19 connected, if Group 8 of the heaters are connected to bus 1P  
20 and bus 1P is receiving power from off-site power, and then  
21 a fault occurs on the pressurizer heater circuit, what  
22 signals are available and can be relied upon to trip the  
23 main feeder breaker on bus .

24 A (WITNESS TORCIVIA) As far as -- again we are  
25 talking purely theoretical, an assumption here -- as far as

1 the conditions which prevailed prior to the connection to  
2 the off-site power, as to the protective devices, the  
3 coordination of the various breakers involved, the breaker,  
4 the main feeder breaker would trip out under the same fault  
5 conditions as it would from the -- should it be connected  
6 from the diesel instead of the off-site power.

7 Q That was going to be my next question, so you have  
8 saved us some time. The same condition, pressurizer heater  
9 Group 8 being powered from bus 1P, and bus 1P receiving  
10 power from the diesel generator, and we have now a loss of  
11 coolant accident, if there are no failures, am I correct  
12 that the ES signal will trip the main feeder breaker on bus  
13 1P?

14 A (WITNESS SHIPPER) That is correct.

15 A (WITNESS TORCIVIA) Yes, sir.

16 Q Would that ES signal also trip the other ES loads  
17 on bus 1P?

18 A (WITNESS SHIPPER) Immediately or at time T-0 of  
19 the accident?

20 Q At time T-0 when the signal is actually generated,  
21 at the same time that the main feeder breaker is tripped.

22 A (WITNESS SHIPPER) Yes, it will, it will trip the  
23 loads -- you said we are on diesel.

24 Q Right. Let's back up. We had the heaters running  
25 off bus 1P. Bus 1P was being powered by the diesel

1 generator.

2 A (WITNESS SHIPPER) Okay.

3 Q We then have a loss of coolant accident which  
4 generates an ES signal. What I am trying to do -- and maybe  
5 I will ask the question broadly -- can you tell me  
6 everything that happens after that ES signal is generated?  
7 I know one of the things that happens if nothing fails, then  
8 the main feeder breaker will trip as a result of the ES  
9 signal.

10 A (WITNESS SHIPPER) To the best of my knowledge,  
11 the ES signal trips blocks 2, 3, and 4, and then sequences,  
12 resequences the loading of blocks 2, 3, and 4.

13 Q The diesel generator breaker would not trip?

14 A (WITNESS SHIPPER) The diesel generator breaker  
15 would not trip.

16 Q And we go into our normal accident sequence for  
17 the LOCA, and the ES loads would be reapplied in blocks.

18 A (WITNESS SHIPPER) That is correct to the best of  
19 my knowledge.

20 Q Now that we have gone this far in this scenario,  
21 can the operator at this point reclose the main feeder  
22 breaker?

23 A (WITNESS SHIPPER) Not immediately.

24 Q When can he reclose the main feeder breaker?

25 A (WITNESS SHIPPER) To the best of my knowledge,

1 when he bypasses the ES signal.

2 Q When he bypasses this ES signal, let's assume the  
3 ES signal had been generated by 1600 low pressure in the  
4 reactor coolant system. When he bypasses that ES signal,  
5 does the action of bypassing that signal also bypass the ES  
6 signal generated by four pounds in the reactor building?

7 A (WITNESS SHIPPER) No.

8 Q It is your testimony, then, that even if the  
9 reactor pressure is still below 1600 pounds and he bypasses  
10 the ES signal to the main feeder breaker, that if  
11 subsequently building pressure increases to four pounds, he  
12 will get another ES signal to trip the main feeder breaker?

13 A (WITNESS SHIPPER) Would you run through that  
14 scenario again?

15 Q Sure.

16 This goes back, Mr. Shipper, to the lines of  
17 questioning I was asking yesterday about whether we really  
18 had three signals or three diverse inputs generating the ES  
19 signal.

20 A (WITNESS SHIPPER) Like I said, I think I  
21 understand some of the functions of it. I do not totally  
22 understand the complexity of it.

23 Q All I am trying to determine is if I have had a  
24 loss of coolant accident which generates the 1600 pound low  
25 reactor coolant system pressure, the operator then bypasses

1 that ES signal, recloses the main feeder breaker, and then  
2 subsequent to that point in time, with the reactor coolant  
3 system pressure still below 1600 pounds, we get a four pound  
4 building pressure, will the main feeder breaker trip?

5 A (WITNESS SHIPPER) Yes. I think that was also  
6 brought out in our depositions with UCS back in March.

7 Q But at the time the operator closes the main  
8 feeder breaker, any ES signals which are present would have  
9 been bypassed, is that correct?

10 A (WITNESS SHIPPER) That is correct, or reset.

11 Q Either bypassed or reset, in any case not present.

12 A (WITNESS SHIPPER) Not present, correct.

13 Q Referring to page 13 of UCS Exhibit 19, which is  
14 Emergency Procedure 1202-29, at the bottom of page 13, there  
15 is a note which says, "An ES signal will trip the  
16 pressurizer heaters off the bus but will not lock them out."

17 Can you please explain to me what that means,  
18 particularly the phrase, "but will not lock them out?"

19 A (WITNESS SHIPPER) Trip and lock out is an  
20 electrical term used when a trip signal is present, a --  
21 well, when a trip signal is not present, a normally closed  
22 contact is inserted in the closing circuit. It is put in  
23 there in order to prevent what we call bumping or  
24 antipumping, and antipump circuit. If a trip is present,  
25 then you close the breaker, the breaker will close and



1 immediately trip.

2 Q As opposed to the point being if the breaker had  
3 originally been tripped by the ES signal and locked the  
4 breaker out, you would not be able to reclose the breaker  
5 until you bypassed that ES signal, correct?

6 A (WITNESS SHIPPER) That is correct.

7 Q So the design at Three Mile Island Unit 1 at the  
8 time of restart is such if the main feeder breaker trips due  
9 to an ES signal, that the operator can attempt to reclose  
10 the breaker without bypassing the ES signal, and the breaker  
11 will in fact close and then immediately trip out again.

12 A (WITNESS SHIPPER) Within cycles it will trip out.

13 Q What information does the operator have in the  
14 control room to determine why a main feeder breaker tripped?

15 A (WITNESS SHIPPER) Are we talking of the  
16 pressurizer heaters?

17 Q I'm sorry, I'm still referring to the same main  
18 feeder breaker.

19 A (WITNESS SHIPPER) You would have ES actuation,  
20 undervoltage indication. To the best of my knowledge, those  
21 are the two pieces of information you would have available.

22 Q If the main feeder breaker tripped on undervoltage  
23 and that corrected the undervoltage condition, could the  
24 operator reclose the main feeder breaker from the control  
25 room?



1 A (WITNESS SHIPPER) No.

2 Q Why not?

3 A (WITNESS SHIPPER) Because the control switch is  
4 located in the 322 elevation of the control building.

5 CHAIRMAN SMITH: Mr. Trowbridge, are you satisfied  
6 with the line of questioning now?

7 MR. TROWBRIDGE: I have no problems.

8 BY MR. POLLARD: (Resuming)

9 Q I have just one last line of questioning.

10 Mr. Torcivia, during your rebuttal testimony when  
11 Mr. Trowbridge was questioning you, he referred you to page  
12 4-7 of my testimony, particularly the last sentence at the  
13 bottom of the page which continues on the top of page 4-8,  
14 the part dealing with a "fault in the non-safety grade  
15 pressurizer heater circuits will cause the loss of the 480  
16 volt ES system to which the heaters are connected."

17 As I recall your answer, you said yes, that was  
18 true, except you also went on to emphasize that the single  
19 failure is the main feeder breaker.

20 Do you recall that?

21 A (WITNESS TORCIVIA) Please forgive me. Page 4-7?  
22 I'm trying to -- I'm trying to work from my notes. Perhaps  
23 I should have taken the time to try to look at the  
24 transcript.

25 Q Let's not worry. Let me ask the question directly

1 and let's forget about whether I have accurately remembered  
2 what you said.

3 Let me just go through an accident sequence very  
4 slowly, and then I will ask you how many single failures are  
5 involved in that accident sequence.

6 Let's assume the plant is operating at some power  
7 level and we have a reactor shutdown and loss of off-site  
8 power. The operator then connects pressurizer group 8 to  
9 bus 1P, and that bus is receiving power from the associated  
10 diesel generator. Bus 1S has no power for whatever reason,  
11 either the diesel failed to start, there is a fault on the  
12 bus, a breaker failed to close, all of these are potential  
13 single failures, I think you could agree, that would result  
14 in no power being available to bus 1S. We then have a fault  
15 in pressurizer heater group 8, and the main feeder breaker  
16 fails to trip, the main feeder breaker associated with group  
17 8 and bus 1P.

18 Now, I am going to go back through it at each step  
19 and ask you for each of those steps is that a single failure  
20 within the meaning of the single failure criteria, the  
21 single failure of a safety grade system or component.

22 The plant was operating at power. We had a  
23 reactor trip and loss of off-site power.

24 Is loss of off-site power counted as a failure in  
25 analyzing a system for compliance with the single failure

1 criteria?

2 A (WITNESS TORCIVIA) No.

3 Q Then the operator connected pressurizer heater  
4 group 8 to bus 1P which was receiving power from its  
5 associated diesel generator, but there was no power  
6 available on bus 1S. Is that a single failure within the  
7 meaning of the single failure criteria, the lack of power on  
8 bus 1S?

9 A (WITNESS TORCIVIA) In my opinion it is.

10 Q Now, we have a fault in pressurizer heater group 8.  
11 Is that counted as a single failure of a safety  
12 grade system?

13 A (WITNESS TORCIVIA) No.

14 Q And then the main feeder breaker fails to trip on  
15 the fault current.

16 In your opinion is that a single failure of a  
17 safety grade component?

18 A (WITNESS TORCIVIA) For that one diesel, we have  
19 already had one single failure on this side, so for that one  
20 diesel that is another single failure.

21 Q We have a failure of the diesel generator  
22 associated with bus 1S, and you said that was a single  
23 failure, I understand. Without regard to how many failures  
24 we are adding up to here, can you just answer the question  
25 that if we had a fault in pressurizer heater group 8, the

1 failure of the main feeder breaker associated with bus 1P to  
2 trip, in your opinion, is that a single failure within the  
3 meaning of the single failure criteria?

4 A (WITNESS TORCIVIA) Again I think I am restating  
5 what we said some time back, we did not take credit for  
6 that, so that becomes a single failure for that.

7 Q For that diesel generator.

8 A (WITNESS TORCIVIA) For that unit.

9 Q Am I correct in the scenario I have gone through  
10 twice, the plant operating at power, it trips, we lose  
11 off-site power, one division of emergency power fails to  
12 work properly, we have a fault in the heater, and then the  
13 main feeder breaker fails to trip on fault current, you  
14 believe that represents two failures of safety grade  
15 components, is that correct?

16 A (WITNESS TORCIVIA) Just so it is straight in my  
17 mind, it would be a single failure on the main feeder  
18 breaker 1P, and the fact that we lost a diesel on the other  
19 end is single failure, is that the two?

20 Q Yes.

21 A (WITNESS TORCIVIA) In my opinion.

22 Q In your opinion that is two failures and that is  
23 not permitted?

24 A (WITNESS SHIPPER) I would like to add a third  
25 failure that we haven't stressed upon. You have also had to

1 fail to actuate that distribution panel breaker, so that is  
2 a third failure.

3 Q But you had already testified you were not going  
4 to take any credit for that breaker anyway because of its  
5 location.

6 A (WITNESS SHIPPER) It's there. It is a very  
7 active component. It is a very qualified component.

8 Q Yes, I understand.

9 Now, when you testified in response to the  
10 questions from Mr. Trowbridge, you said that the main feeder  
11 breaker was a safety grade breaker, is that correct?

12 A (WITNESS TORCIVIA) That is correct. \*

13 Q When you said that this main feeder breaker was  
14 safety grade, what criteria did that circuit breaker have to  
15 meet in order for you to say it was safety grade?

16 A (WITNESS SHIPPER) That breaker is not a new  
17 installed breaker., That breaker was as spare breaker as  
18 purchased with that line of switch gear. It was there since  
19 the plant was originally licensed. What we are doing is  
20 utilizing that spare. That is a fully qualified breaker,  
21 qualified to the criteria, in effect, at the time of  
22 purchase of that gear.

23 Q Mr. Torcivia, can you tell me what criteria or  
24 regulations the breaker has to meet in order to be called  
25 safety grade?

1           A     (WITNESS TORCIVIA) 1.75 at the time in effect.  
2                     Is that the answer you are looking for? I am not  
3     sure.

4           Q     Did you just say Reg Guide 1.75?  
5                     (Witnesses conferring.)

6           WITNESS TORCIVIA: The problem is the question  
7     about the breaker, the exact qualification of the breaker  
8     associated with which of these regulations. I have a list  
9     of them.

10           BY MR. POLLARD: (Resuming)

11           Q     Is the problem, as perhaps I perceive the problem  
12     to be you are not sure what the requirements were at the  
13     time the breaker was purchased?

14                     Let me ask a different question and perhaps we can  
15     move on. In order to comply with the lessons learned  
16     requirements from the TMI 2 accident with respect to  
17     connecting the pressurizer heaters to the on-site power  
18     supplies, is it necessary that this arrangement comply with  
19     Regulatory Guide 1.75, in your opinion?

20           A     (WITNESS TORCIVIA) Yes. And to that extent, it  
21     should be recognized just as Mr. Shipper has said, we are  
22     taking a spare breaker and putting it in that area. We are  
23     also installing this breaker into this cubicle which is  
24     being built specifically for this unit -- I'm sorry. I was  
25     thinking, I was confusing myself -- the disconnect switch.

1 I'm sorry, it is an existing unit. My apologies. That is  
2 correct, it is the same breaker and so forth. We have the  
3 disconnects.

4 Q You are agree that it is required that this  
5 arrangement meet the provisions of 1.75, of Regulatory Guide  
6 1.75?

7 A (WITNESS TORCIVIA) That's right.

8 Q Now, if it were determined, another assumption  
9 unfortunately, if it were determined that the main feeder  
10 breaker is not an acceptable isolation device, that is, that  
11 it does not meet the provisions of Reg Guide 1.75, would you  
12 then agree that you could not call the main feeder breaker  
13 safety grade for the purpose of performing the single  
14 failure analysis?

15 A (WITNESS TORCIVIA) If it were determined then it  
16 would not be -- we could not take claim to that 1.75 as it  
17 exists now, if it were so determined.

18 MS. WEISS: We have no further questions of the  
19 witnesses at this time.

20 At this time I would also like to move into  
21 evidence the document marked for identification UCS 28,  
22 memorandum from Mr. Torcivia to Mr. Hartman under date of  
23 August 11, 1980.

24 MR. TROWBRIDGE: No objection.

25 CHAIRMAN SMITH: So received.



1 (The document referred to,  
2 previously marked for identi-  
3 fication as UCS Exhibit No.  
4 28, was received in evidence.)

5 MR. TROWBRIDGE: I would also like to move in  
6 evidence the Licensee's Exhibit 22, which was the IEEE  
7 Standard 384, 1977 version.

8 MS. WEISS: Mr. Chairman, we won't object to  
9 putting in a complete version of 384, 1977, but we will  
10 object to putting it in in the form it is now. That is, it  
11 begins at page 7.

12 CHAIRMAN SMITH: Is there a particular reason or a  
13 general reason?

14 MR. POLLARD: There is a particular reason, Mr.  
15 Chairman, because such IEEE standards, the introductory  
16 pages identify not just who worked on it and when was it  
17 approved; it frequently contains a statement of purpose, of  
18 intent, of further actions on the part of the Committee. I  
19 think it is necessary to have that as part of the exhibit if  
20 it is going to be offered into evidence.

21 MR. TROWBRIDGE: Mr. Chairman, we have no problem  
22 deferring. We can produce obviously the other six pages. I  
23 do note that what you have got starts with the scope and  
24 then a paragraph on purpose. We are certainly not trying to  
25 conceal the first six pages. We will defer our request for



1 this exhibit to be put in evidence until we get six more  
2 pages.

3 CHAIRMAN SMITH: All right.

4 Mr. Ailer.

5 Do you have something, Mr. Trowbridge?

6 MR. TROWBRIDGE: No.

7 BY MR. ADLER:

8 Q Gentlemen, do you now of any other either safety  
9 grade or non-safety grade circuits at TMI 1 that are  
10 connected to the emergency power buses using an isolation  
11 design similar to that or identical to that shown in Figure  
12 1?

13 A (WITNESS SHIPPER) I know of none.

14 Q Do you know of any similar design at any other  
15 nuclear power plant with an operating license?

16 A (WITNESS SHIPPER) I do not know of any.

17 Q Mr. Torcivia, are you thinking about that or do  
18 you agree?

19 A (WITNESS TORCIVIA) I am trying to think. I do  
20 not know of any -- I'm sorry, I do not now of any. If there  
21 are, I don't know of any.

22 Q As far as you know, this is the first time that  
23 the staff has reviewed this type of isolation device? This  
24 is the first time that this type of device has been  
25 presented to a hearing board for review?

1           A       (WITNESS SHIPPER) I think that question would be  
2 better addressed to the staff. I know of -- I don't know.

3           Q       I would like to follow up, then, on some of Mr.  
4 Pollard's questions regarding the standards by which the set  
5 of isolation breakers are to be reviewed.

6                    You were -- you agree that Reg Guide 1.75 is the  
7 appropriate standard?

8                    Did the two of you actually design this set of  
9 breakers?

10           A       (WITNESS SHIPPER) What do you mean design the set  
11 of breakers?

12           Q       Did you determine that these breakers ought to be  
13 used as the appropriate isolation device to isolate the  
14 pressurizer circuit from the emergency power bus?

15           A       (WITNESS TORCIVIA) We had a -- we had some switch  
16 gear there, the 1E switch gear which has a spare cubicle,  
17 and we used that. So we have an existing piece of equipment  
18 which we are using to serve to load as far as that main  
19 feeder breaker goes.

20           Q       You were instructed to provide a means for  
21 connecting the pressurizer heater to the emergency bus, and  
22 your decision was based on the fact that you had an existing  
23 piece of equipment. Is that what you just said?

24           A       (WITNESS TORCIVIA) I said we had an emergency  
25 bus. Within that switch gear of that emergency bus was a

1 spare unit, do I make myself clear, and so we merely used  
2 that spare unit to accommodate the circuitry.

3 Q When you were told that you needed to isolate the  
4 pressurizer heater circuit from the emergency bus, you were  
5 of course aware that you needed to comply with the  
6 requirements of Reg Guide 1.75, were you not?

7 A (WITNESS SHIPPER) Yes.

8 Q Did you look at the second page of Reg Guide 1.75?

9 A (WITNESS SHIPPER) Yes.

10 Q I would like to refer you to the second full  
11 paragraph on that page, and I will read it for the record.  
12 "The NRC staff does not agree with certain provisions of the  
13 trial use standard such as those pertaining to the  
14 definition of raceway, the routing of power cables through  
15 the cable spreading areas and control rooms, and the status  
16 of non-Class 1E circuits that are not separated from  
17 associated circuits by acceptable distance or barriers.  
18 This lack of agreement is reflected in regulatory position  
19 C.1, 2, 4, 6, 7, 9, 10, and 12."

20 UCS refers to position C.1 in their testimony. I  
21 am sure that you are familiar with the fact that that  
22 position precludes the use of fault circuit, fault current  
23 breakers as an isolation device.

24 I would like you to explain how you came to the  
25 determination that you were to be permitted to use a fault

1 current breaker as in the new IEEE standard when it was  
2 specifically precluded by Reg Guide 1.75.

3 A (WITNESS SHIPPER) I think if you continue to read  
4 on the Basis, under the section of Basis, the second  
5 paragraph, I quote, "Breakers are tripped on receipt of a  
6 signal other than one derived from the fault current or its  
7 effects, e.g., an accident, are acceptable."

8 Q You are testifying that the ESFAS signal meets the  
9 requirements of Reg guide 1.75.

10 A (WITNESS SHIPPER) I think you would consider that  
11 an accident signal.

12 Q Please refer to Mr. Pollard's testimony at page  
13 4-7. The footnote at the bottom of that page reads, "The  
14 example of an acceptable trip signal given in Regulatory  
15 Guide 1.75, an accident signal, is inapplicable in this  
16 instance. That signal is incapable of protecting the  
17 on-site power supply against a heater fault."

18 I would like you to address that argument.

19 A (WITNESS SHIPPER) The postulation that Mr.  
20 Pollard put forth is not addressed by Reg Guide 1.75, where  
21 he has removed the accident signal. The accident signal is  
22 a tripping means in order to protect the diesel generator on  
23 its way up. Once it is up and is capable and has not  
24 reached its capacity, it is then capable of supplying the  
25 load, and then when we get back into the new 384 that

1 addresses that, the on-site source must be capable of  
2 supplying the fault current for the time of, available time  
3 in order for the breaker to operate.

4 Q Let me see if I understand your answer. Your  
5 testimony is that the ES signal meets Reg Guide 1.75 only  
6 for the purpose of the initial use of the diesel generator,  
7 the initial start-up of the diesel generator, and after  
8 that, while the diesel is in operation, you rely on the  
9 circuit breakers as an isolation device.

10 A (WITNESS SHIPPER) I think if you continue on with  
11 the reading of that second paragraph of 1.75, you will see  
12 where I am coming from.

13 Q Do either of you gentlemen know -- I will ask this  
14 question of the staff as well -- if the NRC has ever  
15 expressed any approval or disapproval of IEEE 384-1977?

16 A (WITNESS SHIPPER) I think that came out in the  
17 rebuttal testimony. To the best of our knowledge, we do not  
18 know if they have approved or disapproved of it.

19 Q The isolation devices pictured in Figure 1, to  
20 your knowledge, are these the only requirements in IEEE  
21 384-1977 to isolate the pressurizer heaters from the  
22 emergency power bus?

23 DR. JORDAN: I missed the question. Would you  
24 repeat it?

25 BY MR. ADLER: (Resuming)

1 Q I will ask the question another way. Please refer  
2 to Section 4.6 of 384-1977. It is on page 9. 4.6.1,  
3 General Criteria, reads "The isolation of non-Class 1E  
4 circuits from Class 1E circuits or associated circuits shall  
5 be achieved by complying with the following requirements."  
6 Now, requirement No. 2 is the requirement for an electrical  
7 isolation device. My question is whether you have done  
8 analyses to ensure that Criterion 1 has been met.

9 A (WITNESS SHIPPER) I think we previously stated  
10 that the circuits have been separated up to the point where  
11 they enter the terminal box, at the secondary shield wall.

12 Q In accordance with all the requirements of 5.1.3,  
13 5.1.4, and 5.6?

14 A (WITNESS SHIPPER) To the best of my knowledge, we  
15 meet or exceed all those requirements.

16 Q Is that referenced at all in the Restart Report?

17 A (WITNESS TORCIVIA) I didn't hear that.

18 Q Is that referenced in the Restart Report?

19 A (WITNESS TORCIVIA) I don't recall.

20 A (WITNESS SHIPPER) I think the Restart Report, to  
21 the best of my knowledge, reads that we meet the  
22 requirements of 1.75.

23 A (WITNESS TORCIVIA) I do not find it here. I do  
24 not recall putting it in or taking it out. I'm sorry.

25 A (WITNESS SHIPPER) I could also be confused with

1 our design input data.

2 Q With your design input data?

3 A (WITNESS SHIPPER) Right.

4 (Counsel for the Commonwealth of Pennsylvania  
5 conferring.)

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1 Q I am somewhat confused about your procedures for  
2 shedding unnecessary loads from the emergency bus. If you  
3 can refer to pages 12 and 13 of EP 1202-29.

4 Now, in the restart report you say that procedures  
5 will call for tripping non-essential loads to accomplish  
6 this within the two hour requirement.

7 I presume the procedure you are referring to is  
8 step D which continues on page 13.

9 Is that correct?

10 A (Witness Torcivia): That is correct.

11 Q It is my impression from your testimony yesterday  
12 that the operators would make the decision to shed  
13 non-essential loads based on the 3000 kilowatt capacity of  
14 the bus.

15 Is that correct?

16 A (Witness Shipper): No.

17 Q It is not?

18 A (Witness Shipper): You used the wrong term.

19 Q Why don't you correct me, then?

20 A (Witness Shipper): 3000 kilowatt capacity of the  
21 diesel not the bus.

22 A (Witness Torcivia): If I may, I would like to  
23 indicate that we are connecting the pressurizer heaters on  
24 only one diesel at a time so that the condition in which we  
25



1 find ourselves, we have to shed a lot of loads as if the  
2 other diesel is out of service.

3           And then only one diesel is carrying the  
4 pressurizer heaters. If both diesels are working, then  
5 naturally we can load more on the other diesel.

6           Q     I understand that; what confuses me is that  
7 according to step G, the decision is based on the 150 amp  
8 rather than the 3000 meter.

9           A     (Witness Torcivia): All right. I can understand  
10 the confusion then. We really have two parameters we are  
11 discussing there. One is the loading of the diesel and  
12 maintaining it at its 3000 kW rating..

13           The other is the loading of the specific bus to  
14 which the pressurizer heaters are connected up and limit its  
15 current to the value of both the bus and the breakers so as  
16 to maintain the integrity of that unit and not to overload  
17 that bus, if I make myself clear.

18           Q     Not completely.

19           A     (Witness Torcivia): The 3000 kW rating we are  
20 talking about is a question of the loading of the diesel  
21 itself. Now, that is the first point. So we have now taken  
22 care of the limits on the diesel.

23           The next point involved is that we do not want  
24 extra loads on the particular bus to which the pressurizer  
25 is connected to and have it exceed its safe operating

1 condition.

2 Q I understand now why both of those are required.  
3 I do not see in the operating procedures where the first  
4 decision is made to make sure that the total load on the  
5 diesel does not exceed or is at or below 3000 kW.

6 A (Witness Torcivia): I believe we have indicated  
7 that that will be included in the procedure, although it has  
8 not yet been done.

9 Q That is another addition that has not been made  
10 yet.

11 A (Witness Torcivia): That is another addition.

12 A (Witness Shipper): I think that was brought out  
13 in testimony yesterday to the effect that in -- I forget  
14 what exhibit it is -- but it is -- it is UCS whatever. 28, I  
15 think.

16 A (Witness Torcivia): As indicated on that.

17 Q It is the list of equipment that will be shed, the  
18 same as that shown on page 13 of the procedures. The list  
19 of non-essential equipment that you would shed from the  
20 diesel, is that the list shown on page 13?

21 A (Witness Torcivia): That is correct.

22 Q Is that a prioritized list? Would you shed the  
23 first item of equipment first and then go down the line?

24 A (Witness Torcivia): We have not specifically  
25 prioritized it. Some of that equipment is a matter of

1 protecting equipment, balance -- some equipment which may or  
2 may not be of interest to the operator.

3           The operator is free to choose what he considers  
4 of value.

5           Q     In step G, the operator first must obtain the  
6 permission of the shift foreman.

7           A     (Witness Torcivia): That is correct.

8           Q     And that produces some question in my mind as to  
9 the non-essential nature of the equipment that is being  
10 shed. Are you familiar with these items and what functions  
11 they perform in the plant?

12          A     (Witness Torcivia): Well, I am going to give my  
13 opinion on that. If I were the shift foreman, I would  
14 select those loads -- to remove those loads which at that  
15 time I feel are no longer required or that the -- the  
16 particular equipment to which they are connected to can be  
17 ignored.

18                 The selection is based on the events at that  
19 moment.

20          Q     You think some of this equipment might be required  
21 during plant operation during the transient?

22                 MR. TROWBRIDGE: Could we have a definition of  
23 "required." Are we talking about safety or for some other  
24 purpose?

25                 MR. ROBERT ADLER: That is exactly what I am

1 trying to determine.

2 WITNESS TORCIVIA: The equipment required for the  
3 safe shutdown of the plant is included in the block  
4 loadings, and that equipment is sacred. It is not touched.

5 BY MR. ROBERT ADLER:

6 Q Do you know if an analysis has been performed for  
7 particular transients where the pressurizer heater may be  
8 connected to determine what the effect would be of  
9 eliminating each of these items from the emergency power  
10 supply?

11 A (Witness Torcivia): Do you mind repeating that  
12 question again?

13 Q Do you know if an analysis has been performed for  
14 transients where the pressurizer heater would be connected  
15 to the emergency power supply to determine what the effect  
16 would be of eliminating each of these components from  
17 operation?

18 A (Witness Torcivia): some analysis was made  
19 indicating the need for equipment on a time factor. Now,  
20 let me explain what I mean: once the diesel has been loaded  
21 and the various safety equipment on there perform their  
22 function, some of that load is relieved during the time, if  
23 I make myself clear.

24 As that time goes on, the amount of power required  
25 from the generator, the diesel generator is naturally

1 reduced and some other loads can be added on at the  
2 discretion of the chief operators there.

3           We have determined in some areas that certain  
4 units will not be required for two, three, or four hours, as  
5 the case may be.

6           Q     What information does the operator have available  
7 to determine which item on this list to choose?

8           Before I ask that question, does he know what the  
9 load is of each of these items and how much it will reduce  
10 the total load on the diesel?

11          A     (Witness Torcivia): What the load is of each of  
12 these items?

13          Q     Yes, sir.

14          A     (Witness Torcivia): We have a loading -- I have  
15 got the procedures; some of these approximate. One is 3  
16 kW; another is 2 kW.

17                I have another here that is 41 kW; another one,  
18 1.4, .5; they vary.

19          Q     Why weren't those values listed on the emergency  
20 procedure? Wouldn't that have assisted the operator?

21          A     (Witness Torcivia): You may be correct. It never  
22 was brought up as a question by the operator or anyone  
23 else.

24          A     (Witness Shipper): My personal opinion in  
25 discussing the plant with the operators and the staff, they

1 know it better than what we do. Normally, they can spout  
2 off kW and horsepower jst by giving them the tag number.

3 A (Witness Torcivia): They do it every day of the  
4 week.

5 Q This procedure for shedding non-essential loads,  
6 was this required -- is this a procedure that exists  
7 independent of the need to connect the pressurizer heater to  
8 the emergency power supplies or was this provided solely for  
9 the purpose of accommodating the pressurizer heater?

10 A (Witness Torcivia): I do not understand the  
11 question.

12 Q Would there be any need to have a procedure for  
13 shedding non-essential loads from the diesel, even if you  
14 did not increase the potential load on the onsite power  
15 supply by adding the pressurizer heaters?

16 Or is this a new set of procedures?

17 A (Witness Torcivia): My opinion would be that it  
18 would be left to the judgment of the operating personnel  
19 there if such a procedure is required. I have no way of  
20 determining if the -- if they feel it is essential. I do  
21 not know what to tell you.

22 A (Witness Shipper): I think there have been  
23 procedures in effect at the site that told the operators to  
24 keep the load below 3000 kW.

25 Q And they would just make an instantaneous decision

1 to shed certain loads in order to do that?

2 A (Witness Shipper): Your description of  
3 instantaneous, I do not think fits. They are very  
4 calculating in what they will do and what they will remove  
5 in order to maintain the load based on plant conditions.

6 Q But they would just base that decision on their  
7 general operating experience and knowledge and not on any  
8 specific procedures?

9 A (Witness Shipper): You cannot come up with a  
10 procedure for every instance; there are general guidelines.

11 A (Witness Torcivia): Let me explain our problem  
12 over here. The plant may have many procedures of which we  
13 are not aware which they have developed. We do not know all  
14 of the procedures that they have, so we are not quite sure  
15 what procedures may have already been developed.

16 We are at a loss to make any positive statement.  
17 I do not know of any procedure set up for this prioritizing  
18 here.

19 MR. DORNSIFE: I have one followup question from  
20 what Mr. Adler was asking.

21 BY MR. DORNSIFE:

22 Q Are there any non-safety grade loads which are  
23 normally powered from either the 1P or the 1S bus?

24 A (Witness Shipper): There are.

25 Q There are?



1 A (Witness Shipper): Yes.

2 Q Are they protected by any isolation device such  
3 as a main feeder breaker, similar to this?

4 (Pause)

5 A (Witness Shipper): Not that I recall.

6 Q So if this main feeder breaker is not an  
7 acceptable isolation device for the pressurizer heaters,  
8 then in order to make the design consistent, it would not be  
9 acceptable for any of the other safety loads?

10 Is that not true, the non-safety grade loads?

11 A (Witness Shipper): The pressurizer heaters is the  
12 only load that is now being installed in the plant. These  
13 loads that we speak of have been there and have been there  
14 since the original design.

15 The original design -- this was an acceptable  
16 method.

17 Q The point still is -- the question I was asking  
18 is from a realistic standpoint there is no difference in the  
19 pressurizer heaters except maybe for the amount of load that  
20 is concerned and these other non-safety grade loads that are  
21 similarly protected.

22 Is that correct?

23 They could also have a fault if it is not an  
24 acceptable isolation that could affect the bus the same as  
25 the pressurizer heaters would affect it.

1 Right?

2 A (Witness Shipper): I think the answer to that  
3 would be yes.

4 Q So the pressurizer heaters are not unique as far  
5 as that is concerned, as far as that breaker being an  
6 isolation device?

7 A (Witness Shipper): I think that is correct.

8 (Pause)

9 Q In your testimony on the first -- I guess it is  
10 page 1. It is not numbered. At the very bottom, you say,  
11 "The use of pressurizer heaters is normal, and therefore the  
12 most desirable means for maintaining the pressure of the  
13 reactor coolant system during natural circulation."

14 Would that include that means of maintaining  
15 natural circulation as being the most desirable -- include a  
16 loss of offsite power during a small break loss of coolant  
17 accident where natural circulation is required?

18 You are saying it is desirable for natural  
19 circulation when it is required.

20 Would that desirability also include a small break  
21 loss of coolant accident when you would need natural  
22 circulation when there is a loss of offsite power?

23 A (Witness Shipper): If you want to get into  
24 accident analysis --

25 Q I am asking if you included that when you were

1 writing that. Is that -- we have verified that natural is  
2 required for some small break loss of coolant accidents.

3 Does your testimony there -- I am not saying it is  
4 the only way.

5 But are you saying it is the most desirable way of  
6 maintaining pressure during natural circulation? Would it  
7 include that particular circumstance?

8 MR. TOURTELLOTT: Mr. Chairman, I guess I would  
9 object because I do not think this witness is qualified to  
10 answer that question. This is beyond the scope of his  
11 expertise.

12 MR. TROWBRIDGE: We have other qualified witnesses  
13 who have addressed that subject. This seems to be quite  
14 outside the scope.

15 MR. DORNSIFE: He must have had something in mind  
16 when he wrote this; I am trying to find out what it was,  
17 what it covered.

18 CHAIRMAN SMITH: Then ask it on that basis.  
19 Normally, if such an objection would be made by the sponsor  
20 of the witness, we would not automatically grant it or we  
21 would not -- I do not mean automatically grant it. But when  
22 the objection is being made by another party who is also --  
23 has an interest, not necessarily the same interest as the  
24 licensee or the sponsor of the witnesses; we do have to  
25 apply that test.

1           Ask your question as to what the basis for what  
2 they were, but if the answers will go beyond their  
3 expertise, then we will have to give some consideration to  
4 Mr. Tourtellotte's objection.

5           Do you understand the nature of the ruling?

6           MR. DORNSIFE: Yes, sir.

7           (Counsel for the Commonwealth of Pennsylvania  
8 conferring.)

9           BY MR. DORNSIFE:

10          Q       Did you have anything specific in mind when you  
11 made the statement in your testimony?

12                 Did you rely on someone else for that statement?  
13 Or was it beyond your knowledge?

14          A       (Witness Shipper): I am not sure if this came out  
15 of part of the reg guide or the understanding of the NUREG  
16 and this is basically a preface to our written testimony.

17          Q       You have no knowledge of whether it is required,  
18 it is desirable for a small break loss of coolant accident?

19                 That is beyond your expertise?

20          A       (Witness Shipper): That is beyond my scope.

21          Q       Let's assume that it is desirable, not necessary;  
22 there is something else, but it is desirable for a small  
23 break loss of coolant where you need natural circulation.

24                 If you recall the questions concerning the  
25 capability of the diesel during that particular accident --

1 and there was a number that the staff had come up with from  
2 the safety evaluation report of 2517 -- I believe --  
3 kilowatt loading on the diesel for the accident.

4 Do you recall that?

5 Do you know whether that included the emergency  
6 feedwater pumps?

7 (Pause)

8 A (Witness Shipper): We are not sure.

9 Q Do you have a copy of the restart safety  
10 evaluation, NUREG-0680, NUREG-0680, TMI-1 Restart  
11 Evaluation by the staff?

12 A (Witness Shipper): I only have the portion that  
13 pertains to the pressurizer heaters.

14 Q I am looking at page C1-2.

15 (Pause)

16 A (Witness Shipper): We have that section.

17 Q Item three talks about automatic block loading of  
18 motor driven AFW pumps on the diesel and on the next page,  
19 the second paragraph, the last sentence says, "We have  
20 reviewed the licensee's response to this request and concur  
21 with the licensee's conclusion that adequate diesel  
22 generator capacity with about 6 percent margin is available  
23 to accommodate the steady state, motor driven AFW pump  
24 loads."

25 Based on the response to that, the staff's

1 response, do you know what the -- what response was reviewed  
2 to come up with that conclusion of the licensee's? How the  
3 staff came to that conclusion? What they used?

4 (Pause)

5 Maybe I can help you out. Was it question three  
6 in supplement one, part one of the restart report, the  
7 licensee's restart report?

8 MR. TROWBRIDGE: Mr. Dornsife, would you mind an  
9 interruption? There is no objection to your pursuing this  
10 line of questioning. However, I think it is going to be  
11 much easier and quicker to do it when we produce the tables  
12 that I talked about at the outset, about the loading of the  
13 diesel.

14 I would hope you would defer your questions; you  
15 are entirely privileged to continue them despite my  
16 suggestions.

17 MR. DORNSIFE: Mr. Trowbridge, that question does  
18 contain loading tables; that is why I am referring --

19 MR. TROWBRIDGE: We will be using that and other  
20 tables when we come back. I think the record will be clear,  
21 and we will save time if we do it all at once.

22 MR. TOURTELLOTTE: Mr. Chairman, could we have a  
23 short break. It is a little after 10:00.

24 CHAIRMAN SMITH: Is there any objection? Mr.  
25 Dornsife, is this a satisfactory time for a break for you?

1 MR. DORNSIFE: I would like to make one comment.  
2 I was not aware that the people knew of the existence of  
3 this table and whether it would satisfy the concerns raised  
4 previously. That is the reason I brought it up. It is a  
5 pretty detailed list of the loads and the loading sequence  
6 on the diesel for the accident.

7 MR. TROWBRIDGE: That is correct. That is one of  
8 the tables we spent time with last night. What we intend to  
9 do, Mr. Dornsife, in part, that is a total listing of  
10 automatic and manual loads on the diesel, the table you are  
11 talking about.

12 What we think would be more useful -- and this is  
13 approximately what we will produce -- would be what is the  
14 loading on the diesel for, say, loss of offsite power. What  
15 is the loading on the diesel, say, for loss of offsite power  
16 in a small break, loss of offsite power in a large break,  
17 and then possibly taking the most demanding of these events  
18 -- what is the sequence of loading and unloading with a  
19 running, cumulative total; so that we see something of --  
20 where are we in relation to the -- throughout the loading  
21 pattern.

22 Where are we in relation to the capacity of the  
23 diesel? That part of the picture does not appear from the  
24 table that Mr. Dornsife is talking about. It is a fair feat  
25 to derive it from the footnote to that table. That is why



1 we are coming back.

2 Does that help?

3 MR. DORNSIFE: That is acceptable to me. I just  
4 wanted it identified to see if it would help in the  
5 proceeding at this point.

6 CHAIRMAN SMITH: Then we will take a mid-morning  
7 break.

8 (Recess)

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1 MR. DORNSIFE: I have two more fairly short, I  
2 hope, lines of questioning.

3 BY MR. DORNSIFE:

4 Q Referring to your Figure 1 in the testimony,  
5 looking at the voltage of the 1-D bus and the 1-P bus, if  
6 you can help me, is it true with the three-phase circuit the  
7 turns ratio, voltage decrease and voltage difference -- the  
8 current -- the turns ratio in the transformer, as it is in a  
9 single-phase circuit? Is that still the basic rule? In  
10 other words, the ratio of the voltage in the 1-P bus to the  
11 1-D bus would be the turns ratio of the transformer?

12 A (WITNESS SHIPPER) I think that's correct.

13 Q The current would be inversely proportional to the  
14 turns ratio of the --

15 A (WITNESS SHIPPER) Yes.

16 Q So the volt amperage would be basically the same  
17 on either side of -- the volt-ampere rating would be the  
18 same on either side of the turns ratio?

19 A (WITNESS TORCIVIA) Basically, that's right.

20 Q My question, then, is concerned with Procedure  
21 12012-29, which is UCS 19, on page 12, where you talk about  
22 the 150 amp current in step 8.g on page 12.

23 A (WITNESS TORCIVIA) What was it?

24 Q UCS 19, Exhibit 19, on page 12, Procedure 1202-29.

25 A (WITNESS TORCIVIA) Right.

1 Q If you recall, Mr. Pollard was asking questions  
2 about the 150 amp reading that is called out there. I  
3 believe you had said that that reading is on the 4160 volt  
4 side?

5 A (WITNESS TORCIVIA) That is correct.

6 Q What is the turns ratio of that transformer?  
7 Could you figure it out real quickly for me?

8 A (WITNESS TORCIVIA) Now we are getting inside the  
9 transformer itself. What we look at is the relationship  
10 between the high side of the voltage, the high voltage and  
11 the low voltage. And in this case it happens to be 4160 to  
12 480.

13 Q I'm trying to determine what that current really  
14 is on the 480 side.

15 A (WITNESS TORCIVIA) Yes.

16 Q I think there were some misstatements in the  
17 testimony, because the way I calculated it it comes out to a  
18 much smaller value. That's what I'm trying to get at. If  
19 you divide the 4160 by 480, my calculation you come up with  
20 8.6 as the turns ratio. If you multiply 8.6 by 150, which  
21 should give you the current on the 480 side, that is about  
22 1290 amps?

23 A (WITNESS TORCIVIA) That is correct.

24 Q That is well below the 1600 rating of that bus?

25 A (WITNESS TORCIVIA) That is correct.

1 Q With the amperage at 150 amps, you could still  
2 load the pressurizer heaters on the bus without exceeding  
3 the rating of the bus?

4 A (WITNESS TORCIVIA) That's correct.

5 Q I think you said that that -- there was some  
6 statement saying that that was the absolute limit of the  
7 bus, the 150 amps?

8 A (WITNESS TORCIVIA) I know what you're referring  
9 to. The reason we limited that to 150, we did not want to  
10 exceed the capacity of the bus. That's what we are  
11 considering our limitation, the 1600 amps. So we are  
12 starting out with 1290. We add on the pressurizer heaters  
13 and we are trying to keep it at 1600 amps or below.

14 Q The procedure is correct as written? That is  
15 verified before you add the pressurizer heaters?

16 A Yes.

17 Q Do you know, in addition to the possibility that  
18 is precluded by the Kirk Key interlock of connecting the 1-P  
19 and the 1-S bus, are there any other ways of connecting  
20 those two buses together?

21 A (WITNESS TORCIVIA) Not to my knowledge. I don't  
22 know of any way there is of connecting those other two buses  
23 together.

24 MS. WEISS: Which two buses?

25 MR. DORNSIFE: The 1-P and the 1-S bus.

1 BY MR. DORNSIFE: (Resuming)

2 Q You have the restart report one-line diagram  
3 E-206-032? I can give you my copy if you would like.

4 (Pause.)

5 CHAIRMAN SMITH: What is that number, the diagram  
6 number?

7 MR. DORNSIFE: E, and the last number is 032.

8 (Pause.)

9 MS. WEISS: Would you wait a minute before  
10 answering that, until we can get a copy of the diagram?

11 (Pause.)

12 DR. JORDAN: While we are waiting, I think there  
13 is a slight clarification of Mr. Dornsife's question. He  
14 asked if there was any other way of connecting those two  
15 buses together, namely -- and I think he said 1-P and 1-S.  
16 I don't think there is any way of connecting 1-P to 1-S.

17 MR. DORNSIFE: That was my question, Dr. Jordan.  
18 I am referring him to this drawing. There appears to be a  
19 way to do that.

20 DR. JORDAN: What you said is, is there any other  
21 way. By "other" I presumed you meant other than those  
22 keys. And the keys do not connect the two buses together.

23 MR. DORNSIFE: I think I made it clear in my  
24 question that was precluded by the interlock.

25 DR. JORDAN: All right, good.

1 BY MR. DORNSIFE: (Resuming)

2 Q Do you see the red-green interconnection there?  
3 Would you explain what that is?

4 MS. WEISS: Would you hang on one second until we  
5 can get it out, please?

6 (Pause.)

7 MS. WEISS: We're ready now. Thank you.

8 (Panel conferring.)

9 WITNESS TORCIVIA: Yes. I feel rather red-faced  
10 on that, particularly because -- this may sound off, but  
11 several weeks ago I personally made a note to investigate  
12 what we could do for those two particular breakers, to take  
13 them off. They are in there for maintenance, that is  
14 correct. They are controlled and everything else.

15 I have made that one of the items that we could  
16 investigate as to what we could do in that area to provide  
17 the necessary maintenance for the plant and at the same time  
18 to permit us to eliminate that possible -- but you are  
19 correct and I apologize.

20 BY MR. DORNSIFE: (Resuming)

21 Q Are there any interlocks in those breakers now?  
22 What type of precautions are there to prevent connecting the  
23 two buses currently?

24 A (WITNESS SHIPPER) In order to close what is  
25 listed as the 1-S-12 breaker, either the 1-P-02 or the

1 1-S-02 must be opened. There is a positive interlock  
2 electrically interlocked in order to close those.

3 Q Would you tell me which breakers they are, the  
4 feeder breakers into that bus from the 480 volt?

5 A (WITNESS SHIPPER) If you look on our diagram, if  
6 you look on Figure 1, it is what is known as -- it is shown  
7 as the main feeder breaker.

8 Q You mean the main breaker?

9 A (WITNESS SHIPPER) Excuse me. The main breaker.  
10 I'm sorry.

11 Q There is no positive interlock right now to  
12 prevent? It is just an administrative interlock, an  
13 administrative procedure?

14 A (WITNESS SHIPPER) No, no, no. Didn't you  
15 understand what I said? It is electrically interlocked to  
16 prevent closing unless the 1-P-02 or the 1-S-02 breakers are  
17 open.

18 You are asking me to recall -- well, that's as  
19 much as I know for certain.

20 A (WITNESS TORCIVIA) I recognize your concern.  
21 That is the area that I plan to investigate to see what kind  
22 of mechanical obstacle could be put in the path.

23 Q In other words, that would have to be a dead bus  
24 electrically before you could close either one of those  
25 breakers?



1 A (WITNESS SHIPPER) That's correct.

2 DR. JORDAN: But a single failure in that case  
3 could cause the interconnection, isn't that true?

4 WITNESS SHIPPER: Postulated.

5 WITNESS TORCIVIA: On the basis that the interlock  
6 may fail, is that the basis?

7 DR. JORDAN: Yes.

8 WITNESS TORCIVIA: That is possible. That is my  
9 concern, that's correct.

10 BY MR. DORNSIFE: (Resuming)

11 Q Are there any other combinations of red and green  
12 safety buses that have the same type of interconnections?

13 A (WITNESS SHIPPER) On the same one, you have the  
14 1-S and the 1-T, which is the screenhouse 480 switch gear.

15 MS. WEISS: Was that 1-S and 1-T as in "Thomas"?

16 WITNESS SHIPPER: Excuse me. 1-R and 1-T as in  
17 "Thomas."

18 It is conceivable to tie the 4 KV buses together  
19 when they are on offsite power. Should a transformer be  
20 lost, the two 4 KV buses, the 1-D and the 1-E can be tied  
21 together through a set of interlocks, through a set of  
22 breakers. And I don't have the details in front of me.

23 BY MR. DORNSIFE: (Resuming)

24 Q You said the 1-D and the 1-E bus?

25 A (WITNESS SHIPPER) Yes.

1 Q I would assume they would be tripped, those  
2 breakers would be tripped on an ESFAS signal?

3 A (WITNESS SHIPPER) I think -- I am really  
4 stretching here -- that on an ES actuation -- with an ES  
5 actuation with loss of offsite power, the incoming line  
6 feeders are tripped. I forget the numbers. 1-D-1 and  
7 1-D-14 and 1-E-1 and 1-E-14. 1-E-13, I'm not sure.

8 MR. POLLARD: If I could assist, buses 1-D and 1-E  
9 are shown on restart Figure E-206022.

10 MR. ROBERT ADLER: Can Licensee's counsel please  
11 provide the witnesses with a copy of these?

12 (Handing documents to witnesses.)

13 (Panel conferring.)

14 WITNESS SHIPPER: The ties between -- that could  
15 be operated are the 1-SAD-2, 1-SAE-2, as shown, connected to  
16 transformer 1-A, 1-SBE-2, and 1-SBD-2.

17 BY MR. DORNSIFE: (Resuming)

18 Q This drawing doesn't show whether they are  
19 tripped, the ES signals?

20 A (WITNESS SHIPPER) They wouldn't be tripped on an  
21 ES signal.

22 Q So they would be?

23 A (WITNESS SHIPPER) They would not be tripped on an  
24 ES signal.

25 Q The interconnection between the two buses?

1           A       (WITNESS SHIPPER) I would have to check on the  
2 operating sequence. You would not -- if you were on offsite  
3 power, you have an ES condition, you certainly would not  
4 want to trip your incoming line feeders, as long as you have  
5 incoming voltage.

6           Q       This interconnection is upstream of the -- it is  
7 actually on the non-safety side of the feeder breakers. It  
8 is not on the buses themselves?

9           A       (WITNESS SHIPPER) Yes, definitely.

10          Q       It is on the buses themselves for the 1-P and the  
11 1-S connection?

12          A       (WITNESS SHIPPER) Yes.

13          Q       If they were interconnected, there would be a  
14 desirability to have an ES signal to open that  
15 interconnection?

16          A       (WITNESS SHIPPER) Yes, correct.

17                   MR. DORNSIFE: I have no further questions.

18                   CHAIRMAN SMITH: Mr. Tourtellotte?

19                                   CROSS-EXAMINATION

20                   BY MR. TOURTELLOTTE:

21          Q       Mr. Shipper, Mr. Pollard asked you a series of  
22 questions which apparently established that the main feeder  
23 breaker would not be controlled from the control room, but  
24 must be closed, and I think you said by going to the 322  
25 elevation?

1 A (WITNESS SHIPPER) That's correct.

2 Q He stopped his questioning at that point. Is  
3 there any significance in the fact that it is not controlled  
4 from the control room and that you must go to the 322  
5 elevation?

6 A (WITNESS SHIPPER) The significance to that was an  
7 attempt to have the operators be certain that they want to  
8 establish this tie and not to use it at will as a normal  
9 means of operation.

10 Q Why was that?

11 A (WITNESS SHIPPER) The design criteria was that it  
12 was an emergency situation, not one of normal means,  
13 "emergency" meaning loss of offsite power.

14 Q How long would it take to go to the 322 elevation  
15 to control that?

16 MR. TROWBRIDGE: I'm unable to hear, Mr.  
17 Tourtellotte.

18 BY MR. TOURTELLOTTE: (Resuming)

19 Q How long would it take to get to the 322 elevation  
20 to control that main feeder breaker?

21 A (WITNESS SHIPPER) As long as it would take you to  
22 walk down two flights of stairs, approximately one minute.

23 Q I would like to invite the attention of both of  
24 you for a moment back to the fundamental contention in this  
25 case. You have been asked a lot of questions, you have

1 answered a lot of questions. And basically, the thrust of  
2 UCS Contention 4 is that the use of non-safety grade heaters  
3 degrades the capacity, capability and reliability of the  
4 onsite emergency power supply.

5 Is there anything that has transpired during the  
6 course of the cross-examination that tends to make you  
7 believe that Mr. Pollard is correct and the position you  
8 took in your testimony is wrong?

9 A (WITNESS SHIPPER) There has been nothing to  
10 change my mind. I still believe we have not degraded the  
11 capability, capacity, nor reliability of the onsite power  
12 source.?

13 A (WITNESS TORCIVIA) I feel the same way.

14 (Pause.)

15 Q Mr. Torcivia, do you have a copy of yesterday's  
16 transcript, December 23? I would like to invite your  
17 attention to pages 9220 and 9221. The reason I do that, I  
18 would like you to take a few moments and refresh your memory  
19 as to what was going on right there and then I will ask you  
20 a question.

21 A (WITNESS TORCIVIA) I'm sorry, I didn't hear you.

22 Q I beg your pardon?

23 A (WITNESS TORCIVIA) I do not hear you here at all.

24 Q I would ask you to read 9220 and 9221 to refresh  
25 your memory, and then I will have a question for you.

1 (Pause.)?

2 A (WITNESS TORCIVIA) At 9220.

3 Q Actually, 9220 is to sort of get you into the --  
4 what I am interested in is an explanation from you about  
5 lines 2 and 3, where you state that there would be a drop of  
6 460, 9221.

7 A (WITNESS TORCIVIA) All right.

8 Q Lines 2 and 3 there. You had just been asked the  
9 question on the previous page, quote: "You were saying the  
10 voltage on bus 1-P will not drop below, very low below 480  
11 volts."

12 And your answer, quote: "No, probably down to the  
13 basis 460, if it is originally established."

14 Now, I would invite your attention to your  
15 testimony on page 6.

16 A (WITNESS TORCIVIA) All right.

17 Q Do you have that?

18 MR. TROWBRIDGE: Do you have page 6 of your  
19 testimony available also, Mr. Torcivia?

20 BY MR. TOURTELLOTTE: (Resuming)

21 Q I ask you to look at the ninth line from the  
22 bottom, where the sentence starts, quote: "Voltage on the  
23 emergency bus for a fault on the pressurizer heater would  
24 also cause the undervoltage relays (refer to item 2 in the  
25 preceding paragraph) to cause opening of the main

1 pressurizer heater supply breaker to isolate the fault by a  
2 shunt trip independent of the overcurrent trip." Quote.

3           The question I have for you: Is what you were  
4 saying in lines 2 and 3 consistent or inconsistent with what  
5 you are saying on page 6 of your testimony?, or are you even  
6 talking about the same thing, and tell me why?

7           A       (WITNESS TORCIVIA) I recognize that the written  
8 testimony appears to indicate that that voltage relay will  
9 operate on a fault on the pressurizer heaters, which would  
10 reduce the voltage on the bus and therefore operate. Is  
11 that satisfactory? Do I make myself clear there?

12           In other words, our testimony seems to indicate  
13 that a fault on the pressurizer heater is what would reduce  
14 the voltage to the point at which the relay would trip and  
15 disengage the pressurizer heater itself. I hope that  
16 yesterday I indicated that undervoltage relay is connected  
17 to the bus as a whole, and when that happens, as far as the  
18 undervoltage relay is concerned, it does not know that the  
19 voltage has been reduced because of a fault on the heater or  
20 a fault on another feeder, or wherever that may be on the  
21 entire bus.

22           The undervoltage relay does not discriminate. It  
23 merely indicates that there is an undervoltage on that bus.  
24 Now, when that happens, our undervoltage relay is set to  
25 trip out the pressurizer heaters themselves. That does not



1 mean that the pressurizer heaters were at fault that caused  
2 that voltage to dip. It may have been something else.

3 The only backup that we feel we are providing  
4 there is a backup to eliminate that pressurizer heater as a  
5 possible cause of the problem and therefore leave the bus  
6 free to carry on the other load.

7 (Pause.)

8 Q Assume for a moment that the overvoltage  
9 protection system does not work -- I'm sorry, the  
10 overcurrent protection system does not work, and there is a  
11 fault that is caused by pressurizer heaters. Does the  
12 voltage drop low enough to actuate the undervoltage relays?

13 A (WITNESS TORCIVIA) As I have indicated in the  
14 testimony, I just grabbed the figure out of the air. We  
15 have made no definite analysis of that value of current,  
16 which is approximately 4,000 amps, just what the dip would  
17 be on the bus at that time.

18 But if the 4,000 amps fault current develops and  
19 is such, and does dip the voltage down below approximately  
20 92 percent setting of the relay, it would trip it out. I  
21 have not made a study of just how far it would dip.

22 Q Do you think there is a reasonable likelihood that  
23 it would go below 92 percent?

24 A (WITNESS TORCIVIA) Quite possible, quite possible.

25 MR. TOURTELLOTTE: I have no other questions.

## 1 BOARD EXAMINATION

2 BY DR. JORDAN:

3 Q Mr. Torcivia, I am really puzzled. Yesterday you  
4 did say you were not relying on the undervoltage relays to  
5 detect a fault in the pressurizer heaters?

6 A (WITNESS TORCIVIA) That's correct.

7 Q That was your testimony?

8 A (WITNESS TORCIVIA) Yes.

9 Q Therefore, that does seem to me to be inconsistent  
10 with your statement here. I hear what your explanation has  
11 been, but if I read what it says, I just cannot arrive at  
12 the conclusion that you are not relying on the undervoltage  
13 relays to open up the circuit in the case of a fault in the  
14 pressurizer heaters. The sentence doesn't say that to me.

15 A (WITNESS TORCIVIA) The testimony?

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1 Q Yes. Shouldn't the testimony, that line, be  
2 rewritten then to correspond?

3 A (WITNESS TORCIVIA) Yes.

4 Q When you come back next time, could you have it  
5 revised line?

6 A (WITNESS TORCIVIA) Definitely.

7 CHAIRMAN SMITH: Is there any confusion about the  
8 line that is involved? It is page 6 of the testimony. It  
9 is: "Voltage on the emergency bus for a fault pressurizer  
10 heaters would also cause the under-voltage relays (refer to  
11 item 2 in the preceding paragraph) to cause opening of the  
12 main pressurizer heater supply breaker to isolate the fault  
13 by a shunt trip independent of the over-current trip."

14 DR. JORDAN: I have one or two clarifying  
15 questions, and I will not go into the matter that we are  
16 going to talk about next time concerning the loading of the  
17 buses.

18 BY DR. JORDAN:

19 Q I need help in one or two respects. The main  
20 feeder breaker, as shown on your figure 1 in your testimony,  
21 I believe you said was set to open on a current of something  
22 like 1200 amperes. Is that right?

23 A (WITNESS SHIPPER) That's correct.

24 Q Supposing the fault were only -- was such as to  
25 draw 1000 amperes.

1 A (WITNESS TORCIVIA) Please bear with me.

2 Q If the fault were such as to draw only 1000  
3 amperes, what power would that represent? Then there would  
4 be no tripping; isn't that correct?

5 A (WITNESS TORCIVIA) The distribution breakers.

6 Q The distribution breakers would trip?

7 A (WITNESS TORCIVIA) Would trip.

8 Q What current level are they set for?

9 A (WITNESS TORCIVIA) Between 950 and 1100 amps.

10 Q Then let's assume that the fault drew only 900  
11 amperes. There would be no breakers tripped?

12 A (WITNESS TORCIVIA) No. If you would make it down  
13 to 800 amps --

14 Q Let's take 800.

15 A (WITNESS TORCIVIA) -- then I could give a better  
16 answer.

17 Q Your number then? I will see whether I will want  
18 to abandon my number. What power is that?

19 A (WITNESS TORCIVIA) That would take approximately  
20 -- I am sorry, you asked what power or what time?

21 Q What power?

22 MS. WEISS: Please use the microphone.

23 BY DR. JORDAN:

24 Q How much power would that draw from the diesels,  
25 that fault? Is it 800 times 480 times the square root of

1 3?

2 A (WITNESS SHIPPER) 665.

3 A (WITNESS TORCIVIA) 665 KVA.

4 Q Kilowatts?

5 A (WITNESS TORCIVIA) Yes.

6 MS. WEISS: You said "KW."

7 WITNESS TORCIVIA: In this case they are both  
8 equal, KVA and KW, with the pressurizer heaters. May I add  
9 this --

10 CHAIRMAN SMITH: I doubt whether the reporter got  
11 that. What did you say about the KVA?

12 WITNESS TORCIVIA: In this case, because the  
13 pressurizer heaters are resistant-type equipment, the KVA,  
14 as we refer to it, and the KW, are very, very equivalent.

15 WITNESS SHIPPER: Let me clarify one thing on  
16 this: The breakers would trip at that value.

17 BY DR. JORDAN:

18 Q I see.

19 A (WITNESS SHIPPER) It would take a longer time for  
20 them.

21 Q But they would trip?

22 A (WITNESS SHIPPER) Yes. 800 amps, it would take  
23 approximately three seconds for the distribution breaker to  
24 trip.

25 Q What is the lowest at which they would trip for

1 continuous current?

2 A (WITNESS SHIPPER) About 85 amps.

3 Q Who much?

4 A (WITNESS SHIPPER) 85 amps.

5 Q Is 85 amps representing less than 126 kilowatts?

6 (Witness conferring.)

7 A (WITNESS TORCIVIA) Dr. Jordan --

8 Q Wait a minute. Let me ask Mr. Shipper what power  
9 level is 85 amperes?

10 A (WITNESS SHIPPER) Let me clarify one thing: When  
11 we are talking 85 amps, we are into the single-phase  
12 breakers. Before, we have been talking three-phase.

13 Q All right. I see.

14 A (WITNESS SHIPPER) At the single-phase level, that  
15 is 40 KW.

16 Q How much?

17 A (WITNESS SHIPPER) 40 KW.

18 Q With three-phase, is that 120? That checks then?

19 A (WITNESS SHIPPER) Yes, approximately.

20 Q It would seem they are set slightly below the  
21 power drawn by the heaters, which is 126 KW.

22 A (WITNESS TORCIVIA) 42 KW.

23 MR. POLLARD: I am being confused, and I think I  
24 see the reason why. I hate to interrupt. You postulated  
25 certain value of current, and these witnesses are assuming

1 all that current goes through one of the three distribution  
2 panel breakers, whereas the 126 KW is distributed among all  
3 three.

4 DR. JORDAN: I think you're right. Thank you. My  
5 main problem was answered earlier.

6 BY DR. JORDAN:

7 Q I am now looking at a document from the NRC, I&E  
8 Bulletin 79-01B, Supplement Number 3, "Environmental  
9 Qualification of Class 1-E Equipment." This was dated  
10 October 24, 1980. Under item number 1 it says: "The  
11 qualification information for equipment needed to achieve  
12 and maintain a hot shutdown condition must be submitted not  
13 later than November 1, 1980; and, B, the qualification  
14 information for equipment required to achieve and maintain a  
15 cold shutdown must be submitted not later than February 1,  
16 1981."

17 Does that include the pressurizer heaters? And  
18 are the pressurizer heaters qualified in accordance with  
19 this I&E Bulletin?

20 A (WITNESS SHIPPER) As far as the pressurizer  
21 heaters themselves are concerned, I do not know.

22 DR. JORDAN: That's all the questions I have.

23 CHAIRMAN SMITH: Mr. Trowbridge?

24 MR. TROWBRIDGE: I have no more questions.

25 CHAIRMAN SMITH: What was the assumption? That we



1 would have to bring these witnesses back?

2 MR. TROWBRIDGE: These witnesses will be back our  
3 first hearing day after the first, after New Year's.

4 CHAIRMAN SMITH: Solely to supply the information  
5 about the diesel loading?

6 MR. TROWBRIDGE: Yes.

7 CHAIRMAN SMITH: Do we have agreement as to the  
8 information that is to be supplied? Is there any area of  
9 confusion?

10 MR. TROWBRIDGE: I described it as best I could,  
11 the tables that we intend to develop. They haven't been  
12 done yet. I think it is a fairly accurate forecast of what  
13 they will look like.

14 MS. WEISS: Mr. Chairman, we would renew our  
15 request, and maybe Dr. Jordan is in a position now to know  
16 whether he would like to see these two. But if these tables  
17 are coming in on the diesel loading, we would renew our  
18 request for the underlying calculations. This is not  
19 something that is just mechanical. You don't just go and  
20 add up a nameplate rating on the equipment. You have to  
21 apply service factors, power factors, which involve an  
22 exercise of engineering judgment.

23 At this point, I don't think the Licensee can  
24 argue that there is any prejudice to producing those  
25 calculations, since they are going to produce a summary of

1 them or the results of them, and certainly isn't going to  
2 delay the proceeding any. We would renew our request for  
3 that at this point.

4 MR. TROWBRIDGE: I don't have any problem with  
5 that. We have a piece of paper that Mr. Torcivia and Mr.  
6 Shipper can bring with them, their calculations so they can  
7 answer questions. We have that choice. We will be prepared  
8 to talk to the basis for the calculations, the backup for  
9 the calculations.

10 MS. WEISS: That's an improvement, but that is not  
11 the same as giving them to us beforehand so that we can be  
12 prepared to do questioning.

13 MR. TROWBRIDGE: There isn't going to be a lot of  
14 lead time on this. There are not many working days between  
15 now and January 5.

16 MS. WEISS: I am going to press the request. We  
17 want to be able to look at those. Mr. Torcivia says he has  
18 them. It is not a matter of making something up. And we  
19 have enough working days so that we can look at them and  
20 prepare our questions on them.

21 MR. TROWBRIDGE: Mr. Chairman, I think that we  
22 will produce them. I doubt that UCS will need very many  
23 days to review them or prepare their questions. I am no  
24 sure what Ms. Weiss wants during the hearing or --

25 MS. WEISS: I would like to have those

1 calculations in my office during the week between Christmas  
2 and New Year's.

3 MR. TROWBRIDGE: They will not be available during  
4 that time. It is going to take some time to put these  
5 together.

6 MS. WEISS: Mr. Torcivia said he had done  
7 calculations. I am not asking him to do something new.

8 MR. TROWBRIDGE: We are talking about two  
9 different sets of calculations.

10 CHAIRMAN SMITH: That's my concern.

11 MR. TROWBRIDGE: I have been talking all along  
12 about the calculations associated with these new tables that  
13 we are talking about. I misunderstood you. You are talking  
14 about the calculations that Mr. Torcivia said had been made  
15 before in connection with the capability of the diesel; is  
16 that correct?

17 MS. WEISS: The calculations which are the  
18 underlying calculations which result in associating a  
19 particular load with a particular piece of equipment, I  
20 assume you take the nameplate rating, you apply a service  
21 factor, a power factor. I assume he is going to use those  
22 same numbers even if he is going to use part and not all of  
23 the equipment.

24 MR. TROWBRIDGE: Let me have a moment with Mr.  
25 Torcivia to find out what he has got and what we can give

1 you.

2 (Counsel conferring with witness.)

3 MS. WEISS: We also have some more questions.

4 (Discussion off the record.)

5 MR. TROWBRIDGE: Mr. Chairman, I would like to  
6 make a suggestion. We don't have in a drawer a file marked  
7 "Calculations." We would like to sit down, I think, right  
8 now with Ms. Weiss and Mr. Pollard and see if we can't agree  
9 on what it is they would like to have in the way of backup  
10 data. I think we can save some hearing time if we did that.

11 CHAIRMAN SMITH: All right. That's fine. In any  
12 event, these witnesses are going to return?

13 MR. TROWBRIDGE: They are going to return.

14 CHAIRMAN SMITH: I will leave it up to you: We  
15 will either adjourn, or you can --

16 MR. POLLARD: We have one more thing we would like  
17 to do on the record, not questioning, just to make sure that  
18 we are all in agreement as to what are the outstanding items  
19 of information that are going to be supplied later.

20 CHAIRMAN SMITH: In addition to the --

21 MR. POLLARD: In addition to the tables.

22 CHAIRMAN SMITH: -- to the tables and the  
23 quasi-calculations or whatever they may have been?

24 MS. WEISS: Right. I have gone through my notes,  
25 and there were several other things remaining. What we

1 propose to do is save our questions until the witnesses come  
2 back. I would just like to state what my notes reflect  
3 about what are the remaining outstanding questions other  
4 than the tables.

5 I have also noted that the question of confirming  
6 the three signals, and particularly the 400-pound reactor  
7 coolant system pressure signal, there is a question  
8 outstanding as to what engineered safety features are  
9 actuated by that signal. My notes indicate that the  
10 witnesses had undertaken to provide that information later.

11 The second question that I have is the witnesses  
12 were asked whether revision 12 of emergency procedure  
13 1202-29 and amendment 22 of the restart report accurately  
14 recite the design at restart with respect to the Kirk Key  
15 interlocks.

16 My notes reflect the witnesses were also going to  
17 check on that. I also have a question of Dr. Jordan's  
18 open. It may have been ours. My notes are not clear. But  
19 the question was whether the Kirk Key interlock system is  
20 used in any situation other than a loss of off-site power.  
21 I believe that is an open question as well.

22 MR. TROWBRIDGE: Do you recognize the question? I  
23 recognized the first two questions. I don't recognize this  
24 one.

25 WITNESS SHIPPER: No.

1 MS. WEISS: I have it marked in my notes. Do the  
2 witnesses think that they answered that question already, or  
3 does it not just sound familiar at all?

4 WITNESS SHIPPER: The question does not sound  
5 familiar.

6 MS. WEISS: Maybe I will just serve notice on you  
7 that we will ask you that question when we come back on.

8 MR. TROWBRIDGE: Would you restate it?

9 MS. WEISS: Whether the Kirk Key interlock system  
10 is used in any situation other than loss of off-site power?

11 WITNESS SHIPPER: As it pertains to the  
12 pressurizer heaters?

13 MS. WEISS: Yes.

14 MR. TROWBRIDGE: We will be prepared to answer  
15 that question.

16 MS. WEISS: Those are all the questions that my  
17 notes indicate to be open.

18 MR. POLLARD: I have one final item which relates  
19 to the questioning that Dr. Jordan picked up after Mr.  
20 Tourtelotte finished. As I understood how it was left, the  
21 witness was going to come back with a rewrite to page 6 of  
22 his testimony. During the recent break I consulted with the  
23 staff, and the staff can correct me if I am wrong. What I  
24 would prefer to ask the witnesses to do is to compare their  
25 written testimony with the testimony they gave in response

1 to my cross examination and decide which one needs to be  
2 corrected. I am not yet convinced that it is the written  
3 testimony that's wrong.

4 DR. JORDAN: All right. That's fine.

5 CHAIRMAN SMITH: Anything further before we  
6 adjourn?

7 (No response.)

8 CHAIRMAN SMITH: Then we will meet on January 6 at  
9 10:00 a.m.

10 (Whereupon, at 11:30 a.m., the hearing was  
11 adjourned, to reconvene at 10:00 a.m. Tuesday, January 6,  
12 1981.)

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NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

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in the matter of: METROPOLITAN EDISON COMPANY (TMI Unit 1)

Date of Proceeding: December 24, 1980

Docket Number: 50-289

Place of Proceeding: Harrisburg, Pa.

were held as herein appears, and that this is the original transcript thereof for the file of the Commission.

Barbara L. Whitlock

Official Reporter (Typed)

Barbara L. Whitlock

Official Reporter (Signature)

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