

1 UNITED STATES OF AMERICA  
2 NUCLEAR REGULATORY COMMISSION

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4 In the matter of: :  
5 METROPOLITAN EDISON COMPANY :  
6 (Three Mile Island Unit 1) :  
7 - - - - - :

Locket No. 50-289  
(Restart)

8  
9 25 North Court Street,  
Harrisburg, Pennsylvania

10 Wednesday, January 7, 1981

11 Evidentiary hearing in the above-entitled  
12 matter was resumed, pursuant to adjournment, at 9:05 a.m.

13 BEFORE:

14 IVAN W. SMITH, Esq., Chairman,  
Atomic Safety and Licensing Board

15 DR. WALTER H. JORDAN, Member

16 DR. LINDA W. LITTLE, Member

17 Also present on behalf of the Board:

18 MS. DORIS MORAN,  
19 Clerk to the Board

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## 1 APPEARANCES:

2 On behalf of the licensee, Metropolitan Edison  
Company:

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4 THOMAS A. BAXTER, Esq.  
5 DELISSA A. RIDGWAY, Esq.  
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Washington, D. C.

7 On behalf of the Commonwealth of Pennsylvania:

8 ROBERT ADLER, Esq.  
Assistant Attorney General,  
9 505 Executive House,  
Harrisburg, Pennsylvania  
10 WILLIAM DORNSIFE,  
Nuclear Engineer

11 On behalf of Union of Concerned Scientists:

12 ELLYN WEISS, Esq.,  
13 ROBERT D. POLLARD  
Harmon & Weiss,  
14 1725 I Street, N.W.  
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15 On behalf of the Regulatory Staff:

16 JAMES TOURTELLOTT, Esq.  
17 JAMES M. CUTCHIN, IV, Esq.  
Office of Executive Legal Director,  
18 United States Nuclear Regulatory Commission,  
Washington, D. C.

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C O N T E N T S

1					
2	<u>WITNESS:</u>	<u>DIRECT</u>	<u>CROSS</u>	<u>REDIRECT</u>	<u>RECROSS</u> <u>BOARD</u> <u>CROSS</u> <u>ON BOARD</u>
3	Paul Shipper, Jr. Joseph A. Torcivia				
4	By Mr. Trowbridge		9554		
5	By Ms. Weiss By Chairman Smith			9558 (Continued) 9561	
6	By Mr. Pollard By Ms. Weiss			9563 (Continued) 9587	
7	By Mr. Dornsife By Dr. Jordan			9589	9594
8				Afternoon Session p. 9604	
9	Robert Pollard				
10	By Ms. Weiss By Mr. Trowbridge	9506		9638	
11	By Mr. R. Adler By Ms. Weiss			9668	9689
12	Robert Fitzpatrick				
13	By Mr. Cutchin	9699			
14	By Ms. Weiss By Mr. Pollard			9706 9719	
15	<u>NUMBER</u>			<u>EXHIBITS</u>	<u>IN EVIDENCE</u>
16	UCS 29		9608		
17	UCS 30		9610		
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P R O C E E D I N G S

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2 CHAIRMAN SMITH: On the record.

3 I have a report to make about scheduling matters.  
4 I am reading the notes of Mrs. Moran. January 6, 1981, Mrs.  
5 Moran called ECNP, spoke with Dr. Judith Johnsrude, notified  
6 her that ECNP Contention 10 will be heard as early as  
7 tomorrow afternoon at 1:00 p.m., that is, January 7. Dr.  
8 Johnsrude stated: "Given our commitments," probably neither  
9 she nor Dr. Kepford will attend. I left the phone number of  
10 the Board office if they have any need to reach us.

11 On January 7th, this morning, Mr. Marvin I. Lewis  
12 returned a call from yesterday. He was given the message  
13 sent in a letter by express mail. That evidence on his  
14 contention regarding filters will be heard as early as 1:00  
15 p.m. January 8th. He said he would make every effort to be  
16 present, but that if it went over to Friday he would not be  
17 able to be present. He mentioned his car was out of order,  
18 and he would have to make other arrangements to be there on  
19 Thursday.

20 Are there any other preliminary matters?

21 (No response.)

22 CHAIRMAN SMITH: That being the case, I guess we  
23 are ready to address the subject matter that we closed with  
24 yesterday. And that is, to begin with, whether the  
25 questioning on the various loads identified in UCS Exhibit

1 19 -- could you help me on that page?

2 MR. POLLARD: 12.

3 CHAIRMAN SMITH: If questioning on those items of  
4 this panel is within the scope of the contention.

5 Mr. Trowbridge.

6 MR. TROWBRIDGE: Mr. Chairman, as we indicated  
7 yesterday, and as I will elaborate today, it is Licensee's  
8 position that questions to Licensee's witnesses on diesel  
9 loadings under accident conditions is outside the scope of  
10 UCS Contention 4.

11 I begin by reminding the Board that UCS already  
12 has a Contention 3, which contends that the pressurizer  
13 heaters are necessary for maintenance of natural circulation  
14 following a small-break LOCA but the pressurizer heaters  
15 should be fully safety-grade, and that their use and,  
16 therefore, their connection to the diesel generators should  
17 be mandatory in the case of a LOCA accompanied by loss of  
18 off-site power.

19 If UCS wins on Contention 3, it will automatically  
20 accomplish the objectives now sought by UCS in seeking to  
21 examine diesel loadings under accident conditions. Licensee  
22 would not only have to redesign the pressurizer heaters but  
23 would necessarily have to reexamine the capacity of the  
24 diesels and the selection of loads under the condition that  
25 the loading of the pressurizer heaters is mandatory.

1 Licensee does not accept UCS Contention 3 and is  
2 not proposing automatic or mandatory loading of the  
3 pressurizer heaters on the diesel generators. On the  
4 contrary, Licensee's plan of action is to assure that the  
5 disconnection of the pressurizer heaters is to assure the  
6 disconnection of the pressurizer heaters upon an FS signal  
7 and to prohibit connection of the pressurizer heaters unless  
8 and until adequate margin exists in the diesel capacity,  
9 whether through manual shedding of other loads or otherwise,  
10 to allow the connection without exceeding the capacity of  
11 the diesels.

12 CHAIRMAN SMITH: Mr. Trowbridge, I wonder if you  
13 could repeat that entire last statement again? I think I  
14 followed it, but it is an important statement, and I would  
15 like to ponder it for a moment.

16 MR. TROWBRIDGE: Licensee does not accept UCS  
17 Contention 3 and is not proposing automatic or mandatory  
18 loadings of the pressurizer heaters on the diesel  
19 generator. On the contrary, Licensee's plan of action is to  
20 assure the disconnection of the pressurizer heaters upon an  
21 ES signal and to prohibit connection of the pressurizer  
22 heaters unless and until adequate margin exists, whether  
23 through manual shedding of other loads or otherwise, to  
24 allow the connection without exceeding the capacity of the  
25 diesels.

1           The fair reading of USC Contention 4 is that it  
2 attacks the impact of the pressurizer heaters on the diesel  
3 capacity and reliability under the conditions which Licensee  
4 proposes to use the pressurizer heaters, i.e., when other  
5 loadings on the diesels allow their use.

6           This reading of Contention 4 is borne out by UCS'  
7 own testimony, which is mostly concerned with possible  
8 effects of fault currents in the pressurizer heaters if they  
9 are connected to the diesel and not with the overloading of  
10 the diesel beyond its capacity.

11           I hope that the Board will rule promptly on the  
12 scope of UCS Contention 4. We have promised to come back to  
13 the Board with further data on diesel capacity under the  
14 single condition of loss of off-site power. This is a  
15 relatively simple story to tell, although we do not at the  
16 moment have with us all of the data required to tell the  
17 story.

18           If we have to come back to address diesel loadings  
19 under accident conditions including selection of manual  
20 disconnects and the relative importance of various manually  
21 connected loads, we need a very different set of witnesses  
22 than we now have here.

23           (Board conferring)

24           MS. WEISS: The Licensee's proposal with respect  
25 to the treatment of the pressurizer heaters -- that is, not

1 to make them safety-grade --

2 MR. TROWBRIDGE: I am unable to hear.

3 MS. WEISS: The Licensee's proposal with respect  
4 to pressurizer heaters -- that is, not to make them  
5 safety-grade, but to provide a connection to the heaters and  
6 the emergency power supplies -- has two consequences, in  
7 UCS' view.

8 The first consequence is that the availability of  
9 the heaters to perform a function when needed is not  
10 sufficiently reliable. That has been the subject of UCS  
11 Contention 3, already litigated.

12 The second consequence of the proposal of the  
13 Licensee is to threaten the emergency power supplies and the  
14 remainder of the safety functions which must be performed  
15 via the emergency power supplies in the event of either loss  
16 of off-site power or an accident. We have never made any  
17 distinction between the two. There is no distinction in the  
18 Contention, and there is no distinction in the Licensee's  
19 procedures.

20 It is well established that emergency procedure  
21 1202-29, with respect to connection-disconnection of the  
22 pressurizer heaters and load setting to make room for the  
23 pressurizer heaters, the shedding of other loads on the  
24 safety buses applies both for loss of off-site power events  
25 and for accidents. There is no distinction.

1           This is the first time that we have ever heard an  
2 objection to the scope of the Contention along the lines  
3 presented by Mr. Trowbridge in almost this year and a half  
4 that we have been litigating the Contention.

5           Let me trace back a little bit to how we got to  
6 the question which engendered the long argument and the long  
7 objection.

8           On page 4 of the licensee's direct testimony of  
9 the witness Torcivia and the witness Shipper, the first  
10 paragraph, the first full paragraph, reads: "TMI-1  
11 emergency procedures specify that only one group of  
12 pressurizer heaters be connected to an emergency bus at any  
13 one time and that sufficient capacity be available for the  
14 emergency diesel generator to handle the pressurizer heater  
15 loads as verified by the watt meter indicator for the rated  
16 capacity. The diesel has been verified as being capable of  
17 handling the heaters in addition to the safety-related loads  
18 required during loss of off-site power events."

19           MR. TROWBRIDGE: Could I have a rereading of  
20 that? I failed to follow. It was fast and not all of it  
21 audible.

22           MS. WEISS: I read the entire paragraph on page 4  
23 of Shipper and Torcivia's testimony. The witnesses were  
24 asked what emergency --

25           CHAIRMAN SMITH: Give Mr. Trowbridge an

1 opportunity to identify and come up to speed on that  
2 paragraph.

3 (Pause.)

4 MR. TROWBRIDGE: Thank you.

5 MS. WEISS: The witnesses were asked, "What TMI-1  
6 emergency procedures does that paragraph refer to?" They  
7 answered, "That refers to emergency procedure 1202-29."

8 Mr. Torcivia eventually produced a letter  
9 instructing the plant to change emergency procedure  
10 1202-29. That is in evidence now. Page 13 of the procedure  
11 describes the process for ensuring that the loads will be  
12 kept below 3000 KW -- KW, excuse me. That process includes  
13 shedding series of loads, which are identified only by  
14 number but which are described as "nonessential."

15 Let me stress that UCS' Contention goes not only  
16 to the threat posed by the connection of the pressurizer  
17 heaters to the diesels, because the diesels are  
18 nonsafety-grade and not -- because the heaters are  
19 nonsafety-grade and not appropriately isolated, but also to  
20 the fact that the addition of the load in itself makes it  
21 critical to ensure that the entire accumulative load on the  
22 diesel is kept below the rated capacity for the diesels, so  
23 that the diesels are not threatened.

24 In other words, there are two sources of threat:  
25 One is that a failure, a short circuit from failure in the

1 circuits of the pressurizer heaters may cause a failure in  
2 the diesels. The second nature of threat is that the  
3 additional load of the pressurizer heaters of the diesels  
4 may overload those diesels and thereby threaten them.

5           So a fair question is: How do you determine that  
6 the diesel load is kept below 3000 KW?

7           Now, it is clear that the witnesses saw that to be  
8 a question relevant to the Contention, because they answered  
9 it, and they answered it on page 4.

10           Now, there was questioning on transcript page  
11 9350, which we went over somewhat yesterday, asking for the  
12 specification of the nature of loads on page 13, emergency  
13 procedure 1202-29. Those questions are highly pertinent,  
14 because there are indications on the face of the document  
15 that some of those loads may be safety loads, indications,  
16 at least, flowing from the use of the word "redundant."

17           We asked the witnesses, "How was it determined  
18 that these loads could be shed? Did somebody else tell you  
19 that? And did you simply use the work of somebody else, or  
20 did you employ -- did you use any of your own judgments?"  
21 Had the answer to that question been, "We simply took  
22 somebody else's word for it," I think the Licensee could be  
23 in a position to arguably maintain that these are not the  
24 appropriate witnesses to answer the question.

25           Although I am not prepared to say right here that

1 I would agree to that, but, in fact, that is not what the  
2 witnesses said. They said -- I haven't had a chance to find  
3 this page yet this morning. But to paraphrase what they  
4 said -- and I will provide you -- in fact, I did find it, on  
5 page 9514 of yesterday's transcript, line 2.

6           The question was asked by Mr. Pollard: "Am I  
7 correct then that neither of you have any basis for  
8 testifying as to the accuracy of any of the information you  
9 were given as to what loads are needed and the time frames  
10 in which they are needed? This is something you used as an  
11 input in preparing your testimony in which you conclude that  
12 you have adequate capacity?"

13           The answer from Witness Shipper is: "What we did  
14 use was the engineered safeguard loading sequence, and what  
15 is loaded by the engineered safeguard systems."

16           Question: "Those are all automatic loads; am I  
17 correct?"

18           Answer: "They are all automatic loads."

19           Question: "What about manual load where the  
20 operator may choose to add something or may need to add  
21 something manually?"

22           Answer: "That was basically our discretion."

23           Question: "Your discretion?"

24           Answer: "We looked at the loading and said, 'We  
25 have certain margin in order to load the manual loads and

1 what may or may not be needed based on our knowledge of the  
2 operation.'"

3           The question which then followed and to which the  
4 objections were raised were an attempt to get the witnesses  
5 to explain exactly how that discretion was used.

6           I have a couple of final remarks. As I said  
7 earlier, this procedure -- that is, emergency procedure  
8 1202-29 -- applies in all cases, whatever the cause of the  
9 need to connect or disconnect the pressurizer heaters to  
10 shed the loads. And the arbitrary distinction between loss  
11 of off-site power or accident sequences has no importance or  
12 significance whatever to the record, as far as we have been  
13 able to determine.

14           We think that we have shown that the questions are  
15 clearly relevant to the Contention. The addition of the  
16 significant load of the pressurizer heaters --

17           CHAIRMAN SMITH: Your microphone seems to go on  
18 and off.

19           MS. WEISS: The addition of the significant load  
20 of the pressurizer heaters makes it even more critical that  
21 nonessential loads be shed and to determine that they are  
22 really nonessential and that the procedure for shedding  
23 them, for instructing the operator to shed them, is a  
24 correct one.

25           Three, I would like to stress the scope of cross

1 examination is limited by the scope of the direct  
2 examination. And this is clearly within the scope of the  
3 direct examination. I don't think that there is any  
4 colorable argument that these questions are not within the  
5 scope of the direct and are not relevant to the direct and  
6 to other questions asked on cross.

7           The Licensee is not free to put in evidence or to  
8 allow other parties to ask questions on evidence without  
9 objecting to them and then attempt to impute those answers  
10 from reasonable cross examination of other parties.

11           CHAIRMAN SMITH: Mr. Cutchin.

12           MR. CUTCHIN: I have nothing further to add.

13           CHAIRMAN SMITH: Mr. Dornsife.

14           MR. DORNSIFE: Just one comment. I don't recall  
15 any testimony which indicates that the pressurizer heaters,  
16 either procedurallywise or other, is not allowed to be  
17 loaded on the diesel following a small-break loss-of-coolant  
18 accident.

19           DR. JORDAN: I am sorry, I missed the import of  
20 your statement.

21           MR. DORNSIFE: I don't recall any testimony which  
22 indicates, or any other oral or written testimony that  
23 indicates, that there is any procedural limitations or any  
24 other type of limitation on loading the pressurizer heaters  
25 on the diesels following a small-break loss-of-coolant. If

1 anything, it was indicated as being desirable if they are  
2 available.

3 CHAIRMAN SMITH: This is a reference to Mr.  
4 Trowbridge's earlier statement this morning?

5 MS. WEISS: I think he is absolutely correct. And  
6 we agree. If I didn't say that, I meant to say it.

7 MR. DORNSIFE: In fact, with the addition of the  
8 emergency feedwater pumps onto the diesel during a  
9 small-break loss-of-coolant accident, the margin to  
10 2000-hour rating becomes about 6 percent. And if you add  
11 the pressurizer heaters onto that, you are getting down  
12 within 1 to 2 percent of the maximum rating of the diesels.  
13 So it becomes much more critical, considering the addition  
14 of the emergency feedwater pumps onto the diesels.

15 CHAIRMAN SMITH: Mr. Trowbridge, do you want to  
16 respond to these comments?

17 MR. TROWBRIDGE: Yes, Mr. Chairman, but I would  
18 like a few minutes to consult with Mr. Wallace.

19 CHAIRMAN SMITH: Let's take a five-minute break so  
20 that the Board can see if we have questions, too.

21 MR. TROWBRIDGE: Thank you.

22 (Brief recess.)

23 CHAIRMAN SMITH: Would you proceed, Mr.  
24 Trowbridge?

25 MR. TROWBRIDGE: I will try and respond to some of

1 the points made by Ms. Weiss more or less in the order in  
2 which she made them.

3 Her argument that this is the first time for  
4 Licensee objection, the simple answer, I think, to that is  
5 we have not had occasion for objection or notice until very  
6 recently that UCS intended to question diesel loadings under  
7 accident conditions.

8 CHAIRMAN SMITH: Mr. Trowbridge, excuse me just a  
9 moment. I want to assure both of the parties that the Board  
10 is not going to be making a decision of this nature based  
11 upon that particular argument. I see Ms. Weiss busily  
12 writing notes, and I think we can just shortcut that process  
13 and get right down to the merits of the subject matter.

14 MR. TROWBRIDGE: I will say no more on that,  
15 then.

16 There was a reference to page 4, a paragraph on  
17 page 4 of Licensee's direct testimony, which was then cited  
18 as the basis for the examination on the ground that they  
19 were simply examining into matters covered by Licensee's  
20 direct testimony.

21 As I indicated yesterday, in Licensee's view the  
22 paragraph deals solely with the loss of off-site power  
23 event, by itself. It is there. One of the reason why we  
24 are prepared to put further evidence in on diesel loading in  
25 the event of loss of off-site power is because that

1 paragraph is there.

2           But that paragraph was there also because of the  
3 situation where the loss of off-site power is different than  
4 the loss of off-site power plus a LOCA, in that there is no  
5 ES signal and automatic disconnect of the pressurizer  
6 heaters, where there is only the off-site power.

7           In that sense, and to the extent that we talk in  
8 our testimony about the ES disconnect signal, it is not  
9 applicable to a situation where you have no LOCA but only  
10 loss of off-site power. To the extent that UCS attempts  
11 further to talk about our emergency procedure, I would  
12 remind the Board that that emergency procedure was not  
13 offered by Licensee. That emergency procedure is an exhibit  
14 offered by UCS, and it is UCS' construction, not ours, that  
15 that procedure has to do with accident situations.

16           It is, in fact, our view that that procedure is  
17 concerned with pressurizer heater problems, including  
18 off-site power. But if you have an accident condition, you  
19 go look to the accident procedures for operator guidance.

20           Ms. Weiss made an argument, the relevance of which  
21 I don't understand, but I will comment on it. Ms. Weiss  
22 made the observation that the Contention 3 had two aspects  
23 to it: one, whether connection of the pressurizer heaters  
24 might, through the fault current, degrade the power supply.  
25 And also, in her view, Contention 3 dealt with the

1 possibility of overloading the diesel.

2           It has been -- we have addressed -- and perhaps I  
3 misunderstood Mr. Dornsife in this respect -- we have  
4 addressed in the direct testimony and elsewhere in oral  
5 testimony the fact that we do have a limitation, not a  
6 prohibition, not a prohibition, on connecting the diesel  
7 generator -- the pressurizer heaters to the diesel  
8 generators. We have acknowledged that if there is -- if we  
9 are able to do that and if we have the capacity for doing  
10 that, it is a desirable thing to do.

11           It is the preferred means for maintaining natural  
12 circulation, but we have clearly testified that there is a  
13 limitation -- and I think that is the word Mr. Dornsife used  
14 -- have clearly testified that there is a limitation on the  
15 loading of the diesels under -- with the pressurizer heaters  
16 under accident conditions. You do not load them. And the  
17 procedures will have additional -- we will have additional  
18 procedures, as has been testified by Mr. Torcivia, which  
19 prohibit the loading of the diesels or limit the loading of  
20 the pressurizer heaters on the diesels and that the capacity  
21 must be there without overloading the diesel.

22           There was further reference to the Commonwealth's  
23 questioning, and we are back, as far as I can see, on the  
24 question of opening doors.

25           CHAIRMAN SMITH: We are not going to receive

1 arguments on that now.

2 MR. TROWBRIDGE: All right. I would be very happy  
3 to address further the question of opening doors, if we can,  
4 to that point. I will simply say I think that is an  
5 opening-door question, observation not limited, as the Board  
6 wanted this initial argument limited, to the scope of the  
7 Contention. I don't think what the Commonwealth has to do,  
8 to say, has any bearing on the scope of UCS' Contention.

9 I would make one last observation. Ms. Weiss  
10 read, and read correctly -- and the transcript, as far as I  
11 am concerned, is correct -- a passage, an examination by Mr.  
12 Pollard of our witnesses, with answers provided by Mr.  
13 Shipper, concerning their role and responsibilities in  
14 determining diesel capacity requirements in the light of  
15 loads. Ms. Weiss was entirely proper in using that  
16 testimony in support of her arguments.

17 I do wish to report to the Board that Mr. Shipper  
18 has notified me, last evening and again this morning, that  
19 his answer to Mr. Pollard's question was incorrect. And I  
20 intend on redirect to ask him for a further and more  
21 accurate definition of his role.

22 CHAIRMAN SMITH: I have been advised that Ms.  
23 Bradford has called back, and I would like to take a short  
24 break so we can resolve the problem.

25 MR. TROWBRIDGE: Very well.

(Brief recess.)

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1 CHAIRMAN SMITH: On the record.

2 (Board conferring.)

3 CHAIRMAN SMITH: The Board during the very brief  
4 recess has reviewed the background of how this issue came to  
5 be within the scope of the notice of hearing in the first  
6 instance. We feel that one of the provisions of 2.1.1 of  
7 NUREG-0578 is as a category A item and thus is incorporated  
8 into the scope of the hearing by that reference.

9 We see that matters discussed at pages A-1 through  
10 A-5 of the Lessons Learned short-term recommendations,  
11 NUREG-0578, and that those recommendations require that  
12 pressurizer heaters be connected to the diesel generators,  
13 the emergency power source; and that, quoting from page A-3,  
14 "careful attention should be given to ensure that the  
15 capacity, capability and reliability of the emergency power  
16 source is not degraded." Quote.

17 We understand that Mr. Trowbridge's point is that  
18 the direct testimony which is being challenged refers --  
19 that paragraph on page 4 refers to the particular sentence  
20 that has been referred to several times now, and that is,  
21 quote:

22 "Further, the rated capacity of the diesel has  
23 been verified as being capable of handling the heaters in  
24 addition to the safety-related loads required during loss of  
25 offsite power events." Quote.

1           Mr. Trowbridge has made the point that  
2 cross-examination on that direct testimony should be limited  
3 then to loss of offsite power events. As I understand the  
4 progression of the debate, Ms. Weiss then points out that  
5 the procedure reflected in Union of Concerned Scientists  
6 Exhibit 19 -- that is, 1.02-29 -- UCS's Exhibit 19, 1202.19,  
7 is not necessarily an accident sequence or a loss of power  
8 sequence.

9           We haven't restudied that to determine whether  
10 that is the case. We don't think that we have to go into  
11 whether the Commonwealth has opened the door or not. And in  
12 fact, when it comes right down to it, the Board has decided  
13 that we do not have to decide whether it is within the scope  
14 of UCS' contention, that the short-term lessons learned and  
15 the action plan reflected in 0737 makes it clear that the  
16 shedding of loads as they may relate to safety functions  
17 should be considered in the implementation of this 2.1.1 as  
18 it relates to pressurizer heaters.

19           That would be -- this would be page III-85 of  
20 NUREG-0737. The position reflected there, item 2, quote:  
21 "Procedures and training shall be established to make the  
22 operator aware of when and how the required pressurizer  
23 heaters shall be connected to the emergency buses if  
24 required. The procedure shall identify under what  
25 conditions selected emergency loads can be shed from the

1 emergency power source to provide sufficient capacity for  
2 the connection of the pressurizer heaters." Quote.

3           So we believe that the subject of the procedure of  
4 shedding loads to accommodate the pressurizer heaters is  
5 clearly within the scope of the proceeding and is something  
6 that is appropriately before us, if not within the scope of  
7 the contention.

8           Now, in the course of litigating the contention,  
9 this panel of witnesses has testified as to the -- as power  
10 supply engineers, they have testified within their  
11 disciplines and their limited knowledge, and we have heard  
12 several times what the limitation is. However, the fact is  
13 that Mr. Shipper did say that some loads, including those  
14 loads under 1202.29, will be shed, at least in part, in a  
15 manner which has been determined within the discretion of  
16 the people in Mr. Shipper's department.

17           I understand that that is a statement that is  
18 going to be clarified.

19           MR. TROWBRIDGE: Mr. Chairman, I'm not sure that  
20 was a very precise repetition of his statement. It is not  
21 that important if the statement is going to be clarified.

22           CHAIRMAN SMITH: It was a statement which  
23 identifies a safety issue that the Board believes is  
24 appropriate to be explored and the record completed on it.  
25 It is clearly within the scope of the proceeding, although I

1 don't know how we can satisfy Mr. Cutchin's request that we  
2 clearly identify how it is related to the TMI-2 accident.  
3 We don't have to do that because the Commission takes a  
4 shortcut to that consideration by requiring it to be a  
5 consideration in the notice of hearing.

6 MR. TROWBRIDGE: Mr. Chairman, I have no quarrel  
7 with the determination by this Board that it wishes to hear  
8 more on this subject. I don't quarrel that it is within the  
9 scope of the proceeding if somebody raises it properly or if  
10 the Board wishes to.

11 I implore the Board to not waste further time with  
12 these witnesses, one or both of which could be part of a  
13 further panel, but will not be -- will not be the spokesman  
14 on many aspects of the shedding of loads or the safety  
15 significance of some of the --

16 CHAIRMAN SMITH: I want to assure you, Mr.  
17 Trowbridge, that although it may seem like a convenience for  
18 the Board at this point to decide we don't have to unravel  
19 all of the arguments and evidentiary considerations, it is  
20 something we have been debating as the argument has  
21 unfolded.

22 We would have taken the record as it has been  
23 presented to us now. We would have, without any further  
24 argument, if we had caught it, required that the record be  
25 completed on the point.

1 Now, as to further examination of these witnesses,  
2 I do think it is appropriate to explore the basis for Mr.  
3 Shipper's statement.

4 MR. TROWBRIDGE: I would appreciate the  
5 opportunity for Mr. Shipper to --

6 CHAIRMAN SMITH: We also think it is appropriate  
7 for parties to argue to the Board that our ruling is  
8 incorrect and move for reconsideration.

9 (Counsel for Licensee conferring.)

10 (Board conferring.)

11 CHAIRMAN SMITH: Are there any further comments on  
12 the Board's ruling?

13 MR. TROWBRIDGE: Mr. Chairman, the answer to your  
14 question, if it was a question, the Licensee does not object  
15 to the Board's request and will produce a panel of  
16 witnesses. It will take a little preparation.

17 CHAIRMAN SMITH: Ms. Weiss, I assume you are  
18 satisfied with our ruling?

19 MS. WEISS: Yes, Mr. Chairman. I guess I would  
20 just ask to be informed as soon as you can let us know when  
21 this other panel will be appearing.

22 CHAIRMAN SMITH: Now where do we go? Have you  
23 concluded your recross examination on the redirect and  
24 corrections of the staff? I don't believe you had. I think  
25 we stopped, so let's complete that, and then we will go back

1 and clarify the record with respect to this one particular  
2 issue.

3 MR. POLLARD: Before I resume, Mr. Chairman, I  
4 thought I heard Mr. Trowbridge say that perhaps Witness  
5 Shipper had some clarification to the testimony which Ms.  
6 Weiss had read on transcript page 9514.

7 CHAIRMAN SMITH: Yes, he did, and that was the  
8 point I was making. Not only should the clarification be  
9 made, but examination on the clarification; there should be  
10 an opportunity for that. But I am suggesting that we come  
11 back to that on re-redirect as a separate matter, and you  
12 complete your recross examination.

13 MR. TROWBRIDGE: If it would facilitate Mr.  
14 Pollard's examination, I would have no objection.

15 CHAIRMAN SMITH: It is certainly at the pleasure  
16 of the parties, whatever fits your --

17 MR. TROWBRIDGE: It might save time if we could do  
18 it now.

19 CHAIRMAN SMITH: All right, then it will fit into  
20 the discussion of the matter.

21 REDIRECT EXAMINATION

22 BY MR. TROWBRIDGE:

23 Q Do you have 9514 of the transcript before you?

24 A (WITNESS SHIPPER) Yes.

25

1 Q I wish to refer particularly to the questions and  
2 answers on lines 13 through 22. And since Ms. Weiss has  
3 already read those lines verbatim into the record, I will  
4 not repeat them. I will just pause long enough for the  
5 Board to indicate that it has familiarized itself with those  
6 questions and answers.

7 Mr. Shipper, I ask you simply whether you regard  
8 your answers to the questions to be correct or whether they  
9 need in your view modification in any respect?

10 A (WITNESS SHIPPER) I feel they need some  
11 modification. The loads manual or automatic are given to  
12 the electrical power group by mechanical system designers,  
13 and we use those as a basic summation to assure capacity.  
14 Our system designers tell us what they need and we tell them  
15 whether we have it available.

16 Q Would you comment more specifically on the lines  
17 16 through 18 -- excuse me, lines 13 through 17? The  
18 question was, what about the manual loads where the operator  
19 may choose to add something or may need to add something  
20 manually. And your answer was, quote: "That was basically  
21 our discretion." Quote.

22 Would you qualify that answer in any respect?

23 A (WITNESS SHIPPER) When I stated "our discretion,"  
24 I meant the discretion of the system designers, not "our"  
25 meaning strictly the electrical end.

1 MR. TROWBRIDGE: Thank you.

2 DR. JORDAN: I would inquire, by the system  
3 designers you refer to the mechanical department? Are they  
4 the system designers?

5 WITNESS SHIPPER: The mechanical system, whether  
6 they be the fluid system designers or the heating,  
7 ventilating system designers; this nature.

8 DR. JORDAN: What group is this? This is one of  
9 the Met Ed operating groups presumably you are talking about  
10 now; is that right or not?

11 WITNESS SHIPPER: In the preliminary design stage  
12 it would be the engineering group and in this case it would  
13 be the operating staff.

14 DR. JORDAN: Operating staff, fine.

15 DR. LITTLE: Operating staff of TMI-1?

16 WITNESS SHIPPER: Yes.

17 CHAIRMAN SMITH: Could you give us more of a  
18 layman's explanation of just how this works? Do they come  
19 to you and say, we need so many -- we have X amount of power  
20 requirement for the system and then -- or do you help them  
21 identify the nature and the amount of load that they require  
22 for their function?

23 WITNESS SHIPPER: No. The identification is made  
24 first by what we call the mechanical system designer, and  
25 that is fixed based on how much water you have to pump, how

1 much air you have to blow around. From that is developed  
2 pump characteristics, which is then converted to motor  
3 characteristics.

4 CHAIRMAN SMITH: That is done by whom? You?

5 WITNESS SHIPPER: No, the mechanical system  
6 designer develops the pump characteristics and a motor is  
7 mated to that pump.

8 CHAIRMAN SMITH: To do the work that has to be  
9 done?

10 WITNESS SHIPPER: To circulate the fluid.

11 CHAIRMAN SMITH: And then you are -- at what point  
12 do you enter into it? Are you given the motor  
13 characteristics or are you given a net power requirement?

14 WITNESS SHIPPER: They go hand in hand.

15 CHAIRMAN SMITH: There is an interface there where  
16 you begin with the characteristic of the load and the amount  
17 of the load needed, and then there is apparently some  
18 interface overlapping and consideration. But that is the  
19 point where you take it, and then you do your job and that  
20 is making sure that the power is available?

21 WITNESS SHIPPER: Making sure that the power is  
22 available to run that piece of mechanical driven equipment.

23 CHAIRMAN SMITH: You make no judgments as to the  
24 safety significance of the unit that is involved?

25 WITNESS SHIPPER: No.

1 RE CROSS EXAMINATION -- CONTINUED

2 BY MS. WEISS:

3 Q Mr. Shipper, can you tell me when it is you  
4 decided you needed to change your testimony?

5 A (WITNESS SHIPPER) Probably about 5:30 yesterday  
6 afternoon.

7 Q Listening to the lawyers arguing about the legal  
8 significance about what might or might not flow from those  
9 words?

10 A Yes.

11 Q Let me take you back to the first question on that  
12 page, to recall for you the context in which the answer was  
13 given. I am on transcript page 9514, line 2. The question  
14 was, quote: "Am I correct, then, that neither of you have  
15 any basis for testifying as to the accuracy of the  
16 information you were given as to what loads are needed?  
17 This is something you used as an input in preparing your  
18 testimony, in which you conclude that you have adequate  
19 capacity?" Quote.

20 Would your answer to that question today be yes?

21 A (WITNESS SHIPPER) I think my answer to that  
22 remains as was presented in the testimony. The engineered  
23 safeguards loading sequence and what is loaded by the  
24 engineered safeguards system is, as I described, given or  
25 determined by the mechanical designers.

1 Q Then it would be accurate to say that it is an  
2 input in preparing your testimony?

3 A (WITNESS SHIPPER) It is an input in preparing the  
4 diesel loading sequence.

5 Q You neither -- it is not part of your job to  
6 verify or to check that information in any way?

7 A (WITNESS SHIPPER) To verify what is required for  
8 safety?

9 Q Yes.

10 A (WITNESS SHIPPER) That is correct.

11 Q Let me refer you down to line 19, the question and  
12 answer after the answer which you have just corrected. You  
13 stated, now, as I understand, that when you referred to "our  
14 discretion" you meant discretion of people other than  
15 yourself, discretion of mechanical systems engineers,  
16 correct?

17 A (WITNESS SHIPPER) That is correct.

18 Q And you were then asked your discretion and the  
19 answer was, beginning on line 19, transcript 9514, quote:  
20 "We looked at the loading and said we have certain margin in  
21 order to load the manual loads and what may or may not be  
22 needed based on our knowledge of the operation." Quote.

23 Would you testify today that the "we's" and the  
24 "our's" in that answer also refer to people other than  
25 yourself, in other words, who were not involved in looking

1 at that loading, and you were not involved in determination  
2 of what might be needed based on your knowledge of the  
3 operation?

4 A (WITNESS SHIPPER) The "we" and "our" refers to a  
5 design team or design effort.

6 Q We should not include either yourself or Mr.  
7 Torcivia?

8 A (WITNESS SHIPPER) No. It had to include the  
9 electrical people in order to assure that the mechanical  
10 design would have sufficient power.

11 Q Maybe what we need to do is break that answer up  
12 into two parts. The second part of the answer refers to  
13 what may or may not be needed based on our knowledge of the  
14 operation. Would it be accurate to say that that part of  
15 the analysis did not involve you?

16 A (WITNESS SHIPPER) That would be accurate.

17 MS. WEISS: Thank you.

18 CHAIRMAN SMITH: Are we going to go around to all  
19 the parties on this clarification? I think we should before  
20 you resume your main line of examination.

21 Mr. Adler?

22 MR. ROBERT ADLER: Not on the clarification.

23 CHAIRMAN SMITH: Mr. Cutchin?

24 MR. CUTCHIN: No questions on the clarification,  
25 Mr. Chairman.

1 (Board conferring.)

2 BOARD EXAMINATION

3 BY CHAIRMAN SMITH:

4 Q Would it be possible for you to describe an  
5 example, a typical interface that you might have with an  
6 operating department, how far your discipline might  
7 penetrate into their presentation to you and how far their  
8 knowledge of supplying electric power may penetrate into  
9 your discipline, just to put it into context, an example?

10 You would have, I imagine, a good understanding of  
11 the load characteristics of an electric motor, which they  
12 would present to you as a given, however. That is the type  
13 of thing that I wonder if you could give us a brief  
14 elaboration on how it actually works?

15 A (WITNESS TORCIVIA) Mr. Chairman, let us take an  
16 example. For some reason or other, the ventilation people  
17 decide that they need a fan, and they also decide at the  
18 same time that it is a fan that, for some reason or other,  
19 is to be available for loss of offsite power on the diesel.  
20 And they may come back to us and say, which they have done  
21 many times, we need a five horsepower motor from the diesel.

22 Our normal answer is, where is the horsepower  
23 required, the five horsepower needed? Can you give  
24 characteristics from which we determine how the motor will  
25 actually draw during its full load capacity?

1           We obtain that information and decide the load  
2 that is required for the diesel, whether it can be put on  
3 the diesel under those conditions, when it will be required  
4 on the diesel, which may be a timing sequence of an hour,  
5 five hours, ten hours, which we will ask that also: Will it  
6 be required six hours, eight hours, or immediately?

7           At that point we will determine that there is at  
8 that time X number of KW on the diesel and we therefore can  
9 put it on and can allow it to be put on at that particular  
10 time.

11           Should the motor be of an extreme higher  
12 horsepower capacity, we might involve ourselves into the  
13 question as to inrush current during its starting procedure,  
14 its acceleration time, if any such problem does exist, and  
15 if during that period of time we do have voltage drop  
16 conditions which may be detrimental to either other  
17 equipment and provide other problems down the line.

18           And that is the extent of our operation.

19           Q     You might say, I want to know a little more about  
20 net horsepower, I want to see the motor, I want to see some  
21 specs on it, and you are likely to know more about their  
22 motor than they do?

23           A     (WITNESS TOPCIVIA) That's correct.

24           Q     You take as a given the fact that the motor has to  
25 be used?

1           A       (WITNESS TORCIVIA) That's correct. And we obtain  
2 the motor characteristics from the manufacturer when we feel  
3 that is critical to get more precisely what we are doing.

4           CHAIRMAN SMITH: That's very helpful to me.

5                        RECCROSS EXAMINATION -- CONTINUED

6           BY MR. POLLARD: (Resuming)

7           Q       In determining whether the diesel generators have  
8 adequate capacity, am I correct that if all of the equipment  
9 which can be connected to the diesel generator buses, both  
10 at the 4160 volt level and the 480 volt level, that if all  
11 of that equipment were simultaneously connected the diesel  
12 generator would be overloaded; is that correct?

13                       (Panel conferring.)

14          A       (WITNESS TORCIVIA) I have pointed out that there  
15 are time sequences involved which the mechanical people tell  
16 us. Now, I fully appreciate that your statement is that if  
17 all of the loads were put on simultaneously the diesel  
18 engine would be overloaded.

19          Q       I didn't mean to imply anything about the loading  
20 sequence itself. I assumed that we went through the normal  
21 loading sequence in blocks so we don't stall it out.

22                       I am basically just trying to get an idea, if you  
23 simply added up all of the loads connected to these buses  
24 they would total more than 3,000 KW, am I correct?

25          A       (WITNESS TORCIVIA) I have a little problem, not

1 in answering the question, but in its implications, and that  
2 is as to adding up all of the loads. Which loads are we  
3 talking about? The loads required by the mechanical people  
4 at that time or all of the loads that we have specified on  
5 our listing at one time?

6 Q All of the loads which physically could be  
7 connected to the diesel generator power supply?

8 A (WITNESS TORCIVIA) If all of those loads that  
9 have been listed for the diesels exceed 3,000 KW rating for  
10 2,000 hours or the 3300 KW rating for the half-hour rating,  
11 they will of course exceed the rating.

12 Q Maybe I could ask the question and try for you not  
13 to worry too much about the implication of the question, and  
14 then I could get to my next question. Just let me ask it a  
15 different way.

16 If I simply added up the KW of the equipment which  
17 can be connected to the diesel generator power supply, am I  
18 correct that that total would exceed 3,000 KW?

19 A (WITNESS TORCIVIA) I think you have made a  
20 reasonable assumption. I have no reason not to question  
21 that if all of the loads and everything we can conceive of  
22 were lumped together and put on all at one time, yes. I  
23 think I must make an affirmative statement there.

24 Q When the Commonwealth was cross-examining you, you  
25 referred to the equipment on page 13 as non-essential,

1 correct? Page 13 of emergency procedure --

2 A (WITNESS TORCIVIA) I recognize what you're  
3 talking about.

4 Q But the record might not. Page 13 of emergency  
5 procedure 1202-29.

6 I think you answered another question from the  
7 Commonwealth that there is other non-safety equipment  
8 powered from bus 1-P and 1-S other than the pressurizer  
9 heater; is that correct?

10 A (WITNESS SHIPPER) That is correct.

11 Q And then finally we get to the question I want to  
12 ask. In evaluating whether the diesel generator would have  
13 sufficient capacity to carry the pressurizer heaters, did  
14 either of you recommend or did you recommend to someone else  
15 to consider removing non-essential loads from the diesel  
16 generator buses and powering them from somewhere else in  
17 order to eliminate the need to shed non-essential loads so  
18 that the diesel would be capable of carrying the pressurizer  
19 heaters?

20 A (WITNESS TORCIVIA) Let me say this. That has  
21 been given consideration and some thinking has been done in  
22 that area, to eliminate some of these so-called  
23 non-essential loads and put them on possibly some other  
24 power supply.

25 We have specified that our limitations before

1 putting on the pressurizer heater shall be, as it stands  
2 right now, 2874, and frankly, I am considering lowering it  
3 down to 2850, so as to satisfy the possibility of the  
4 instrument error which has been brought up. On that basis,  
5 we have limited the operator from putting on any more than  
6 is required, so as not to exceed the capacity of the diesel.

7           We have also set up a situation in which records  
8 are kept of any loads that are put on from time to time for  
9 any other reason, so that no loads are put on the diesels  
10 without them being included or excluded from the present  
11 loading, to assure that we are not overloading the diesel.  
12 We are making every effort to maintain that and I'm trying  
13 to do that.

14           Our interest is not to exceed the capacity of the  
15 diesel.

16           Q     It would also, of course, be valuable in terms of  
17 overall safety if the operator did not have to be concerned  
18 about shedding non-essential loads from the diesel generator  
19 before he added the pressurizer heaters; wouldn't you agree  
20 with that?

21           A     (WITNESS TORCIVIA) I'm sorry, I didn't get the  
22 question.

23           Q     Wouldn't it be an overall safety advantage if we  
24 could remove sufficient non-essential loads from the diesel  
25 generator buses that the operator might not need to be

1 concerned about load-shedding before he added the  
2 pressurizer heaters?

3 MR. TROWBRIDGE: Objection.

4 MR. POLLARD: I withdraw the question, then.

5 BY MR. POLLARD: (Resuming)

6 Q I have one further line of questioning, which is  
7 on the Commonwealth cross-examination on transcript page  
8 9355 from December 24th, beginning at line 22. The  
9 Commonwealth asked, quote: "Are there any non-safety grade  
10 loads which are normally powered from either the 1-F or the  
11 1-S bus?" Quote.

12 Witness Shipper answered, quote: "There are."  
13 And it is repeated: "Question: There are?" And the answer  
14 is "Yes."

15 And if you could go on and read the rest of that  
16 line of questioning, which deals with how are the other  
17 non-safety loads possibly affecting the diesel generator  
18 supplies.

19 (Pause.)

20 If you could continue reading through at least  
21 line 7 on page 9357.

22 (Pause.)

23 MR. TROWBRIDGE: How far should we be reading?

24 MR. POLLARD: Line 7 on page 9357.

25 MR. TROWBRIDGE: Thank you.

1 (Pause.)

2 BY MR. POLLARD: (Resuming)

3 Q It has been some time since you gave those  
4 answers. I just wanted you to have a chance to refresh your  
5 memory.

6 What I would like to do now is explore how the  
7 normal design of Three Mile Island works and how the  
8 non-safety loads are shed from the bus and how the automatic  
9 loads are added. I am not talking about which loads or the  
10 magnitude. I just want to understand the design of Three  
11 Mile Island Unit 1.

12 I am going to try the technique of going through a  
13 sequence of how I understand how it works and see if you  
14 agree with it.

15 MR. TROWBRIDGE: Could we have an identification  
16 as to how this relates to -- an explanation as to how this  
17 relates to the contention which deals with the connection of  
18 the pressurizer heaters?

19 MR. POLLARD: I don't know if I can answer his  
20 question directly at first. It clearly relates to the line  
21 of questioning as to how other non-safety loads are shed,  
22 whether or not the pressurizer heaters are somehow unique or  
23 not unique. It deals with the contention in the sense that  
24 can we rely upon the design at Three Mile Island Unit 1 in  
25 the sense of is there adequate provision for isolating the

1 non-safety grade pressurizer heaters from the safety grade  
2 emergency power supplies.

3 MR. TROWBRIDGE: I still don't have any  
4 understanding of how this line of questioning relates to the  
5 connection. I am mindful at this point of Ms. Weiss'  
6 arguments that we waited too long to object and therefore we  
7 can't object any more.

8 It seems to me that we need to have a better  
9 understanding of where we are going, so that I at least have  
10 a provisional --

11 CHAIRMAN SMITH: Before we get too far away from  
12 the question, I predict it will have to be read back. So  
13 would this be a good time to do it? Or is there going to be  
14 an objection?

15 MR. POLLARD: So far a question hasn't been  
16 asked. I was just explaining to the witness what I was  
17 intending to do. I haven't yet asked a question, other than  
18 to say, as I am going through this sequence, please correct  
19 me if I am wrong.

20 MR. TROWBRIDGE: You indicated you are going to be  
21 talking about other loads, the shedding of other loads,  
22 perhaps the mechanics of shedding other loads. And having  
23 announced that line of questioning, I can announce -- I can  
24 do one of two things.

25 I can say, I object because I don't see that it is

1 relevant, or I can ask for an explanation of how it is going  
2 to be connected up with the contentions.

3 DR. JORDAN: I think Mr. Trowbridge is raising the  
4 point of, are we going to litigate the design of TMI-1. I  
5 am sure it's Mr. Pollard's position that the design of TMI-1  
6 is inadequate in that it did not meet the requirements of  
7 the reg guide. And so therefore I believe that, Mr.  
8 Trowbridge, am I right, you are raising the question of  
9 whether this is within the scope now of this hearing, or  
10 also as well as the scope of the contention?

11 MR. TROWBRIDGE: Both. I would raise the  
12 contention question, but I would also at this point -- I  
13 don't see its relevance to the scope of the proceeding.

14 DR. JORDAN: I think I understand your position.

15 MS. WEISS: We would suggest, if it seems  
16 appropriate to the Board, that we may approach the bench and  
17 on the record have Mr. Pollard go through precisely the  
18 question that he was going to ask, outside of the hearing --

19 CHAIRMAN SMITH: Wouldn't it be easier to ask the  
20 witnesses to leave?

21 MS. WEISS: Probably. I didn't want to make them  
22 feel bad.

23 (Witnesses temporarily  
24 excused.)

25 MR. POLLARD: Perhaps I asked the witnesses to

1 read too much of the transcript. What I intend to focus on  
2 is the question on page 9357 at line 4 and Witness Shipper's  
3 answer to it. The general line of questioning dealt with,  
4 are there other non-safety loads, how are they handled. And  
5 then we finally get to the final question: "So the  
6 pressurizer heaters are not unique as far as that is  
7 concerned, as far as that breaker being an isolation device?"

8 And Witness Shipper says: "I think that is  
9 correct." And I believe that is an incorrect answer,  
10 because the other non-safety loads are shed and stay shed.

11 DR. JORDAN: Are what?

12 MR. POLLARD: The breakers are opened by an  
13 undervoltage trip as a result of loss of offsite power.  
14 They are tripped by either the undervoltage or the ES signal  
15 and never reclosed. That is the unique part of the  
16 pressurizer heaters.

17 MS. WEISS: I don't know if that needs further  
18 explanation, but the point of the line of questioning is to  
19 show the difference between the treatment of the pressurizer  
20 heaters and the treatment of all of the other non-safety  
21 loads.

22 DR. JORDAN: That was my understanding, that you  
23 are saying that not only are the pressurizer heaters  
24 inadequate to meet, but also the other loads don't meet.

25 MS. WEISS: The point is not to argue that the

1 shedding of the other loads is in some way in violation of  
2 the regulations, but to show the contrast.

3 CHAIRMAN SMITH: The other loads are the standard  
4 that you are saying the isolation --

5 DR. JORDAN: I had missed the point entirely

6 MR. POLLARD: I am only taking issue with the  
7 answer that he thinks that the arrangement of the heaters is  
8 not any different than any of the other non-safety loads. I  
9 think it is different.

10 DR. JORDAN: But you are saying it is different  
11 because it has the undervoltage protection device.

12 MR. POLLARD: No, because after having the main  
13 feeder breaker trip open it is subsequently reclosed. At  
14 that point, with the engineered safety feature signal  
15 bypassed, the only available signals to trip the circuit  
16 breaker now become the fault current or the undervoltage  
17 which is derived from the fault current, and therefore the  
18 design does not meet Reg Guide 175, whereas if you left the  
19 breakers open, the breakers that were tripped by the ES  
20 signal, then it would meet Reg Guide 175. That is the  
21 difference.

22 That is why when I get on the stand I will explain  
23 the footnote in my testimony, why I said that the ES signal  
24 is not appropriate in this circumstance. It is bypassed and  
25 the breaker is reclosed.

1 MS. WEISS: The point is not to argue that the  
2 other non-safety loads are a problem, but that the  
3 pressurizer heater is unique.

4 DR. JORDAN: All right. I see. You are saying he  
5 is mistaken in making that statement.

6 MR. POLLARD: That is correct.

7 DR. JORDAN: All right.

8 MR. POLLARD: The method I was going to go through  
9 this was simply to describe how the whole sequence works,  
10 from the plant in operation, we have a loss of offsite  
11 power, the undervoltage relays actuate, they shed all the  
12 non-safety loads, the diesel generator starts, and  
13 automatically the load loads. And the operator has the  
14 freedom to add whatever else he wants.

15 And then along comes an accident signal and that  
16 will trip everything off again, or at least the non-safety  
17 loads off, and then we will go into the accident sequence  
18 for the diesel generator, which is different from the  
19 sequence loading for loss of offsite power, and the  
20 distinction being under those circumstances you bypass the  
21 ES signal and reclose the main feeder breaker on the  
22 pressurizer heaters.

23 MR. TROWBRIDGE: Mr. Chairman, I think Mr. Pollard  
24 will in the end have to decide how he goes at this. We are  
25 not objecting to further questioning in this area. I think,

1 quite frankly, Mr. Torcivia is inevitably looking at the  
2 implication of the questions. I can't believe that the  
3 element of surprise is very important to Mr. Pollard. And  
4 if he simply gave the explanation of what he was concerned  
5 with, we would get there faster.

6 I can't dictate the method here.

7 CHAIRMAN SMITH: It is within their judgment how  
8 they approach cross-examination.

9 MR. TROWBRIDGE: And I am asking Mr. Pollard to  
10 consider whether or not he really wishes to pursue this step  
11 by step without indicating what his ultimate concern is.

12 CHAIRMAN SMITH: I don't want to interfere with  
13 your cross-examination.

14 MR. POLLARD: I appreciate that kind of help. I  
15 know the Board has also tried to help me with this before,  
16 and I will see if I can't approach it in a simpler manner.

17 CHAIRMAN SMITH: Could you ask the witnesses to  
18 return, please.

19 (Witnesses resumed the  
20 stand.)

21 BY MR. POLLARD: (Resuming)

22 Q Mr. Shipper -- and Mr. Torcivia as well, you can  
23 add, if you think you can, on any question I asked. I am  
24 particularly concerned with the question the Commonwealth  
25 asked you: "So the pressurizer heaters are not unique as

1 far as that is concerned, as far as that breaker being an  
2 isolation device?"

3           And your answer was: "I think that is correct."

4           Can you please tell me, if we have a loss of  
5 offsite power and an accident signal, what happens to all of  
6 the non-safety loads on bus 1-P or 1-S? Are they all shed?

7           A       (WITNESS SHIPPER) All of the loads, all of the  
8 non-safety loads are shed if they are controlled by  
9 automatic means. When I say "automatic means," if they are  
10 controlled by a circuit breaker, electrically operated  
11 circuit breaker, a motor controlled through a motor starter  
12 or some type of remote device.

13          Q       In other words, there are a few loads that are not  
14 shed that are relatively small loads?

15          A       (WITNESS SHIPPER) These would be loads that would  
16 be fed from the 120-volt distribution panels, et cetera.

17          Q       Thank you. Now, after the shedding of the  
18 non-safety loads -- and I assume under the circumstances I  
19 have given you, with a combination of loss of offsite power  
20 and an accident signal, we would have also shed the safety  
21 loads -- then the diesel generator starts and then we  
22 sequentially load automatically the necessary safety loads.  
23 And I think you have described that. Is that correct?

24          A       (WITNESS SHIPPER) That is correct.

25          Q       Now at this point, if the operator decides he

1 wants the pressurizer heaters and if the load on the bus is  
2 below 3,000 KW limit by an amount sufficient that he has the  
3 capacity to add the pressurizer heaters, he then bypasses  
4 the ES signal and then closes the main feeder breaker, after  
5 going through all of the Kirk key interlocks and so on; is  
6 that correct?

7 A (WITNESS SHIPPER) I think your description is  
8 correct.

9 Q Now what happens to the other non-safety loads?  
10 Do they remain disconnected?

11 A (WITNESS SHIPPER) That is correct.

12 Q So the pressurizer heaters are unique in the sense  
13 that they might be reconnected, but the other non-safety  
14 loads would not be?

15 A (WITNESS TORCIVIA) They are all manually  
16 operated. So they can be connecting other loads at the  
17 discretion of the operator. They can be connected up. I  
18 don't follow your questioning, so forgive me. They can or  
19 cannot be connected up just like any other manual load.

20 Q I know, but we have a procedure which says to the  
21 operator connect them if you can for the pressurizer  
22 heaters, right?

23 A (WITNESS SHIPPER) I don't think the procedure  
24 says that, connect them if you can.

25 Q Doesn't 1202-29 set forth the procedure for

1 powering the pressurizer heaters from the emergency buses?

2 A (WITNESS SHIPPER) It says connect them if you  
3 feel they are necessary.

4 Q Can you please tell me where the procedure says  
5 that, connect them if you feel they are necessary?

6 (Pause.)

7 Q Or does it simply say, if you have lost the normal  
8 power supply for the heaters, go ahead and connect them,  
9 either group 8 or group 9, to either bus 1-P or 1-S?

10 A (WITNESS SHIPPER) I think in the scenario on page  
11 10, on the bottom under "Objective": "The objective of this  
12 procedure is to maintain pressurizer control and to ensure  
13 conservation of RCS inventory and provide emergency power  
14 to the pressurizer heaters, if needed."

15 Q Doesn't the "if needed" mean if you don't have  
16 other power to them?

17 A (WITNESS SHIPPER) I think we are back into the  
18 contention or the discussion that preceded this, which I was  
19 not a party to, saying that the pressurizer heaters are not  
20 needed, but they are the preferred method.

21 (Counsel for UCS conferring.)

22 Q Isn't the whole purpose of this modification to  
23 Three Mile Island Unit 1 to provide the operator with the  
24 capability of powering the pressurizer heater from the  
25 onsite power supplies if he does not have offsite power

1 available for the heaters? Is that the whole purpose for  
2 the modification?

3 A (WITNESS SHIPPER) I think one of your statements  
4 said "offsite power." I think you meant to say "onsite  
5 power."

6 A (WITNESS TORCIVIA) Loss of offsite.

7 A (WITNESS SHIPPER) Be that as it may, the purpose  
8 of this connection is to provide -- or the purpose of this  
9 modification is to provide a reliable power source to one  
10 group of pressurizer heaters.

11 Q And if the operator did not have power available  
12 to the heaters from the normal power source, he would then  
13 proceed as a matter of course to connect the pressurizer  
14 heaters to the onsite power supply, after first making sure  
15 he had sufficient capability remaining so that the diesel  
16 generator would not be overloaded?

17 WITNESS TORCIVIA: I don't know if I'm in order or  
18 out of order, Mr. Chairman, but please correct me if I am  
19 out of order. The line of questioning that appears to be  
20 developing here is associated with the loading, in which, as  
21 Mr. Trowbridge has indicated, we will indicate where the  
22 loading is and the loading that is required at particular  
23 stages and when the pressurizer heaters are put on, what  
24 manual loads will be required at that time for the safe  
25 shutdown of the plant and the safety of the environment or

1 whatever it may be, and what capacity will be available to  
2 put on that 126 KW required.

3           And it is very difficult for us to continue this  
4 line of questioning without eventually jeopardizing  
5 ourselves, in the sense that we don't know what the loads  
6 will be at that point without those facts that Mr.  
7 Trowbridge has been referring to.

8           CHAIRMAN SMITH: This particular consideration has  
9 come up before and this is presented in a somewhat different  
10 light. As far as objecting to a question, which seems to be  
11 the essence of what you are doing, that is not your  
12 prerogative. It is your counsel's prerogative, unless you  
13 feel that you are personally or professionally being dealt  
14 with unfairly, which I don't think is the issue here.

15           WITNESS TORCIVIA: No.

16           CHAIRMAN SMITH: From that point of view, you have  
17 to rely on your counsel to make objections.

18           However, we also, as we have indicated before,  
19 have a right and an obligation to make sure that the record  
20 is accurate as to what you know and what you don't know.  
21 And that is your own individual right, notwithstanding your  
22 counsel, to make sure that you as an individual do not  
23 appear in a hearing under oath and give the wrong  
24 impression. So that is your right.

25           Is that guidance helpful to you?

1           WITNESS TORCIVIA: Yes, that's the area I am  
2 concerned about. The answers at least that I might give at  
3 this stage, at this point, may not be exactly accurate  
4 because of the loading chart which we are talking about down  
5 the line.

6           BY MR. POLLARD: (Resuming)

7           Q     I was not trying to question you on loading or  
8 loading sequence. I was questioning you along the lines  
9 that the purpose of the modification was to allow the  
10 operator -- to provide the operator the capability or the  
11 means to energize the pressurizer heaters from the onsite  
12 power supply, as a result of this modification and the  
13 development of emergency procedure 1202-29.

14           My simple question was that, if the operator did  
15 lose offsite power or lost the normal source of power for  
16 the pressurizer heaters, wouldn't he as a matter of course  
17 proceed to energize the pressurizer heaters from the onsite  
18 power supply, observing the precautions of making sure that  
19 he has sufficient capacity on the diesel generators so that  
20 he could power the pressurizer heaters?

21           A     (WITNESS SHIPPER) I think that question would be  
22 better asked of someone from the operations department.

23           Q     So your answer is you don't know?

24           A     (WITNESS SHIPPER) I do not know.

25           Q     Mr. Torcivia?

1           A       (WITNESS TORCIVIA) My line of thinking just  
2 suddenly disappeared. Would you repeat the last statement?

3           Q       Wouldn't the operators, as a matter of course, if  
4 they lost the normal source of power to the pressurizer  
5 heaters, proceed to energize the pressurizer heaters from  
6 the onsite power supply, observing the precautions in the  
7 procedures of making sure that there was sufficient capacity  
8 available from the diesel generator to carry the heaters?

9           MR. TROWBRIDGE: Mr. Chairman, I object to the  
10 question. But I think my objections could be taken care of  
11 by Mr. Pollard. There are several, it seems to me,  
12 assumptions implicit in Mr. Pollard's question.

13                   One which has not been established is that this  
14 procedure 1202-29 governs the accident situation, as opposed  
15 to the simple loss of power situation. That was not in the  
16 second statement of the question, but it was in the first  
17 statement of the question.

18                   There is another -- there is another assumption  
19 implicit: that Mr. Torcivia is a proper or Mr. Shipper is a  
20 proper individual to discuss at what point you would put the  
21 pressurizer heater on. You will recall testimony before  
22 this by other witnesses that a minimum of two hours and  
23 perhaps a good deal more might be passed before you would  
24 need to call on the pressurizer heaters, assuming you wanted  
25 to call on them, for natural circulation.

1           And Mr. Pollard's question, it seemed to me,  
2 assumed an immediate operator connection, which these  
3 witnesses don't -- that is not their testimony, nor their  
4 expertise.

5           (Counsel for UCS conferring.)

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1           CHAIRMAN SMITH: Mr. Pollard, as I followed the  
2 question, which was difficult -- I think I was able to  
3 follow it -- it seems the question is almost a truism. I  
4 think I could have almost answered the question.

5           But the trouble is, as Mr. Trowbridge points out,  
6 that all of the assumptions are somehow not surfaced. So I  
7 don't know if Mr. Torcivia can honestly say he doesn't know,  
8 nor could Mr. Shipper say that he does know, because  
9 implicit in that are all of the assumptions that he may or  
10 may not know about.

11           But is the question, is it bordering on a trusim  
12 as far as the actual practice is concerned? You begin with  
13 the qualification, "normally," and then you go on from  
14 there.

15           MS. WEISS: I don't know what you mean by  
16 "trusim." We think it is obvious. That is perhaps why I am  
17 troubled. We think the answer to it is obvious. But I must  
18 say I am troubled by the objections.

19           CHAIRMAN SMITH: It is the mischief that can be  
20 caused by that type of a question, because both people are  
21 put on the spot. Mr. Torcivia, I suspect, feels he knows  
22 the answer to the question, but he doesn't know what all of  
23 the ramifications might be. And the same way with Mr.  
24 Shipper. I think you could have two reasonable,  
25 well-informed people answer the question entirely

1 differently, and what does the record demonstrate?

2 MS. WEISS: I guess I really don't follow what you  
3 are saying.

4 CHAIRMAN SMITH: Let's go through the question  
5 again very slowly. If it is important to you, let's carry  
6 it through.

7 MS. WEISS: We think it is important, because we  
8 think it shows a distinction between pressurizer heaters in  
9 a situation in which there is a loss of off-site power or  
10 need to energize safety loads from the emergency buses and  
11 all other nonsafety loads which are shed. For that reason,  
12 we think it is important.

13 We don't think they are all in the same  
14 situation. The nonsafety loads are shed, but the emergency  
15 -- but the pressurizer heaters are then reconnected. We  
16 think -- the questions we are asking are simply trying to  
17 get at that: Isn't it the case that all of the nonsafety  
18 loads are shed, but that then, in the normal course of  
19 events, the pressurizer heaters are reconnected?

20 CHAIRMAN SMITH: There you are, you see. What the  
21 normal course of events is may be one thing to Mr. Shipper,  
22 what the normal course of events is may mean another --

23 MS. WEISS: Let's just take --

24 CHAIRMAN SMITH: More often or not, isn't it a  
25 truism, you lose it and you put it on?

1 MS. WEISS: I think it's correct, and that's why I  
2 can't understand --

3 DR. JORDAN: Can't you ask the witnesses to assume  
4 the correctness?

5 MS. WEISS: My next instruction to Mr. Pollard was  
6 going to be to assume that. As I say, I am troubled when I  
7 hear objections. I would think it is something that the  
8 Licensee would stipulate to, and that raises questions in my  
9 mind that perhaps the record isn't absolutely clear on it.

10 CHAIRMAN SMITH: You are building blocks very  
11 carefully, and you are beginning with the fundamentals.  
12 Okay?

13 MS. WEISS: Yes.

14 CHAIRMAN SMITH: Do you understand the question,  
15 Mr. Torcivia? Do you have the question before you?

16 WITNESS TORCIVIA: If I understand the question --  
17 I hope I understand the question -- my answer to the  
18 question, the way I understand it, would be: If the  
19 capacity is available to the operator, in my opinion, and he  
20 wishes at that time to put on the pressurizer heaters for  
21 whatever reason, he is free to do so. That is the only  
22 answer I know to the question.

23 CHAIRMAN SMITH: I think the question goes one  
24 step further, though, and that is normal -- and you can take  
25 "normal" any way you want to, because it wasn't qualified --

1 "Normally, would he do it?"

2 WITNESS TORCIVIA: He has other avenues available  
3 to him. I don't know if he would normally do it.

4 BY MR. POLLARD:

5 Q Are either of you aware of any other emergency  
6 procedures for Three Mile Island Unit 1 setting forth how to  
7 go about connecting any other nonsafety load to the diesel  
8 generator buses other than the pressurizer heaters?

9 A (WITNESS SHIPPER) I myself am not familiar with  
10 the emergency procedures at Three Mile Island Unit 1.

11 A (WITNESS TORCIVIA) My only answer to that would  
12 be: As we know it right now, there are about 1500 of them.  
13 Of those that I am aware of, I don't think I know of any  
14 that specifically pinpoint in the same manner. I really  
15 don't. Maybe there is; I don't know.

16 Q Have the plant designers ever come to you before  
17 and asked you to verify that the diesel generator had  
18 sufficient capacity to carry another nonsafety load?

19 A (WITNESS TORCIVIA) As I pointed out before, not  
20 only have they been coming to me unofficially to find out,  
21 but several months ago a specific procedure was set up that  
22 no loads were to be put on the diesel and -- without my  
23 personal signature to the request.

24 Now, I want to make it very clear that I am not  
25 questioning what the type of loads are in terms of what they

1 are doing, but rather the KW involved and the nature of the  
2 load if it happens to be one that requires certain  
3 engineering considerations from an electrical point of  
4 view.

5 BY MS. WEISS:

6 Q I am not sure that you heard the question. Maybe  
7 you did. The question was whether the mechanical people or  
8 the systems designers have come to you before with respect  
9 to a nonsafety load and asked you to verify that the diesel  
10 generators are capable of handling that load during a loss  
11 of off-site power or any other transient or accident?

12 A (WITNESS TORCIVIA) May I repeat: Irrespective of  
13 whether it is a safety or nonsafety, any load that is put on  
14 the diesels will come to my attention at one point or  
15 another.

16 Q Correct. And do you know whether any of those  
17 loads that have come to your attention, where the systems  
18 people have said to you, "Tell us whether this can be  
19 carried by the diesels during a loss of off-site power or  
20 any other accident or transient," have been nonsafety  
21 loads?

22 A (WITNESS TORCIVIA) Of late? My recollection for  
23 the past few months has been that most of those loads have  
24 been mostly connected with communications, for additional  
25 communications and some hydrogen --

1 (Witnesses conferring)

2 -- emergency lighting. I don't know if I am  
3 answering the question. I am pointing out the types of  
4 loads that have come up lately. Now, regardless of the type  
5 they are, we make as complete a review as we know how to  
6 make, to arrive at the loads at that particular time when  
7 that load is required.

8 Q The answer is, am I correct, that you don't know?  
9 It is simply not part of your job to know whether a load is  
10 nonsafety-grade or safety-grade when you are approached by  
11 the systems engineers?

12 A (WITNESS TORCIVIA) I don't know -- I don't think  
13 I would be honest in saying I don't know. I normally will  
14 ask. Now, they may not give me an answer. It may be  
15 safety-grade at the time they give me the answer and then  
16 revert back to a nonsafety-grade. I may not know it then.  
17 But I normally ask, "What type of a load is this? Is it  
18 safety-grade load, and when will you require it," and so  
19 forth.

20 (Counsel for UCS conferring)

21 MR. POLLARD: We have no further questions of  
22 these witnesses at this time.

23 CHAIRMAN SMITH: Mr. Adler?

24 MR. ROBERT ADLER: Mr. Dornsife has some  
25 questions.

## 1 RE-CROSS EXAMINATION

2 BY MR. DORNSIFE:

3 Q If you will, look at UCS Exhibit 19, on page 13,  
4 procedure 1202-29. There is some confusion in my mind about  
5 the ES signal and its effect on the pressurizer heater  
6 feeder breaker. If you look at the note at the bottom of  
7 page 13, it says -- you have the procedure?

8 "An ES signal will trip the pressurizer heaters  
9 off the bus but will not lock them out." Does that imply  
10 that as soon as the pressurizer heaters are tripped by an ES  
11 signal, you can then reload them on the bus, or do you have  
12 to bypass the ES signal in total to allow reloading of the  
13 bus? I don't think that is clear from that description.

14 A (WITNESS SHIPPER) I think in previous testimony  
15 we have brought out the fact that when the ES signal trips  
16 the pressurizer heaters, either the accident condition must  
17 have gone away, the accident signal is no longer present, or  
18 the ES would be bypassed, would have to be bypassed, in  
19 order to manually reload the pressurizer heaters.

20 Q Before the criteria are met for bypassing the ES  
21 signal, if the operator would try to put the pressurizer  
22 heaters on the ES bus, they would just trip right off again;  
23 is that correct?

24 A (WITNESS SHIPPER) That is correct. I think that  
25 was brought out in testimony before Christmas.

1 Q From that standpoint, they are no different than  
2 any of the other nonessential loads? They can be all  
3 manually loaded the same way?

4 A (WITNESS SHIPPER) That's correct.

5 Q If you look at the list of loads, then, at the top  
6 of page 13, did you testify, Mr. Torcivia, that they were  
7 nonessential loads?

8 MR. TROWBRIDGE: I object. We have just been  
9 through an explanation by Mr. Torcivia that he -- it is not  
10 his function to know whether they are safety-grade or  
11 nonsafety-grade. The definition in this procedure, the  
12 title may be "nonessential." If we are going to start  
13 getting into the importance to safety of these loads, I  
14 object to the question. If that is not Mr. Dornsife's  
15 intention --

16 CHAIRMAN SMITH: I thought he just wanted help on  
17 what had been the case.

18 Is that your purpose, Mr. Dornsife? You are  
19 trying to have your memory of what was actually testified to  
20 refreshed?

21 MR. DORNSIFE: The witness had said he thought the  
22 loads were nonessential because they weren't automatically  
23 loaded on the diesel.

24 WITNESS TORCIVIA: I sure hope when I use the word  
25 "nonessential," I mean they weren't necessary. If they

1 weren't, they better get out of there. They certainly are  
2 essential in the sense that they wouldn't be there if they  
3 weren't. If I make myself clear.

4 BY MS. DORNSIFE:

5 Q Is your testimony still that they are not  
6 automatically loaded on the diesel; all of these loads are  
7 manually loaded?

8 A (WITNESS TORCIVIA) Out of that list, there are  
9 probably one or two that are automatically loaded. I can  
10 see this first one over here, AHE-15-A, that would be  
11 automatically loaded.

12 Q That's the point I was making. If you look at the  
13 Restart Report, the table on question 1-E, AHE-15-A is  
14 loaded automatically, and I believe also AHE-18, the  
15 emergency control room fans, are also automatically loaded.  
16 So there are at least two on there that are automatically  
17 loaded on the diesel.

18 My last question then: If the manual loads that  
19 are in question on 1-3 of the Restart Report, the list at  
20 the bottom of the -- you have that question -- the manual  
21 loads that are indicated there?

22 A (WITNESS TORCIVIA) On the Restart Report?

23 Q Right. Are there any procedures which cover their  
24 loading onto the diesel?

25 A (WITNESS TORCIVIA) They are talking about --

1 Q Things like instrument air compressors, spent fuel  
2 pump, control building emergency supply fan, the manual  
3 loads indicated in Table 3-1.

4 A (WITNESS TORCIVIA) I hope on page -- no page  
5 number -- the next page, there is a list of notes.

6 Q Correct. Yes.

7 A (WITNESS TORCIVIA) You will notice that those  
8 notes refer back to the chart here where there should be a  
9 column marked "Notes." I hope that will clarify as to the  
10 type of information that we have had as to when those  
11 particular loads go on.

12 For example, Note 7 says: "Manually started loads  
13 within 30 minutes with or without an ES actuation." Things  
14 of that nature.

15 MS. WEISS: Could we have an identification of  
16 where you are?

17 MR. DORNSIFE: Supplement 1, Part 1 of the Restart  
18 Report, question 3, talking about Table 3-1 of that report.

19 MS. WEISS: We need to get a copy of that.

20 BY MR. DORNSIFE:

21 Q My question isn't covered by the notes. My  
22 question is: Is there a procedure, for example, question 8  
23 -- my question doesn't concern looking at the loads --  
24 question 8 says "Manually started loads continue upon diesel  
25 generator capacity." Is there a procedure similar to the

1 procedure in 1202-29 for those other loads?

2 A (WITNESS TORCIVIA) There are 1500 procedures.

3 There must be one, but I don't know what it is. That is a  
4 future job that we have

5 Q You would expect that there would necessarily be a  
6 procedure for each and every one of these manual loads  
7 similar to this procedure verifying the capacity of the  
8 diesel generator prior to starting those loads?

9 A (WITNESS TORCIVIA) I am sure there must be one,  
10 but what it is I don't know.

11 Q Your testimony is, then, that you don't know  
12 whether in fact there are procedures but that there  
13 necessarily should be procedures which cover loading all  
14 those loads on the diesel to ensure the capacity is not  
15 exceeded; is that correct?

16 A (WITNESS TORCIVIA) That is correct.

17 Q In your responsibility, you would probably be the  
18 one that would at least verify, look at those particular  
19 loads and verify they did not exceed the diesel capacity; is  
20 that correct?

21 A (WITNESS TORCIVIA) I see what you mean. Yes,  
22 yes, yes. At no time is a diesel to be overloaded beyond  
23 the 3000 KW. Within those limitations, that's correct.

24 Q I guess my next question is: Obviously, you would  
25 probably go back now and make sure then those loads are in

1 fact covered by procedures?

2 A (WITNESS TORCIVIA) While you have been talking, I  
3 have been trying to think who to assign that whole job to,  
4 which is going to be a monstrous one.

5 MR. DORNSIFE: I have no further questions.

6 CHAIRMAN SMITH: Mr. Cutchin?

7 MR. CUTCHIN: I have no questions of the  
8 witnesses, Mr. Chairman.

9 CHAIRMAN SMITH: Mr. Trowbridge.

10 MR. TROWBRIDGE: No further questions.

11 (Board conferring)

12 BOARD EXAMINATION

13 BY DR. JORDAN:

14 Q Mr. Shipper, you may not be the right witness for  
15 this. I think I have mentioned before that I have observed  
16 in I&E Bulletin 7901B Supplement Number 3 of October 24,  
17 1980, which has to do with the environmental qualification  
18 of Class 1 equipment, item 1B reads as follows: "The  
19 qualification information for equipment required to achieve  
20 and maintain a cold shutdown condition must be submitted not  
21 later than February 1, 1981."

22 Do you know whether the pressurizer heaters are  
23 included as part of that equipment referred to in this I&E  
24 bulletin?

25 A (WITNESS TORCIVIA) My answer to that is: Yes, I

1 do happen to know that the pressurizer heater is not  
2 included in that February bulletin. I say that with tongue  
3 in cheek for fear that I may be asked further questions  
4 within that area for which I am not qualified to do so.

5 Now, the reason I do know --

6 Q You say it is not included, the pressurizer heater  
7 is not included as part of it?

8 A (WITNESS TORCIVIA) No, it will not be included in  
9 the February report.

10 Q That, I think, is as far as I will try to go with  
11 you, because I do realize that would be outside the scope of  
12 your expertise.

13 I would like, however, to warn the Licensee that I  
14 intend to pursue this as to whether the Bulletin Number 3,  
15 in fact, doesn't require the pressurizer heaters to be  
16 qualified. But I think it is outside the scope of these  
17 gentlemen and something to be thought about later.

18 Just a question or two, summarizing your  
19 testimony. Do you believe that the methods of automatic  
20 circuit breakers for disconnecting the pressurizer loads,  
21 the pressurizer heaters in case, say, of a failure, a short,  
22 does meet the requirements of the reg guide, the appropriate  
23 reg guides, Reg Guide 1.75? Do you believe that the  
24 requirements of 1.75 are met with respect to the pressurizer  
25 heater?

1 A (WITNESS TORCIVIA) As Mr. Pollard has indicated  
2 in some of his examinations, I was not a member of that  
3 committee in making it up; and, therefore, I can only put  
4 into it my interpretation of what the intent was.

5 Q I am talking about Reg Guide 1.75.

6 A (WITNESS TORCIVIA) I am sorry.

7 Q That's all right.

8 A (WITNESS TORCIVIA) Which one are we talking  
9 about?

10 Q Reg Guide 1.75. Don't you refer to that?

11 A (WITNESS TORCIVIA) Yes. Reg Guide 1.75.

12 Q You say you weren't a member of the committee?

13 A (WITNESS TORCIVIA) We are talking about 1.75; is  
14 that correct?

15 Q Yes. I thought you were confusing it with the  
16 IEEE 373.

17 A (WITNESS TORCIVIA) Oh, no, no. I am merely  
18 indicating that not having been a member on the committee to  
19 develop this reg guide, I can only put my interpretation as  
20 to the intent of it. And based on my interpretation of the  
21 reg guide, I honestly believe that we fulfilled the intent  
22 of that reg guide.

23 Q That's all I wanted to know.

24 BY CHAIRMAN SMITH:

25 Q Mr. Torcivia, would you be sure that you are

1 referring to the reg guide issued by the staff, the Nuclear  
2 Regulatory Commission, as compared to the IEEE standard that  
3 has also been discussed in connection with 384-1977, is it?  
4 The reason I ask you to be sure about that is you are  
5 talking about being a member of the committee which wouldn't  
6 normally be the case on a reg guide. That is why I would  
7 hope --

8 A (WITNESS TORCIVIA) I am referring to section 3 of  
9 Reg Guide 1.75, which is what we have been discussing  
10 mostly.

11 Q I was just somewhat confused about your reference  
12 to being on the committee, not being on the committee. And  
13 I just want to make sure that you have correctly identified  
14 the document you are referring to, that's all.

15 A (WITNESS TORCIVIA) Yes, my reference to being on  
16 the committee is that I wasn't there.

17 MS. WEISS: Did you say section B or section C of  
18 the reg guide? I wasn't sure I heard.

19 WITNESS TORCIVIA: Section 3. Isolation devices.  
20 All the way down.

21 DR. JORDAN: Page 1.75-2, the second column under  
22 C, regulatory position, we have Roman numeral I section 3,  
23 isolation device. And that's what you're referring to?

24 WITNESS TORCIVIA: Yes. And with particular  
25 reference to the tripping of the main breaker and so forth

1 and so forth, would cause a loss of emergency power.

2 BY DR. JORDAN:

3 Q And you say the basis of your saying that is you  
4 have both overcurrent protection and undervoltage  
5 protection? Is that correct?

6 A (WITNESS TORCIVIA) That is one basis. If I may,  
7 may I read this? And this is the portion that we are  
8 referring to, and, hopefully, I don't read it out of  
9 context: "Tripping of the main circuit breaker would cause  
10 the loss of emergency power to redundant divisions of  
11 equipment. It is recognized that proper breaker-fuse  
12 coordination would preclude such an event. However, because  
13 the main breakers are in series with the fault and could  
14 experience momentary occurrences above their set points, it  
15 is prudent to include the use of interacting devices  
16 actuated only by fault current as acceptable devices for  
17 isolating non-Class 1E circuits from Class 1E as associated  
18 circuits."

19 Q Yes.

20 A (WITNESS TORCIVIA) Again, I say my interpretation  
21 is: The undervoltage device is one device that is tripping  
22 out not through directly the current elements of the breaker  
23 but through, in this case, a shunt trip. So that is  
24 disassociated from the current.

25 My other feeling is that even if we lost the main

1 circuit breaker which was feeding the control center, we  
2 would not be going up to the diesel itself, we would be  
3 tripping out one section of the transformer, one section of  
4 the loads to the diesel. I don't know if I am making myself  
5 clear. We are just tripping out one section, which on  
6 Figure 1 would be that main circuit breaker.

7 Q Yes, that is the main breaker just below the  
8 transformer.

9 A (WITNESS TORCIVIA) We would have a failure of the  
10 main feeder breaker. And in addition to that, the next  
11 breaker that would trip out would be the main breaker.

12 Q Yes.

13 A (WITNESS TORCIVIA) At that point, we are not  
14 losing the power, the diesel itself; we are losing that one  
15 bus, bus 1S.

16 Q Are you saying then that you have not just one  
17 breaker, you have two breakers which protect the diesel?

18 A (WITNESS TORCIVIA) Yes. The main feeder breaker  
19 backed up by the main breaker.

20 Q All right.

21 A (WITNESS TORCIVIA) They are both qualified  
22 breakers.

23 Q Now, with respect to the other nonsafety loads  
24 which may be loaded onto the Class 1E power supply, I don't  
25 really want to get back and relitigate the design of the

1 original plant. But in your opinion, are those other loads  
2 protected in the same way, or is there any need to protect  
3 those other loads in the same way -- and I am referring to  
4 the isolation devices?

5 A (WITNESS SHIPPER) Those loads are all protected  
6 by qualified circuit breakers.

7 Q But are they doubly protected according to the Reg  
8 Guide 1.75?

9 A (WITNESS SHIPPER) When you say "doubly  
10 protected," you mean breakers in series?

11 A (WITNESS TORCIVIA) I think perhaps, Dr. Jordan --  
12 I hope I am interpreting this right -- you must be thinking  
13 in terms of the undervoltage relays which are a separate  
14 signal?

15 Q Yes.

16 A (WITNESS TORCIVIA) No, they are not.

17 Q Is there any reason, logical reason, why they  
18 shouldn't be protected? Is there any reason, I might say --  
19 perhaps you would rather answer the other way -- that you  
20 need both current and voltage in order to protect the  
21 pressurizer heaters? Do we need current and voltage for the  
22 others? Is there a difference? Is there a difference in  
23 the load that makes it sensible to protect the pressurizer  
24 heaters with undervoltage as well as current, but not the  
25 other, not the other loads?

1           A       (WITNESS TORCIVIA) Dr. Jordan, you are asking me  
2 an engineering question. I must answer that based on an  
3 engineering judgment. It is my honest judgment that in the  
4 particular case of the pressurizer heaters, they were put on  
5 there in an effort to further satisfy this 1.7. I was  
6 instrumental in putting them on.

7                   The reason I say that is that I feel the  
8 coordination that exists between -- and the selectivity that  
9 exists -- between the main feeder breaker and the main  
10 breaker, they are so far apart from each other that it is  
11 quite, in my engineering judgment and based on some of the  
12 studies that were made, that the momentary current of which  
13 the reg guide is concerned with -- under some conditions I  
14 agree with it because I have had that experience -- it is  
15 not within the same area.

16                   So, such momentary currents that may develop will  
17 not affect the main breaker, which is shown in Figure 1, the  
18 feed to that bus 1S. So, in my judgment, the relays are  
19 very, very good backup. I say this -- and I hope I am not  
20 introducing something out -- in addition to the undervoltage  
21 relays, we have also provided ground fault relays within  
22 that circuit.

23                   Now, again, in my judgment, from an engineering  
24 point of view, the type of equipment we are talking about is  
25 far more susceptible to a ground fault condition than it is

1 to a bolted short circuit, which we have been discussing  
2 here. Those ground fault relays will normally detect small  
3 undercurrents that develop and will normally take care of  
4 faults which may develop as a result of even a  
5 phase-to-phase condition which eventually turns into what we  
6 term a "ground fault condition."

7           Those relays are set at a very low level to trip  
8 out; and although they are actuated by a current, they will  
9 trip out through a shunt trip, which is exclusive of the  
10 breaker current element.

11       Q       Are you saying that it is more likely that you  
12 have a short to ground than from terminal to terminal in the  
13 pressurizer heater?

14       A       (WITNESS TORCIVIA) With the type of equipment we  
15 are talking about, in my engineering and personal equipment,  
16 yes.

17       Q       I see.

18       DR. JORDAN: I have no further questions.

19       CHAIRMAN SMITH: Ms. Weiss.

20       MS. WEISS: We have no questions.

21       CHAIRMAN SMITH: Anything further by anyone?

22       (No response.)

23       CHAIRMAN SMITH: You are excused, gentlemen.

24 Thank you very much.

25       (Witnesses excused)

1           CHAIRMAN SMITH: I want to report that I had a  
2 telephone conversation with Ms. Bradford. I told her that  
3 her Contention on filters would be heard as early as  
4 tomorrow afternoon, Thursday, January 28th. I explained to  
5 her that we have not ruled on the testimony of Dr. Beyea.  
6 She asked when we would. I said we don't know, we are still  
7 considering it. She said then, "Does that mean there is no  
8 need for Dr. Beyea to be present?" And I said that is up to  
9 her whether he is present or not, but it is -- we are not  
10 scheduling his testimony. I pointed out that other  
11 Intervenor's have had technical advisers, but it is entirely  
12 her judgment. We don't require him to be present.

13           She said that she would be present. She stated  
14 that she hasn't been receiving transcripts. I told her they  
15 were stopped. She wanted to know who stopped them. I told  
16 her it was a result of the General Accounting Office. She  
17 objected that I did not inform her of that. I told her to  
18 come to the hearing and make her arguments.

19           If there is nothing further, we will adjourn until  
20 1:00 p.m.

21           (Whereupon, at 11:51 a.m., the hearing was  
22 recessed, to reconvene at 1:00 a.m., this same day.)

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## 1 AFTERNOON SESSION

2 (1:12 p.m.)

3 CHAIRMAN SMITH: Are we ready to proceed?

4 MR. TOURTELLOTTE: I have one preliminary matter.  
5 After our discussion last night I talked with Mr. Basdekas  
6 once again this morning, and there are two points that he  
7 wished to make and make clear. The first is that if UCS  
8 wishes to talk to him, he would be happy to do so, but he  
9 wishes to make it clear that he does not want to do this as  
10 a private citizen but as an NRC staff member, with  
11 appropriate members of the staff present. In particular, he  
12 thinks it advisable that I be there.

13 The second point he wanted to make, wanted me to  
14 convey to the Board is that he has presented the best way he  
15 knows now the position that he has, which is a more or less  
16 generic position but which may or may not -- may have  
17 applicability to TMI-1. He will does not have a desire to  
18 appear, although he will appear if requested.

19 He believes that if the Board has a question about  
20 what he has presented to them, he would like to have a  
21 specific question directed toward whatever subject matter it  
22 is that the Board is concerned about and then have the  
23 opportunity to respond to that in writing. And, of course,  
24 if the Board also wishes him to appear, he would do that,  
25 but he would also like to have some focus in his appearance.

1           That is the information I have to pass on. I will  
2 also discuss this with Ms. Weiss and see if we can work out  
3 some arrangement to meet with UCS and Mr. Basdekas. I told  
4 him that UCS was concerned about his ability to speak openly  
5 and freely with the staff present, and he indicated that he  
6 had had no difficulty in the past speaking openly and freely  
7 with any member of the staff present and he didn't feel like  
8 that was a particular problem now.

9           CHAIRMAN SMITH: Do you have any comment, Ms.  
10 Weiss?

11           MS. WEISS: No.

12           CHAIRMAN SMITH: Does anyone have a comment?

13           (No response.)

14           CHAIRMAN SMITH: Anything else, Mr. Tourtellotte  
15 or anybody? Ms. Weiss?

16           MS. WEISS: No.

17           Mr. Pollard has already been sworn, Mr. Chairman.  
18 Whereupon,

19                                   ROBERT D. POLLARD,  
20 recalled as a witness by counsel for the Union of Concerned  
21 Scientists, previously having been duly sworn by the  
22 Chairman, was examined and testified as follows:

23           MS. WEISS: We have distributed to the Board and  
24 reporter copies of a document entitled Direct Testimony of  
25 Robert D. Pollard on Behalf of the Union of Concerned

1 Scientists regarding UCS Contention Number 4, dated  
2 September 15, 1980.

3 DIRECT EXAMINATION

4 BY MS. WEISS: :

5 Q Would you direct your attention to that document,  
6 Mr. Pollard? It consists of an outline and 13 pages of  
7 testimony.

8 MS. WEISS: I don't know if the reporter's copy  
9 contains the statement of qualifications. The copy which I  
10 have does not. I have just noticed that for the first  
11 time.

12 THE REPORTER: No.

13 BY MS. WEISS: (Resuming)

14 Q With the exception of the outline, are you the  
15 author of the document?

16 A Yes.

17 Q Are there any corrections which you wish to make  
18 in it?

19 A Just one, on page 4-7, the third line from the  
20 bottom. The page number now reads page 2.1-7. It should be  
21 page 2.1-7(b).

22 Q That correction has been made on the copy which  
23 the reporter has.

24 A Yes.

25 Q With that correction, is the testimony true and

1 correct to the best of your knowledge and belief?

2           A     Yes.

3           MS. WEISS: Mr. Chairman, I move that the Direct  
4 Testimony of Robert D. Pollard on behalf of the Union of  
5 Concerned Scientists regarding UCS Contention 4 be admitted  
6 into evidence and bound into the record as if read.

7           CHAIRMAN SMITH: Are there any objections?

8           (No response.)

9           CHAIRMAN SMITH: The testimony is received and  
10 will be incorporated in the record.

11           (The Direct Testimony of Robert D. Pollard on UCS  
12 Contention 4 follows:)

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OUTLINE - DIRECT TESTIMONY  
ON UCS CONTENTION No. 4

While not requiring pressurizer heaters to conform with all safety-grade criteria, the Staff and Met. Ed. propose to connect the heaters to the onsite emergency power supply, in an apparent attempt to meet GDC 17. This testimony explains the proper application of the single failure criterion and demonstrates that connection of the heaters in the manner proposed compromises the emergency power supply by making it vulnerable to a single failure. The testimony also demonstrates that the proposal violates GDC 17. In addition, it relies to an inordinate degree on operator action. Finally, no showing has been made that the TMI-1 onsite emergency power supply is qualified to start and operate with the additional load. This poses undue risk to public health and safety.

UCS CONTENTION NO. 4

Rather than classifying the pressurizer heaters as safety-grade, the staff has proposed simply to add the pressurizer heaters to the onsite emergency power supplies. It has not been demonstrated that this will not degrade the capacity, capability and reliability of these power supplies in violation of GDC 17. Such a demonstration is required to assure protection of public health and safety.

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In my testimony on UCS Contention 3, I discussed the reasons why the pressurizer heaters must be classified as safety grade and must, therefore, meet the Commission's General Design Criteria. I will now address the reasons why the use of non-safety grade heaters violates General Design Criterion 17 and degrades the capacity, capability and reliability of the onsite emergency power supplies.

General Design Criterion 17 requires that the onsite electric power supplies and the onsite electric distribution system "have sufficient independence, redundancy, and testability to perform their safety functions assuming a single failure." The design described in Section 2.1.1.3.1 of the Restart Report

violates this requirement because a single failure can result in loss of both onsite emergency power supplies. To explain this statement, it is necessary to first explain the requirements of the single failure criterion.

The single failure criterion requires that a safety system be capable of performing its safety function in the presence of any single detectable failure within that safety system (or its essential auxiliary supporting systems or another safety system) concurrent with all failures resulting from the single failure, all undetectable failures, and all failures that caused or were caused by the accident that requires operation of the safety system. Performing an evaluation to determine whether a system meets the single failure criterion involves the following steps:

1. Identify components that are not safety grade, e.g., not seismically and environmentally qualified in accordance with GDC-2 and 4, not physically and electrically separated as required by GDC-17 and 22, or not protected against fire as required by GDC-3.
2. Assume that each non-safety grade component fails if its failure adversely affects the safety system or assume it operates if its

operation adversely affects the safety system.

3. Assume that all failures which can cause or can be caused by the accident requiring the safety system to operate have occurred.
4. Assume that any other single failure has occurred and then determine whether the safety system being evaluated can still perform the required safety function.

Applying the single failure criterion to the TMI-1 onsite power supply considering the proposal to connect non-safety grade pressurizer heaters to that power system yields the following:

1. A safe shutdown earthquake occurs and causes a reactor shutdown and loss of offsite power. This requires use of the onsite electric power system and the pressurizer heaters to assure decay heat removal by natural circulation.
2. Because the heaters are not safety grade, it must be assumed that the heaters are damaged, for example, short circuited.
3. As called for by Met Ed's procedures, one group of damaged heaters is connected to one of the two redundant emergency power supplies and the

short circuit results in loss of that power supply.

4. The other redundant emergency power supply is also unavailable as the result of a single failure, such as the diesel generator failing to start.
5. The result is that the onsite power supply is unable to perform its safety function because both redundant divisions have been lost, one as the result of a single failure and the other as the result of the failure to require safety grade pressurizer heaters.

The foregoing is intended to illustrate only one example of how the use of non-safety grade pressurizer heaters can degrade the TMI-1 onsite emergency power system. Similar analyses can be done for other events such as a fire in or affecting the pressurizer heater circuits or a small steam or reactor coolant leak creating an environment which fails the heaters. The results of those analyses will be the same - loss of both redundant onsite power supplies. Of course, each event also results in loss of the pressurizer heaters as a means of maintaining the reactor coolant pressure necessary to establish natural circulation.

The only disagreement that I foresee from the Staff and Met Ed concerning the foregoing analysis is whether a fault, such as a short circuit in the pressurizer heaters or their circuitry, will result in loss of the emergency power supply.

The reason there may be disagreement is that the Staff and Met Ed may claim that the non-safety grade heaters will be isolated from the safety grade onsite power supplies in accordance with the provisions of Regulatory Guide 1.75, "Physical Independence of Electric Systems." Based on my experience participating as a professional member of the Staff in the development of Regulatory Guide 1.75 and serving as the NRC's representative on the nuclear industry committee that developed IEEE Standard 384, which is endorsed by Regulatory Guide 1.75, I conclude that such claims are without merit. In fact, statements contained in Met Ed's Restart Report and the Staff's TMI-1 Restart Evaluation refute any claim that the design complies with Regulatory Guide 1.75.

On page 2.1-5 of the Restart Report, Met Ed claims that "[t]he 480 volt circuit breaker is the isolation device between Class IE and non-Class IE portions of the design."\* Met Ed

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\* Emphasis added. The terms Class IE and non-Class IE are equivalent to safety grade and non-safety grade.

also attempts to describe how the use of an undervoltage relay to detect a fault and open the circuit breaker connecting the non-safety grade heaters to the safety grade power supply will remove any endangerment to the power supply caused by a fault in the pressurizer heater circuits. In addition, on page 2.1-5a of the Restart Report, Met Ed attempts to describe how the fault protection on the circuit breaker feeding power to pressurizer heaters "will be fully coordinated"\* with the fault protection on the main circuit breaker supplying power to the safety grade bus. (The latter circuit breaker is not shown on Figure 2.1-4 of the Restart Report. If it were, there would be an incoming circuit breaker above bus 1P and another above bus 1S.) Thus, Met Ed's position is that protection of the emergency power supplies is achieved by the provision of a circuit breaker that would open to prevent loss of the onsite power supply in the event of a short circuit in the pressurizer heaters. The circuit breaker would be opened either directly by the fault current or indirectly by an undervoltage relay sensing an effect (i.e., undervoltage) of the fault current.

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\* A circuit breaker generally includes a method of detecting high current through it that causes the breaker to trip open. These devices can be selected to adjust the magnitude of current and the time the high current persists needed to trip the breaker. The word "coordinated" means that when two (or more) circuit breakers are connected in series, the breaker closer to the load will open on a smaller current than the breaker closer to the power source.

In contrast, Regulatory Guide 1.75 states that:

"Interrupting devices actuated only by fault current are not considered to be isolation devices..." (Regulatory Guide 1.75, Regulatory Position C.1., emphasis added.) The Regulatory Guide goes on to explain that "coordination" of circuit breakers was fully considered in developing the position. It also explains that for a circuit breaker to be considered an acceptable isolation device, it must be opened by " a signal other than one derived from the fault current or its effects...." (Regulatory Guide 1.75, Regulatory Position C.1, Basis). Thus, the inescapable conclusion is that the TMI-1 design does not comply with Regulatory Guide 1.75. Neither the "fully coordinated" breakers nor the undervoltage trip derived from the effects of fault current is an acceptable method of preventing a fault in the non-safety grade pressurizer heater circuits from causing a loss of the safety grade power supply.\*

Met Ed's "Safety Evaluation" of the design is contained on page 2.1-7<sup>6</sup> of the Restart Report. Met Ed acknowledges, however reluctantly or tentatively, that a fault in the non-safety grade pressurizer heater circuits will cause the loss

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\* The example of an acceptable trip signal given in Regulatory Guide 1.75 (an accident signal) is inapplicable in this instance. That signal is incapable of protecting the onsite power supply against a heater fault.

of the 480 volt ES system to which the heaters are connected. In the face of that correct statement, the only realistic way I can explain Met Ed's conclusion that the design is acceptable is to conclude that Met Ed either does not understand or chooses to ignore the requirements of the single failure criterion and the provisions of Regulatory Guide 1.75. I will now address the Staff's position, which reflects the same basic misapplication of the single failure criterion, and then explain the fallacy in both positions.

Although "Clarification" item 6<sup>\*</sup> (Restart Evaluation, page C8-6) references Regulatory Guide 1.75, the Staff never discusses how these provisions are met or states a conclusion as to whether it has been complied with. My opinion is that, in view of the language of position #4<sup>\*\*</sup> on page C8-3 (incorporated in the Commission's Order of August 9, 1979) and the reference to Regulatory Guide 1.75, compliance with Regulatory Guide 1.75 is mandated.

On page C8-7 of the Restart Evaluation, the Staff takes note of Met Ed's procedural "prohibition of energizing the two

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\* Clarification item 6 states "The Class IE interfaces for main power and control power are to be protected by safety-grade circuit breakers."

\*\* Position #4 states "Pressurizer heater motive and control power interfaces with the emergency buses shall be accomplished through devices that have been qualified in accordance with safety-grade requirements."

heater banks simultaneously." The Staff also states the following: "The concern with simultaneous energization of both heater banks is that the electrical separation of the heaters within the pressurizer and the heater cables leading to the pressurizer are not sufficient to assure the required independence of the two emergency power supplies." This statement is presumably based on the Staff's recognition that the TMI-1 design does not provide safety-grade isolation devices between the non-safety grade heaters and the safety grade onsite emergency power supply. If a safety-grade isolation device were provided, there would be no concern about energizing both groups simultaneously. Thus, the Staff recognizes that a fault in the heaters can cause the loss of the emergency power supply. Therefore, one must conclude that Regulatory Guide 1.75 is not met.

Furthermore, the Staff, either by misunderstanding or disregarding the requirements of the single failure criterion, apparently concludes that, if only one heater bank is connected to the emergency power supply, a heater failure and the resultant loss of only one emergency power supply will leave the redundant emergency power supply operable, thereby (in the Staff's view) meeting the single failure criterion. This is the same reasoning apparently adopted by Met Ed. Both err in not recognizing that:

1) the heater failure must be assumed at the outset because the heaters are not safety grade; 2) the power supply connected to the heaters must be assumed to be lost because the "isolation device" between the heaters and the power supply does not meet Regulatory Guide 1.75; and 3) the other onsite power supply must be assumed to be inoperable because of a single failure. Thus, the conclusion that the TMI-1 design does not meet the single failure requirement of GDC-17 is compelled.

Another reason why the connection of the pressurizer heaters to the onsite emergency power supply degrades that safety grade system is that operator action will be relied upon to connect the heaters to the emergency power supply and to disconnect other loads to prevent overloading the emergency power supply. Relying upon the operator to perform more actions needed to protect the public as a result of the TMI-2 accident, which was caused in part by incorrect operator action, is inconsistent with the lessons to be learned from that accident. Furthermore, if the objective is to provide "substantial additional protection to the public health and safety," then disconnecting other loads from and connecting the heaters to the emergency power supply should be done automatically as required by GDC-20. Relying on operator action is both unnecessary and unsafe. It poses the risk

of operator errors that could result in failure to establish natural circulation and/or in loss of the emergency power supply due to overload.

I will discuss one other way in which the TMI-1 design degrades the emergency power supply. Met Ed has not performed any qualification tests to demonstrate the reliability and capability of the TMI-1 onsite emergency power supplies to start and operate the loads added as a result of the lessons learned from the TMI-2 accident. Periodic tests are not a substitute for qualification tests. Proper qualification requires that a reliability goal be established and that tests then be performed to demonstrate that the reliability goal is met or exceeded.

Met Ed stated that the reliability of the onsite emergency power supply "has been demonstrated by monthly surveillances since TMI-1 began operation in 1974." (Answer to UCS Interrogatory 39). Met Ed also stated that: 1) the monthly tests were for the purpose of demonstrating both the reliability of starting the diesel generators and the reliability of carrying the required loads; 2) no specific reliability goal has been established; and 3) the reliability demonstrated by the monthly tests is not known quantitatively. (UCS Deposition of Ronald Stevens, et al, March 26, 1980, Tr 78-80). Considering

these statements and the fact that no monthly tests have been done on the modified design, no basis has been presented to support Met Ed's conclusion that the requirements of GDC-17 are met. Similarly, since the Staff has advanced no reliability goal nor proposed any qualification tests on the modified design, there is no basis for determining that the requirements of GDC-17 are met.

I conclude that, in the absence of adequate qualification testing, it has not been demonstrated "that the capacity, capability, and reliability of the emergency power source (diesel generators) is not degraded as a result of implementing the capability to supply selected pressurizer heaters from ... the emergency power source when offsite power is not available." (NUREG-0578, page A-3). I also conclude that it has not been demonstrated that the requirements of GDC-17 are met and, therefore, TMI-1 should not be permitted to restart.

In summary, my testimony has shown that connection of the pressurizer heaters to onsite power supplies in the manner proposed compromises the emergency power supply by making it vulnerable to a single failure as defined by NRC practice. Met Ed's proposed method for "isolating" the emergency power supply from the non-safety grade pressurizer heater circuits is unacceptable; it does not meet GDC-17, Regulatory Guide

1.75 and Position #4 of the Commission's requirements for upgrading the heaters. In addition, Met Ed's proposal relies improperly on operator action. Finally, no showing has been made by either Met Ed or the Staff that the TMI-1 onsite emergency power supplies are qualified to start and operate the loads added as a result of the lessons learned from TMI-2, including pressurizer heaters. In my opinion, it is clear that the Commission's regulations have not been met and that TMI-1 cannot safely be operated under these circumstances.

1 MS. WEISS: I have distributed to the Board and  
2 the reporter two additional documents. The first is  
3 Regulatory Guide 1.75, Revision 2, September 1978, and the  
4 title is Physical Independence of Electric Systems.

5 BY MS. WEISS: (Resuming)

6 Q Is that Regulatory Guide 1.75 the document that is  
7 referred to in your testimony?

8 A Yes.

9 MS. WEISS: I would like to have that marked for  
10 identification, and my records show that would be UCS 29.

11 (The document referred to was  
12 marked UCS Exhibit 29 for  
13 identification.)

14 MS. WEISS: The second document is nine pages is  
15 length, including a title page, stamped at the top right,  
16 "Received September 28, 1979," entitled Report in Response  
17 to NRC Staff Recommended Requirements for Restart of Three  
18 Mile Island Nuclear Station Unit 1, Met. Ed/GPU. There is  
19 handwritten below that, "Pressurizer Heaters - Word Changes  
20 - Amendment 22.

21 BY MS. WEISS: (Resuming)

22 Q Is that in your handwriting?

23 A Yes, it is.

24 Q Now, the document contains nine pages, some of  
25 which are labeled at the bottom right, Amendment 18, and

1 some of which are labeled Amendment 22. Could you please  
2 explain the nature of the document and what it contains?

3 A I had prepared my direct testimony on UCS  
4 Contention 4 and served it on September 15th. I, of course,  
5 used the version of the restart report which existed at that  
6 time. Subsequently, by letter dated October 17, 1980, under  
7 the signature of an H.D. Hukill, H-u-k-i-l-l, Met Fd  
8 transmitted Amendment 22 to the restart report.

9 So, for purposes of explaining my testimony I have  
10 put together the pages which existed at the time I prepared  
11 my testimony, and those are indicated by a diagonal line,  
12 and put together the corresponding pages from Amendment 22.  
13 Although the page numbers don't match, the substance of the  
14 information on the pages do correspond.

15 Of course, also on the pages with diagonal lines  
16 are some other markings and notes that I had made in my copy  
17 of the restart report, as well as some marks I added to the  
18 pages on Amendment 22.

19 Q Have you considered the changes made in Amendment  
20 22, and if you have, have they caused you to change your  
21 testimony in any way?

22 A I have considered the amendments and there are no  
23 changes in my testimony as a result of Amendment 22.

24 MS. WEISS: Mr. Chairman, I would like to have  
25 this document marked for identification as UCS Number 30.

1 (The document referred to was  
2 marked UCS Exhibit No. 30  
3 for identification.)

4 MS. WEISS: We expect both of these to be  
5 discussed further during the questioning and we will move  
6 for their admission after the conclusion of the testimony.

7 I have some rebuttal questions.

8 BY MS. WEISS: Those which follow relate to the  
9 Licensee's testimony of Joseph A. Torcivia and Paul J.  
10 Shipper, Jr. in response to UCS Contention Number 4  
11 (connection of pressurizer heater to diesel). Maybe I  
12 should add, although it is probably unnecessary, if you feel  
13 the need at any time to use the easel to explain anything,  
14 please feel free to do so.

15 Let me first direct your attention to page 3 of  
16 Licensee's testimony. At the beginning of that page the  
17 language is as follows: "Contrary to UCS Contention 4, this  
18 modification does not degrade the emergency busses in  
19 violation of GDC 17."

20 I would also like you to look on page 4 of the  
21 Licensee's testimony, the second full paragraph. The  
22 language is as follows: "Diverse means of tripping the  
23 pressurizer heater loads from the safety-related busses are  
24 provided to assure that the capacity capability and  
25 reliability of the safety buss to supply power to safety

1 loads is not degraded," and these diverse trips are then  
2 listed.

3           Do you have a response to that?

4           A     I disagree with the testimony that this does not  
5 degrade the busses in violation of GDC 17 because the design  
6 does in fact not comply with the provisions of Regulatory  
7 Guide 1.75. In particular, position C.1 of Regulatory Guide  
8 1.75 takes particular exception to Section 3 entitled  
9 Isolation Devices of IEEE Standard 384-1974 by stating that  
10 the isolation devices, the definition or the use of it  
11 should be supplemented as follows: "Interrupting devices  
12 actuated only by fault current are not considered to be  
13 isolation devices within the context of this document."

14           The regulatory guide then goes on to explain in  
15 some detail the basis for this exception to IEEE Standard  
16 384-1974. It points out that in preparing the regulatory  
17 guide, the staff took full consideration of breaker  
18 coordination. It took full consideration of trips derived  
19 from fault current, such as undervoltage.

20           It pointed out that the breakers that trip on the  
21 receipt of a signal other than one derived from fault  
22 current or its effects -- for example, an accident signal --  
23 are acceptable since the downstream circuit breakers would  
24 already be isolated from their respective power sources  
25 under accident conditions and could pose no threat to these

1 sources."

2           In contrast, the Licensee's testimony in  
3 attempting to establish that they have not degraded the  
4 on-site power supply lists on page - and continuing on page  
5 5 the diverse trips. I prefer to go through them in reverse  
6 order.

7           The trips labeled 3 and 4 on page 5 of the  
8 Licensee's testimony are trips of circuit breakers based  
9 directly upon the fault current. This clearly is not an  
10 acceptable trip, given the provisions of Regulatory Guide  
11 1.75.

12           Trip number 2 on page 4, the low emergency buss  
13 voltage trip, is clearly a signal derived from the effect of  
14 the fault current. This was, of course, illustrated, I  
15 think, best by the additional sheet that was handed out by  
16 Mr. Torcivia demonstrating the voltage versus time and  
17 current versus time characteristics under a fault condition.

18           So likewise trip number 2 is not an acceptable  
19 trip within the provisions of Regulatory Guide 1.75.

20           DR. JORDAN: Would you mind -- I know you said it  
21 but I couldn't find it at the moment -- referring me to that  
22 particular section of 1.75 which says the voltage trips that  
23 are derived from high currents are not acceptable?

24           THE WITNESS: It is in the basis section on page  
25 1.75-2, the second paragraph. Breakers that trip on receipt

1 of a signal other than one derived from the fault current or  
2 its effects. The undervoltage trip for the main feeder  
3 breaker for the pressurizer heaters in Three Mile Island  
4 Unit 1 is clearly a signal derived from the effects of the  
5 fault current. It is the fault current itself which causes  
6 the voltage to reduce, and therefore that is an effect of  
7 the fault current, which is not a type of trip which is  
8 acceptable within the provisions of Regulatory Guide 1.75.

9 DR. JORDAN: Thank you.

10 THE WITNESS: And finally, that first trip is  
11 perhaps the one that has caused the most confusion in terms  
12 of whether or not it complies with Regulatory Guide 1.75.  
13 It is an accident signal which is utilized to trip the main  
14 feeder breaker of the pressurizer heaters. If the breaker  
15 subsequently remained open, that is, the main feeder  
16 breakers were not reclosed later by either bypassing the  
17 accident signal or the accident signal being removed, then  
18 the design would comply with Regulatory Guide 1.75.

19 That is, when this regulatory guide was written,  
20 and I think the basis makes it quite clear by the  
21 continuation of the words that the reason the accident  
22 signal is acceptable is because the downstream circuits  
23 would already be isolated from their respective power  
24 sources under accident conditions and could pose no threat  
25 to these sources, clearly, once you closed the main feeder

1 breaker, once again the heaters do pose a threat to the  
2 on-site power supply. At that point the only signals  
3 available for tripping the breaker on a fault current are  
4 either the direct fault trips listed in items 3 and 4 on  
5 page 5 of the Licensee's testimony or the undervoltage trip  
6 listed in item 2 on page 4, and neither of those trips,  
7 either individually or collectively, satisfy the  
8 requirements of Reg Guide 1.75.

9 DR. JORDAN: You bring up points that I probably  
10 should have asked the Licensee, but since you bring them up,  
11 I will ask you. Now, first of all, what is the logic  
12 wherein an ECFAS signal, a trip based on that signal is of  
13 value in, say, a loss of off-site power, which is perhaps  
14 the most usual requirement, is it not, for the pressurizer  
15 heaters? In other words, the only time you would get the  
16 ESFAS signal is during a break.

17 THE WITNESS: Well, that is, of course, one of the  
18 reasons that we -- I keep wanting to say we -- I am no  
19 longer a part of the staff. The Reg Guide was written  
20 putting the accident signal in parentheses as an example of  
21 an acceptable signal. The actual wording is "breakers that  
22 trip on receipt of a signal other than one derived from  
23 fault current or its effects." That is the main requirement.

24 Now, under the conditions you postulate where you  
25 simply have a loss of off-site power, in the designs I am

1 familiar with and also based upon that testimony of Mr.  
2 Torcivia and Mr. Shipper, I think TMI-1 is quite similar,  
3 that when you lose off-site power you receive an  
4 undervoltage signal which sheds all the loads from the ES  
5 buss except for some minor ones like he mentioned down at  
6 the 120 volt level, and then the diesel generator  
7 automatically sequences on those safety loads which are  
8 needed for the event of loss of off-site power.

9           In that case also we have a signal trip in the  
10 nonsafety loads, which is not derived from the fault current  
11 or its effects.

12           DR. JORDAN: I am confused, then, as to what I  
13 thought an ESPAS signal was. I believe the licensee said it  
14 was a signal that was gotten when the reactor pressure went  
15 down to 1600 pounds or the containment pressure went up to 4  
16 pounds. That was the ESPAS signal.

17           THE WITNESS: Yes, but we also learned that there  
18 is also an undervoltage relay which has been added.

19           DR. JORDAN: But that is not part of the ESPAS, is  
20 it, in your understanding?

21           THE WITNESS: No, it's not, Dr. Jordan. Let me  
22 see if I can explain two separate sequences of events.  
23 Let's just take the simple case of a loss of off-site power  
24 with no ES signal. That is, the reactor pressure does not  
25 decrease below 1600 pounds nor does building pressure go

1 above 4 pounds.

2 Under those circumstances without any faults yet,  
3 the undervoltage relay which trips the main feeder breaker  
4 and the undervoltage relays which trip the other nonsafety  
5 loads do satisfy the requirements of Regulatory Guide 1.75  
6 in that they are not tripping the breakers open based on  
7 either the fault current or its effects.

8 Now, we have the nonsafety breakers up and the  
9 heaters at this point can pose no threat to the engineered  
10 safety feature power supply, which is, of course, needed to  
11 power those safety loads that keep the plant in a safe  
12 condition resulting from the shutdown and loss of off-site  
13 power. We still must remove decay heat.

14 Now, at this point everything is fine. We now  
15 connect the pressurizer heaters to buss 1-P or 1-S and  
16 subsequently have a fault. There is no signal available  
17 other than ones derived from fault current or its effects to  
18 isolate those breakers. Therefore, it does not meet Reg  
19 Guide 1.75.

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1           Let me take now a different sequence, where we  
2 have not only loss of offsite power, but also an accident,  
3 an ES signal. Under these circumstances, originally you  
4 have two signals which comply with Reg Guide 1.75. We have  
5 the undervoltage signal which is responding to the loss of  
6 offsite power because we have no voltage on the bus, and we  
7 have the ES signal tripping the non-safety loads.

8           The diesel generator then picks up automatically  
9 those loads required to cope with the accident. It is only  
10 when you subsequently reclose the main feeder breaker that  
11 the design would then violate Reg Guide 1.75, because at  
12 that point, in order to reconnect the heaters, you must have  
13 bypassed the ES signal or it has been removed, in which case  
14 we now have engineered safety features to cope with the  
15 accident.

16           We also have the pressurizer heaters connected to  
17 the ES power supply, assuming there was sufficient capacity  
18 to do that. We now postulate a fault in the pressurizer  
19 heaters. There is no signal available other than those  
20 derived from fault current or its effects to isolate the  
21 pressurizer heaters.

22           That is the basis for my conclusion that it does  
23 not meet Reg Guide 1.75 under either the circumstances of a  
24 simple loss of offsite power or a combination of loss of  
25 offsite power with an accident.

1 DR. JORDAN: I think I see now. Thank you.

2 BY MS. WEISS: (Resuming)

3 Q Let me ask this question. For the first sequence  
4 that you postulated, the loss of offsite power sequence,  
5 without a break or without an ES sequence, what would  
6 activate the undervoltage relay?

7 A Simply the loss of offsite power. It would not be  
8 a fault that would actuate it. The result of the loss of  
9 offsite power actuates the undervoltage relay.

10 Q Could you explain, please in terms of the logic of  
11 electrical engineering, why trips based on fault current or  
12 derived from fault current are not acceptable as isolation  
13 devices?

14 A The reason why Regulatory Guide 1.75 was written  
15 this way is exactly the same reasons behind the position  
16 expressed in Regulatory Guide 1.6, which was UCS Exhibit  
17 27. When you have a fault, the effects of that fault  
18 current are felt everywhere throughout that circuit at the  
19 same time. This does cause an unacceptable influence on the  
20 safety portion of the power supply, and that is why we took  
21 exception that if you have a fault current throughout the  
22 whole circuit, that this fault current could result in  
23 tripping the upstream breaker, even though, breaker  
24 coordination, if it worked properly, that would not be the  
25 effect. The downstream breaker would trip.

1            Now, if you accepted the logic set forth by Mr.  
2 Torcivia and Mr. Shipper, then automatic bus transfer  
3 switches would be acceptable because you could rely upon the  
4 breaker coordination. If it failed on one side, the bus  
5 would be -- the fault would be automatically transferred to  
6 the redundant safety power supply, and we would have to  
7 assume that the breaker coordination worked.

8            The staff fully considered this way back in 1971.  
9 We have been presented many times with designs where  
10 applicants tried to claim that the design met the single  
11 failure criteria because they had two or three or four  
12 circuit breakers in series, and they argued it was not  
13 correct to postulate the failure of all of those breakers to  
14 trip.

15           The staff specifically rejected those arguments  
16 time and time and time again, that you cannot rely upon this  
17 because the fault current simultaneously affects the whole  
18 circuit, and you cannot guarantee that this will not result  
19 in the loss of the safety-related portion of the power  
20 supply.

21           We also had some experiences where this happened  
22 in plants despite attempts at proper breaker coordination.  
23 These are not very accurate devices. They are not easily  
24 callibrated. They can very easily change their set point  
25 between periodic tests.

1           The staff on balance, in weighing the advantages  
2 of automatic bus transfer devices and powering non-safety  
3 equipment from safety power supplies against the  
4 disadvantages of potentially compromising the independence  
5 between power supplies and of compromising the reliability  
6 of safety power supplies, we concluded that we should  
7 prohibit the use of isolation devices which rely solely upon  
8 fault current or its effects.

9           DR. JORDAN: Are you going to ask him what is  
10 permitted?

11           MS. WEISS: Go right ahead.

12           DR. JORDAN: If you cannot rely on either fault  
13 current or its effects, what else is there?

14           THE WITNESS: You are basically asking me, how can  
15 we satisfy Contention 4?

16           DR. JORDAN: Yes, go ahead and design one.

17           THE WITNESS: There are several ways that the  
18 licensee could accomplish its objective of trying to improve  
19 the power availability to the pressurizer heaters without  
20 violating Reg Guide 1.75. You can either put in an  
21 isolation device, such as an impedance transformer --

22           DR. JORDAN: Such as a what?

23           THE WITNESS: Mr. Torcivia mentioned a  
24 high-impedance transformer, a current limiting transformer.

25           DR. JORDAN: Is that what that amounts to, the

1 same thing?

2           THE WITNESS: Yes. But you would have to add one,  
3 so that if you had a fault on the pressurizer heaters  
4 themselves, you would have to have a transfer somewhere -- a  
5 transformer between bus 1-F and the heater itself, so you  
6 could have a fault in the heater and not have any effect on  
7 the voltage on the bus 1-F or 1-P.

8           You have an isolation device which meets the  
9 definition that it prevents unacceptable influences. The  
10 breaker coordination, rather than preventing, attempts to  
11 remove the unacceptable influence after it has occurred.  
12 That is one way.

13           Another way, of course, is to upgrade the  
14 pressurizer heaters to safety-grade. Therefore, under those  
15 circumstances -- I'm not getting into Contention 3. By  
16 upgrade to safety grade I mean make them environmentally  
17 qualified, tested and so on.

18           Under those circumstances, then, we could only  
19 postulate the fault on one bus. Therefore, you could at  
20 most result in loss of one ES power supply, just as if you  
21 had a fault in a high pressure injection pump that could  
22 itself result in loss of one ES power supply. You would not  
23 then be permitted, under the single failure criterion, to  
24 postulate a fault in the redundant one.

25           The difference being, in the design at Three Mile

1 Island Unit 1, underneath the single failure criterion you  
2 can postulate faults in non-safety equipment and still  
3 postulate a single failure in a safety power supply under  
4 those conditions. You could result in total loss of both  
5 1-P and 1-S.

6 That is one way. You could make the pressurizer  
7 heaters safety grade. Another way -- of course, doing that  
8 would also accomplish the objective under UCS 3. But that  
9 is a separate consideration.

10 Another way you could do it is you could add to  
11 Three Mile Island another power supply onsite and use that  
12 power supply to supply electricity to the heaters during the  
13 event of loss of offsite power.

14 I don't know if I have exhausted all the  
15 possibilities. I am sure there are ways to power equipment  
16 on the Three Mile Island Unit 1 site without jeopardizing  
17 the reliability of the engineered safety feature power  
18 supplies.

19 DR. JORDAN: Thank you.

20 BY MS. WEISS: (Resuming)

21 Q Mr. Pollard, still on page 4 of the Licensee's  
22 testimony, the beginning of the first full paragraph  
23 contains the following statement, quote: "TMI-1 emergency  
24 procedures specify that only one group of pressurizer heater  
25 be connected to an emergency bus at any one time." And the

1 sentence continues.

2 Do you have any comment on that?

3 A In my opinion, the reason that the Licensee has  
4 had to write the procedures to require that only one group  
5 of heaters be connected at a time is because they themselves  
6 recognize that a fault in the heaters could result in loss  
7 of one ES power supply. I think this can be illustrated  
8 quite well by UCS 30.

9 At the time I wrote my testimony, there was a page  
10 in the restart report, which is the first page after the  
11 title page in UCS Exhibit 30, labeled page 2.1-6, amendment  
12 18. The last sentence on that page said, quote: "The  
13 undervoltage relays will initiate tripping of the 480-volt  
14 ES circuit breaker feed to the pressurizer heaters and  
15 thereby remove any endangerment caused by that circuit."

16 Now, when they revised the restart report --

17 Q Make sure they have read it first.

18 DR. JORDAN: Thank you.

19 (Pause.)

20 THE WITNESS: "The undervoltage relays will  
21 initiate tripping of the 480-volt ES circuit breaker feed to  
22 the pressurizer heaters and thereby remove any endangerment  
23 caused by that circuit."

24 The endangerment being referred to is, of course,  
25 the ES power supply, if you read the whole paragraph in

1 context.

2 Now, when they revised the restart report -- the  
3 next page in UCS Exhibit 30 is page 2.1-7, amendment 22.

4 Now the corresponding introductory paragraph says:

5 "The design prevents a malfunction fault on the  
6 pressurizer heaters from causing unacceptable influences on  
7 the ES system."

8 They removed the phrase "any endangerment."

9 BY MS. WEISS: (Resuming)

10 Q Could you indicate where on the page that line  
11 appears?

12 A It is the second paragraph under Section  
13 2.1.1.3.1.2, "Design Basis."

14 Similarly, changes were made in the paragraph  
15 entitled "Safety Evaluation," which is the last two pages of  
16 UCS Exhibit 30. The original page or the page that was  
17 current at the time I wrote my testimony is labeled 2.1-7b,  
18 amendment 18. The second or third full paragraph on the  
19 page, entitled "Safety Evaluation," in the middle of that  
20 paragraph there was a sentence which stated, quote: "Taking  
21 into account the single failure criterion, faults on the BOP  
22 system will at most cause the loss of one 480-volt ES  
23 system."

24 When they revised the restart report, the  
25 corresponding paragraph, which is now on page 2.1.7c,

1 amendment number 22, now it says, quote: "The design  
2 prevents a malfunction fault on the pressurizer heaters from  
3 causing unacceptable influences on the ES system as  
4 previously described."

5 I think, rather than clarifying what has happened  
6 here, in the restart report is some word engineering  
7 designed to obfuscate the fact that a fault on the  
8 pressurizer heaters can in fact result in loss of one  
9 480-volt ES bus.

10 Q Let me direct your attention to page 5 of the  
11 Licensee's testimony. There is language quoted from  
12 Regulatory Guide 1.75 towards the bottom of that page. The  
13 language is as follows, quote:

14 "Also, the susceptibility of non-Class 1E loads  
15 energized from redundant Class 1E power sources to design  
16 basis events (e.g., seismic events) could similarly threaten  
17 the redundant main (bus) circuit breakers."

18 Does the quoted language support the manner in  
19 which the Licensee has provided isolation of heater loads  
20 from emergency buses?

21 (Pause.)

22 A No, it does not support that. If you read in  
23 context the entire basis for position C-1 in Regulatory  
24 1.75, the point was that even for seismic events, by opening  
25 the breakers and leaving them open, you would remove the

1 possibility for non-safety equipment threatening the ES  
2 power supply.

3           It was not foreseen that somebody would attempt to  
4 say, well, once we have isolated, we can reclose it. Their  
5 quote from Regulatory Guide 1.75 in my opinion does not  
6 support a conclusion that their design complies with the reg  
7 guide.

8           Q     Now, directing your attention to page 6 of the  
9 Licensee's testimony, additional language from Regulatory  
10 Guide 1.75 is quoted at the top of that page, and the quote  
11 is as follows, quote:

12                     "It is recognized that proper breaker or fuse  
13 coordination would preclude such an event. However, because  
14 the main bus breakers are in series with the fault and could  
15 experience momentary currents above their set points, it is  
16 prudent to preclude the use of interrupting devices actuated  
17 only by fault current" -- ellipses, and then quote.

18                     Is the use of breaker coordination a technically  
19 supportable way of isolating emergency power supplies? And  
20 if not, what is the meaning of that language?

21                     (Pause.)

22           A     I think perhaps I may have already answered this  
23 question. In the staff's view and in my interpretation of  
24 the meaning of Regulatory Guide 1.75, that was the whole  
25 purpose of writing the Regulatory Guide, that you could not

1 rely on a device as an isolation device which was actuated  
2 only by fault current or its effects, because such a device  
3 does not prevent unacceptable influences on the ES system.

4           And as I said earlier, it was a weighing of the  
5 advantages versus the disadvantages. We conclude the  
6 disadvantages in terms of reduced reliability or reduced  
7 independence of ES systems, that it could be precluded from  
8 using such devices and calling them isolation devices.

9           I think the way to sum up is that the design  
10 proposed by the Licensee for Three Mile Island Unit 1 in  
11 this particular case of connecting the pressurizer heaters  
12 to the onsite power supply, it directly violates the  
13 principles underlying not only Regulatory Guide 1.75, but  
14 also Regulatory Guide 1.6.

15           The staff carefully considered this use of breaker  
16 coordination of undervoltage derived from fault current and  
17 concluded it could not be relied upon as an acceptable way  
18 of isolating non-safety equipment from safety buses.

19           Q       Let me refer you back in the testimony, in the  
20 Licensee's testimony, to page 4, item number 2 under the  
21 general heading of "Diverse Trips," bottom of the page. On  
22 the very last line, in fact, the language appears as follows:

23           "Three undervoltage relays are provided, any one  
24 of which will trip the pressurizer heater loads from the  
25 emergency bus when the voltage level indicates that that

1 capability is jeopardized."

2           Is there any particular advantage to having three  
3 undervoltage relays?

4           A     In my opinion, no. And I see no evidence that  
5 there is any advantage presented in his proceeding. All  
6 three of those undervoltage relays are acting to trip the  
7 same circuit breaker, the main feeder breaker.

8           The design would be, in my view, perhaps just as  
9 adequate with one undervoltage relay as three, unless you  
10 did some sort of an analysis to demonstrate that the weak  
11 link was the undervoltage relay rather than the breaker  
12 itself, because you could always postulate a failure in the  
13 breaker, in which case it wouldn't matter how many  
14 undervoltage relays were telling the breaker to trip, the  
15 breaker is not going to trip.

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1 Q Let me direct your attention now to page 7 of the  
2 Licensee's testimony, the item, the paragraph labeled "B,"  
3 the following language: "When required, only one group of  
4 pressurizer heaters are powered from one emergency bus at  
5 one time. The connection means precludes interconnection of  
6 emergency buses or interconnection of a BOP bus with an  
7 emergency bus."

8 My question to you is: Even if only one set of  
9 heaters is connected at a time, does that provide protection  
10 against losing emergency power to both sets of engineered  
11 safety features?

12 A No, it does not. Once again, it must consider the  
13 assumptions which form the bases for saying that the  
14 single-failure criterion is an adequate criterion. The  
15 assumption, the starting point for the single-failure  
16 analyses, is that you must postulate the event, such as loss  
17 of off-site power, you must postulate the failure of  
18 nonsafety equipment, and then -- and the effect of the  
19 failure of the nonsafety equipment and only then do you  
20 apply your postulated single failure of the safety  
21 equipment.

22 So that under the circumstances of the single  
23 failure being one diesel generator failing to start, a  
24 postulated additional fault in the pressurizer heaters is  
25 not two failures, it is a required postulation. And since,

1 under these circumstances, the only devices available to  
2 isolate the heaters from the bus are devices either based  
3 directly upon fault current or its effects, it would result  
4 in loss of the other ES bus, resulting in total loss.

5           So I don't think it is significant that only one  
6 group of heaters is being connected at a time. The design  
7 still violates the provisions of Reg Guide 1.75. And,  
8 therefore, I conclude it violates the requirements of GDC 17  
9 to not degrade the reliability of the on-site power supply.

10           DR. JORDAN: I believe you addressed that directly  
11 in your testimony. Isn't that true?

12           THE WITNESS: There may be one example of a  
13 scenario I went through in my testimony that may give  
14 similar information.

15           DR. JORDAN: I was thinking of pages 4.2 and 4.3.

16           THE WITNESS: Yes, where I went through the  
17 assumption of the single-failure criterion; that's correct.  
18 I don't think we point out there, at least explicitly, that  
19 I don't think it's significant that only one group of  
20 heaters is connected at a time.

21           DR. JORDAN: I see. All right.

22           BY MS. WEISS:

23           Q     Now to change the subject a bit, back to page 4 of  
24 the Licensee's testimony, I would like you to address  
25 yourself to a sentence that has received a fair amount of

1 attention in the past couple of days. That appears at the  
2 end of the first full paragraph there, and I quote -- maybe  
3 I should start a bit before. I will start at the beginning  
4 of the sentence above that: "Sufficient capacity will be  
5 available for the emergency diesel generator to handle the  
6 pressurizer heater loads, as verified by watt meter  
7 indications. Further, the rated capacity of the diesel has  
8 been verified as being capable of handling the heaters in  
9 addition to the safety-related loads required during loss of  
10 off-site power events."

11 Do you have a response to that?

12 A I think that section fails to address the factors  
13 of reliability. I do not think, in my opinion, that you can  
14 divorce the question of reliability from the loading from  
15 the capacity; that is, by increasing the load on the diesel,  
16 even if you still remain within the rated capacity of the  
17 diesel's generator, you have had an effect on the  
18 reliability of that power supply.

19 If you take a case where you are operating the  
20 diesel generator at 2600 KW and you increase the loading to  
21 3000 KW, you are still in both instances under the 2000-hour  
22 rating, but you have, in effect, had some effect on  
23 reliability.

24 CHAIRMAN SMITH: Is that a straight linear  
25 effect? The more the load, the less the reliability? Or is

1 there a curve where reliability is affected, perhaps  
2 flattened out, let's say, at a diesel generator operating at  
3 extremely low speeds, low loads, is as reliable as one  
4 operating at design? Or can you?

5 THE WITNESS: That is correct. In fact, on some  
6 diesel generators you cannot run them under no-load  
7 conditions for a long period of time. No. I do not know  
8 the direct relationship. I am comparing a case where we  
9 have substantial load on the diesel generator and then  
10 increase it but still stay in both cases within the rating  
11 of the diesel generator.

12 CHAIRMAN SMITH: Do you have any idea where that  
13 point is? Do you have any idea what the relationship is in  
14 increased load to reliability? Or is it just a philosophy?

15 THE WITNESS: I don't have any answers for you as  
16 a specific mathematical equation that will tell us what the  
17 decrease in reliability is.

18 The point I was trying to make is that you cannot  
19 make the conclusion, in my view, that the addition of the  
20 pressurizer heaters has not decreased the reliability of the  
21 on-site power supply simply by saying that the loads are  
22 within the rated capacity.

23 CHAIRMAN SMITH: That is different, however, from  
24 your other statement.

25 THE WITNESS: I know it's different. But the

1 other statement is my basis for saying that. I also, from  
2 my experience on the staff in the time period that Three  
3 Mile Island Unit 1 was licensed, my view is that we cannot,  
4 from a technical point of view, accept the fact that these  
5 diesel generators were adequately qualified for their rated  
6 capacity at the time that Three Mile Island Unit 1 was  
7 licensed.

8 BY MS. WEISS:

9 Q Do you have an opinion as to how the reliability  
10 of the diesels to carry this additional load could be  
11 verified or could be established?

12 A I think I have discussed this in my direct  
13 testimony, that question on pages 4-11 and 4-12. In  
14 general, you must run qualification tests -- first, you must  
15 establish what is the reliability that you want, what is  
16 your reliability goal, and then run sufficient qualification  
17 tests to demonstrate that that reliability goal has been  
18 achieved.

19 Q Do you have before you a copy of the testimony of  
20 the staff's witness on this subject, Mr. Fitzpatrick?

21 MR. TROWBRIDGE: Are we engaged in rebuttal of the  
22 staff testimony before it's presented?

23 MS. WEISS: Yes. We've been doing that. Rebuttal  
24 to the written testimony. We've been doing that all along.

25 CHAIRMAN SMITH: I don't recall this exact

1 sequence, but it doesn't seem inconsistent with what we have  
2 been doing.

3 MR. TROWBRIDGE: I believe that's correct. I got  
4 the answer to my question.

5 BY MS. WEISS:

6 Q Do you have an extra copy of it?

7 A No.

8 MR. TROWBRIDGE: Could we have a brief break while  
9 we all get a hold of copies of this?

10 MS. WEISS: Sure.

11 (Brief recess.)

12 BY MS. WEISS:

13 Q Question and answer 5 of Mr. Fitzpatrick's  
14 testimony relative to emergency power supply for pressurizer  
15 heaters appears on page 3 of his testimony. The question  
16 is: "What is the staff's position on the UCS Contention and  
17 its bases for its position?"

18 The answer is: "First, the staff disagrees with  
19 the characterization that we have simply required addition  
20 of the pressurizer heaters to the emergency buses. There  
21 are four positions and seven clarifications which must be  
22 met in order to satisfy the staff's requirements. These are  
23 documented on pages C8-3 and C8-6 of NUREG-0680, 'Staff's  
24 SER on TMI-1 Restart.'"

25 Do those four positions and seven clarifications

1 refer to anything other than connecting the heaters to the  
2 emergency power supply?

3       A     No, they don't. They are all related to the  
4 position of simply requiring the addition of the pressurizer  
5 heaters to the on-site power supply, the emergency buses. I  
6 see no attempt of the staff to evaluate different designs or  
7 to evaluate different ways of assuring that this has not  
8 degraded the on-site power supply. All they did was say you  
9 should connect it, and all of the positions and  
10 clarifications relate to that position.

11       Q     Have you read and considered all of those  
12 positions and clarifications, and do they change your  
13 testimony in any way?

14       A     No, I do not.

15           MS. WEISS: That's all the rebuttal I have. The  
16 witness is available for cross examination.

17           DR. JORDAN: Before we start cross examination, I  
18 had one question on the testimony, which was similar to the  
19 wording of the staff -- of the Licensee's Restart Report.

20           Your testimony was written at an earlier date, and  
21 I think possibly we addressed this earlier. But on pages  
22 4.7 of your testimony, the last sentence, which continues on  
23 4.8, you say, "Met Ed acknowledges, however reluctantly or  
24 tentatively, that a fault in the nonsafety-grade pressurizer  
25 heater circuits will cause the loss of the 480-volt ES

1 system to which the heaters are connected."

2 I looked for that statement and couldn't find it.

3 Do you know where in the Restart Report you found that?

4 THE WITNESS: The statement is not now in the  
5 Restart Report. It used to be at the time I wrote my  
6 testimony. I can show you where it is in Exhibit 30.

7 DR. JORDAN: How is that?

8 MS. WEISS: If you could just repeat that.

9 THE WITNESS: The statement which I make about Met  
10 Ed acknowledging, there is no longer any reference to that  
11 in the Restart Report. This is one of the word engineering  
12 changes they made when they put in Amendment 22. They  
13 obfuscated the fact that this was their position.

14 DR. JORDAN: Was that included --

15 THE WITNESS: It is in Exhibit 30, page 2.1.7B,  
16 Amendment --

17 DR. JORDAN: Did you point that out to me already  
18 this afternoon once?

19 THE WITNESS: Yes, sir. It is on 2.1.7B,  
20 Amendment 18, the next-to-the-last page on UCS Exhibit 30.  
21 It says: "Taking into account the single-failure criteria,  
22 faults on the POP system will, at most, cause the loss of  
23 one 480-volt ES system."

24 MS. WEISS: Would you make it clear what you are  
25 reading from?

1 THE WITNESS: I am reading from the paragraph  
2 labeled "Safety Evaluation."

3 DR. JORDAN: Okay. You did. I didn't understand  
4 it. I had not connected it up with the page on your  
5 testimony. I understand. That's fine.

6 MR. TROWBRIDGE: Mr. Chairman, I am, of course,  
7 prepared to proceed on cross examination of Mr. Pollard's  
8 direct testimony. I would need a conference, I think not  
9 very long, with my technical advisers to determine what, if  
10 any, additional questions I would have with respect to  
11 rebuttal testimony. I think it would be more efficient if I  
12 took -- if I had the conference now and did it all at once  
13 in a coordinated way.

14 CHAIRMAN SMITH: It is still a bit early for our  
15 midafternoon break. Maybe we can take two of them today.  
16 Will 10 minutes be enough?

17 MR. TROWBRIDGE: Fine.

18 (Brief recess)

19

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25

1 (Pause.)

2 CHAIRMAN SMITH: On the record.

3 MR. TROWBRIDGE: Mr. Chairman, I will be using my  
4 cross-examination plan furnished to the Board for my  
5 questions on Mr. Pollard's direct prepared testimony.  
6 However, I will eliminate some of the questions, because I  
7 think events and other testimony have adequately covered the  
8 matter.

9 My questions will largely -- my cross-examination  
10 will largely be confined to the questions listed under page  
11 4-7 and closely related questions of Mr. Pollard's  
12 testimony.

13 CROSS-EXAMINATION

14 BY MR. TROWBRIDGE:

15 Q Let's turn to page 4-7. There will also be a  
16 reference to 4-8 in the course of the cross-examination.

17 MS. WEISS: I'm having a hard time hearing you.

18 CHAIRMAN SMITH: There used to be a gooseneck  
19 stand on that, on that table. I want to point out to the  
20 parties that it is available if you want to use it.

21 BY MR. TROWBRIDGE: (Resuming)

22 Q On page 4-7, Mr. Pollard, of your testimony you  
23 make several references to Regulatory Guide 1.75. I begin  
24 by asking you whether Regulatory Guide 1.75 does not have  
25 the usual notation in the lower left-hand corner of the

1 first page that in fact Regulatory Guides are not  
2 regulations or a substitute for regulations, compliance with  
3 them is not required, and methods and solutions different  
4 from those set out in the guides will be acceptable if they  
5 provide a basis for findings requisite to the issuance or  
6 continuance of a permit or a license by the Commission?

7 My question, this Regulatory Guide in this respect  
8 is no different than other Regulatory Guides? Do you agree  
9 with that?

10 A Certainly that paragraph, you are correct, it  
11 appears on all the Regulatory Guides. I think in this  
12 particular case, though, this Regulatory Guide is  
13 specifically mentioned as part of the position given in the  
14 short-term lessons learned report. So that may give it some  
15 other status.

16 Q Let's turn to that, Mr. Pollard. On page 4-8 of  
17 your testimony, you refer to position number 4 on page C8-3  
18 of the safety evaluation report and to clarification item 6  
19 on page C8-6 of the same report.

20 MR. TROWBRIDGE: Does the Board have a copy of the  
21 safety evaluation report?

22 CHAIRMAN SMITH: Yes.

23 (Pause.)

24 BY MR. TROWBRIDGE: (Resuming)

25 Q Let's take position 4 first, which is quoted in

1 full in your double asterisk footnote on page 4-8; is that  
2 correct?

3 A Yes.

4 Q It says -- in itself it says nothing about  
5 Regulatory Guide 1.75; is that correct?

6 A That's correct.

7 Q Now let's turn to clarification item 6 over on  
8 page C8-6 of the safety evaluation report. The beginning  
9 portion of that clarification is quoted in the single  
10 asterisk footnote on page 4-8 of your testimony. But the  
11 full text adds, parentheses, quote: "See also Reg Guide  
12 1.75," close parentheses, quote; is that correct?

13 A Yes.

14 Q So the only reference in the position, statement  
15 of position or subsequent clarification to Reg Guide 1.75 is  
16 the parenthetical statement which follows the statement  
17 that: "Class 1E interfaces for main power and control power  
18 are to be protected by safety grade circuit breakers." The  
19 only reference to 1.75 is the parenthetical statement, "See  
20 also Reg Guide 1.75"; is that correct?

21 A I think the answer is yes, Mr. Trowbridge. My  
22 confusion is it sounds like you just asked me the same  
23 question twice. If there was a difference, you will have to  
24 ask me again.

25 Q I think there was not a difference. I may well

1 have repeated the same question.

2           On page 4-8 of your testimony, you draw the  
3 conclusion stated in the last sentence of the paragraph in  
4 the middle of page 4-8 that your opinion is that, in view of  
5 the language of position 4 and the reference to Regulatory  
6 Guide 1.75, quote, "Compliance with Regulatory Guide 1.75 is  
7 mandated," quote.

8           Now, I ask you, what basis do you have for  
9 concluding simply by the reference, quote, "See also Reg  
10 Guide 1.75," quote, that there has suddenly been mandated a  
11 Regulatory Guide which otherwise, in the practice of the  
12 Commission, is for guidance, not a regulation, not a  
13 requirement, and open to substitute solutions?

14          A     I can answer your question. I need to get one  
15 more document.

16                   (Pause.)

17          A     Let me see if I can go through it step by step.  
18 It is quite an involved answer, but I will do it slowly.

19          Q     Do it slowly, then.

20          A     First, on position 4 on page C8-3 of the SER, it  
21 is the same, of course, as position 4 in the short-term  
22 lessons learned report, which is on page A-4 of NUPEG-0578.  
23 And where we are talking here is about interfaces between  
24 the non-safety heaters and the safety power supplies. And  
25 the position basically on its face says, quote: "That

1 interface is going to be a circuit breaker and that circuit  
2 breaker shall be safety grade."

3           And then the staff published the clarification  
4 which eventually showed up on NUREG-0737. But at that time  
5 I think the only place I had known of its existence was in  
6 the SER. And clarification 6 on page C8-6 of the SER  
7 references the same interfaces.

8           From that I conclude that the clarification 6 is a  
9 clarification of position 4.

10          Q     That doesn't explain to me very well why you  
11 conclude that --

12          A     I haven't finished my answer.

13          Q     All right, go on.

14          A     Clarification 6 says the circuit breaker shall be  
15 safety grade and it references Reg Guide 1.75. In order to  
16 decide whether that circuit breaker is safety grade when  
17 used as an isolation device or an interface between the two,  
18 the staff's practice has been that it must also meet the  
19 requirements of 1.75.

20          Q     Let's stick for the moment, Mr. Pollard, to the  
21 documents involved. You have made a number of statements,  
22 particularly on rebuttal, in which you talk about staff  
23 positions and staff meanings on the basis of your  
24 participation some years ago in staff activities, some of  
25 which were directly associated with the Regulatory Guide in

1 question.

2           Normally, I would ask you a good deal more about  
3 your qualifications to speak for the entire staff, either as  
4 to the purpose or meaning of the Regulatory Guides. I am  
5 not going to do so now because the staff is here. The staff  
6 will be on the stand and the staff can speak for itself as  
7 to to what extent your views represent those of the staff or  
8 the former views, the views of the staff at the time you  
9 were a member of the staff.

10           If your answer is based on staff experience or  
11 staff actions which you claim have existed, so be it. But  
12 distinguish carefully between testimony by you as to what  
13 staff actions were and what one could derive simply from a  
14 reading of these documents.

15           MS. WEISS: If the two can be separated, which I  
16 don't believe the premise is necessarily true.

17           THE WITNESS: Let me give you my background on the  
18 staff and then I will answer your question with respect to  
19 these documents.

20           BY MR. TROWBRIDGE: (Resuming)

21           Q     Has that not already been provided? Isn't that in  
22 your statement of qualifications and elsewhere?

23           A     Not with respect to Reg Guide 1.75 and IEEE  
24 384-1974. I don't recall. I don't think so.

25           (Pause.)

1           A     Yes. I'm sorry. It is already on page 4-5 of my  
2 direct testimony, so I needn't go into that.

3                     Just working from the documents and taking into  
4 account the positions as they were stated in the short-term  
5 lessons learned report, NUREG-0578, the concern was, on page  
6 8-3 in particular, quote: "That careful attention be given  
7 to assure the capacity, capability and reliability of the  
8 emergency power source is not degraded as a result of  
9 implementing the capability to supply selected pressurizer  
10 heaters from either the offsite power source or the  
11 emergency power source when offsite power is not  
12 available." Quote.

13                    From that flowed four positions, one of which  
14 required that the interfaces be qualified in accordance with  
15 safety grade requirements, and that was then clarified by  
16 position 5, which adds no clarification to the position  
17 except to the reference to Regulatory Guide 1.75. In other  
18 words, the position itself says that pressurizer heater,  
19 motive and control power interfaces with the emergency  
20 buses shall be accomplished through devices that have been  
21 qualified in accordance with safety grade requirements.

22                    The clarification says, quote: "Class 1E  
23 interfaces for control power and main power are to be  
24 protected by safety grade circuit breakers." Without the  
25 parenthetical reference, "See also Regulatory Guide 1.75,"

1 it really says not anything more than the position itself  
2 said.

3           The next document I relied upon to draw this  
4 conclusion that it was mandated was the restart report. On  
5 the first page of UCS Exhibit 30, it came from the restart  
6 report, page 2.1-6, amendment 18. The first paragraph under  
7 "Design Bases," the last sentence, quote:

8           "Separation and isolation of Class 1E equipment  
9 and circuits from non-Class 1E equipment and circuits will  
10 be in accordance with Regulatory Guide 1.75." And then it  
11 goes on to say the 450 volt circuit breaker is the isolating  
12 device between Class 1E and non-Class 1E portions of the  
13 design.

14           It seemed to me, from all the information I had  
15 available to me, everyone was interpreting this correctly,  
16 but in fact the clarification was for the purpose of saying  
17 that the method of accomplishing the interface should be  
18 through a circuit breaker and you should consider whether or  
19 not that is a safety grade device by considering the  
20 requirements of the position in Regulatory Guide 1.75.

21           Q       And from that you drew the conclusion that it was  
22 the staff's intention to mandate a reg guide without regard  
23 to staff practice with respect to other Regulatory Guides or  
24 this one in other circumstances?

25           A       That is certainly how I phrased my direct

1 testimony. There is no doubt in my mind that I also  
2 considered my own engineering evaluation, considering the  
3 statements made in the short-term lessons learned report  
4 about the objectives to be accomplished and the precautions  
5 to be observed in connecting the pressurizer heaters to the  
6 onsite power supply.

7           And it was my conclusion that you cannot achieve  
8 the objectives of not degrading the capability, capacity and  
9 reliability of the onsite power supply if you are going to  
10 use a circuit breaker without conforming to Reg Guide 1.75.

11           Q     Let's get to that, that last statement. Let's  
12 take a look at Reg Guide 1.75. We will look at sentences  
13 that have been read before, but I would like to have them in  
14 sequence for this portion of the record.

15           We are looking, as we have before, at page 2 of  
16 Reg Guide 1.75, paragraph C.1 in the second column, entitled  
17 "Section 3. Isolation Device," or beginning at "Section 3.  
18 Isolation Device." And in particular I am referring to the  
19 basis expressed in the reg guide for the position expressed  
20 in that section C.1.

21           You would agree with me that the basis does state  
22 a recognition that, quote: "Proper breaker or fuse  
23 coordination would preclude such an event." Quote. "Such  
24 an event" means in this case the tripping of the main  
25 circuit breaker. It does contain that statement?

1           A     Yes. I haven't been following you, but I assume  
2 you have read the reg guide correctly.

3           Q     I will give you plenty of opportunity to comment  
4 on this.

5                     It also gives only one reason why it might be,  
6 quote, "prudent," quote, not to rely on interrupting devices  
7 actuated only by a fault current, and that reason is  
8 because, quote, "The main breakers are in series with the  
9 fault and could experience momentary currents above their  
10 set points."

11                    That is also a correct statement of the content,  
12 is it not, of the basis? Those statements are contained in  
13 the basis?

14           A     Yes.

15           Q     Mr. Pollard, I would hope you would answer my next  
16 series or set of questions on the basis of technical  
17 reasoning rather than your interpretation of 1.75. You have  
18 testified on other occasions that it was your purpose here  
19 not to make legal arguments, but technical arguments.

20                    And I am going to ask you, what is the technical  
21 reason for quarreling with the isolation devices which TMI-1  
22 will have? And for the moment, I am going to ask you to  
23 limit the explanation of your quarrel to the two fault  
24 current breakers, the distribution breaker and the main  
25 feeder breaker. And you may ignore for the present any

1 credit we might claim for the undercurrent -- undervoltage  
2 trip.

3           But I ask you to take into account testimony you  
4 have heard that there are two circuit breakers in series,  
5 both of which are safety grade except for the fact the  
6 distribution breaker is located in the non-seismic qualified  
7 area; that the time setting -- that the time to trip of the  
8 -- that the trip time of the distribution breaker and the  
9 trip time of the main feeder breaker are a fraction of a  
10 second; and at current levels not large enough to trip the  
11 main bus breaker.

12           I also ask you to take into account in your  
13 technical assessment of the isolation scheme the testimony  
14 that I believe you had of Mr. Torcivia that even if the main  
15 bus breaker were to trip the restoration of power to that  
16 bus is a very simple action, which can be taken by an  
17 operator in the control room.

18           That is the end of the things that I ask you to  
19 state, except I may have neglected one, and if I did I would  
20 like to be sure that you include it, which is the time delay  
21 in the tripping of the main bus breaker compared to the time  
22 at which the distribution and main feeder breakers would  
23 trip.

24           MS. WFISS: I don't personally remember any  
25 testimony on the very simple action required to restore

1 power to the bus even if the main bus breaker were to trip.  
2 It can be taken by the operator in the control room. If Mr.  
3 Pollard remembers that, he is free to answer. But I do not  
4 recall any testimony on that.

5 BY MR. TROWBRIDGE: (Resuming)

6 Q Do you recall the testimony, Mr. Pollard?

7 A It was before Christmas. As I recall, it was on  
8 the rebuttal and you asked him a question, what would  
9 happen. I think the answer was that, as I basically recall,  
10 you close the breaker. That's all I remember about it.

11 Q I would be glad to take the time. We can locate  
12 it in the transcript, precisely what the answer was. It  
13 would take a few minutes, but I would be happy to do that.  
14 Why don't we do that while you're making notes?

15 A If you think that is an accurate recollection, I  
16 don't think that is significant one way or the other in  
17 terms of my answer to the question you are asking. You can  
18 look for it if you wish. I don't think I need to.

19 Q All right. You answer when you're prepared to.

20 A Also, I should say I do not remember, of course,  
21 the exact trip times of the breakers or the set points or  
22 the time delays or the various currents. I do recall  
23 generally what you have characterized as the main feeder  
24 breaker trip's significantly shorter time than the main  
25 breaker.

1           I do recall the testimony that the distribution  
2 breaker was in a non-seismic area and no credit had been  
3 taken by the Licensee for that breaker. I recall some of  
4 the testimony in the testing scheme with respect that not  
5 only was there no objection to doing the testimony, but also  
6 that it was important enough that it ought to be a  
7 requirement of the technical specifications.

8           I also remember some testimony giving at least an  
9 order of magnitude -- not an order of magnitude, an idea of  
10 the accuracy of the trip devices being approximately 20  
11 percent. I think the actual statement was that they would  
12 not trip unless the current decreased, that the plunger  
13 would continue to move as long as the current remained  
14 within 80 percent of the set point.

15         Q     I believe, Mr. Pollard, the testimony you are  
16 talking about there is -- it relates to the main bus  
17 breaker, not to the --

18         A     It related to any breaker which had this plunger  
19 type of time delay. The clarification -- I had first asked  
20 the question, if the fault current was sufficient to start  
21 the plunger moving, not with respect to any breaker  
22 particularly. It may have been the main feeder --

23         Q     It could be that -- if this is important, we can  
24 get this straight in the record, too.

25         A     I am just going through this so that at least

1 there is some indication in the record to what extent I  
2 recall all of these factors that you have given me to  
3 consider.

4 Q I think it important, if you recall portions of  
5 the record differently than I do, that we get it  
6 straightened out.

7 The 80 percent was talked about by Mr. Torcivia  
8 when I referred him to earlier testimony and asked, did he  
9 wish to expand or correct it. And we made it very clear in  
10 the course of that discussion that what we were talking  
11 about was the main circuit breaker.

12 I am not saying -- I don't know whether similar  
13 tolerances exist. I am saying that that 20 percent  
14 testimony related only to that breaker.

15 A To the main feeder breaker?

16 Q Yes.

17 A I also recall testimony that during a fault on the  
18 pressurizer heaters, the original testimony of the witness  
19 was that with a voltage line to line fault that the voltage  
20 would only drop down to 460 volts and then would immediately  
21 recover. It was only after being off the stand and he came  
22 back and then subsequently revised his estimate down to 390  
23 volts being the peak drop.

24 Q Your statement of the substantive aspect of the  
25 testimony is correct. Your characterization of a witness

1 who said, I can't believe that that is what the transcript  
2 said, is not consistent in my view with -- that he went  
3 home, came back and thought about it later.

4       A       His original testimony was 460 volts. It was  
5 after a break that -- that's a fact, it was after a break  
6 that this chart was produced indicating the voltage drops to  
7 390.

8       Q       That's correct.

9               (Pause.)

10       A       To answer your question, in the past at other  
11 plants there have been instances where, despite an attempt  
12 to have proper breaker coordination, a fault subsequently  
13 resulted in tripping of the equivalent of the main breaker,  
14 that the reliability of devices which operate on fault  
15 current both reliably and accurately, both respect to the  
16 set point and the time delay, is not what I would  
17 characterize as a highly reliable device.

18               Third, if we can believe --

19       Q       Do you have any other -- well, finish your  
20 statement.

21       A       If we can believe the testimony on UCS 3 that it  
22 is not necessary to ever power the pressurizer heaters from  
23 the onsite power supply, then whatever decrease there is in  
24 the reliability of the onsite power supply by doing so is  
25 not worth it.

1 (Pause.)

2 A I think perhaps, if I had heard a proposed test  
3 being described where, prior to restart of Three Mile Island  
4 Unit 1, we were going to load the diesel generators up to  
5 their rating of 3,000 kilowatts, including the pressurizer  
6 heaters, and then subsequently impose on it a voltage line  
7 to line fault and observe what happened, but no equipment  
8 was destroyed, no fires occurred, it might be a basis there  
9 for considering whether or not this arrangement is  
10 adequately safe to permit restart.

11 Beyond that, the only way I can answer it is my  
12 participation on the committee which developed IEEE Standard  
13 384, my participation on the staff in developing Regulatory  
14 Guide 1.75, looking at the other reasons other people on the  
15 staff had given for voting against this particular provision  
16 of the IEEE standard and subsequently touching the  
17 Regulatory Guide.

18 But I agree with the position stated in the  
19 Regulatory Guide that, considering the disadvantages of  
20 decreased reliability of engineered safety features, power  
21 supplies or, in the case of Reg Guide 1.6, the loss of  
22 independence, that it is simply not a wise decision to rely  
23 upon devices actuated by fault current to isolate non-safety  
24 grade equipment from the safety grade power supply.

25 Q Mr. Pollard, you mentioned that there have been a

1 number of plants where, as I understand your testimony, you  
2 say that a circuit breaker failed in its isolation function  
3 to prevent the tripping of the next upstream breaker. Can  
4 you name those plants?

5 A I figured you would ask me that. The only one I  
6 can remember as a specific plant was one at Ocone.

7 Q Do you know, how close were the trip settings  
8 between the breaker that you say failed in its function and  
9 the next breaker, upstream breaker?

10 A No, I can't remember those details.

11 Q You don't remember whether they were rather  
12 closely set?

13 A The best I can remember was, the load that had the  
14 fault in it was a small percentage of the load on the bus,  
15 just as in the case I assume with this arrangement, that the  
16 heaters themselves, 120 KW heaters, are a small percentage  
17 of the total load on bus 1-P or 1-S. And I would assume  
18 that the difference between the trip set points of the  
19 breakers on overcurrent was probably in the same ratio, at  
20 least within an order of magnitude. That's all I can  
21 remember.

22 Q Do you recall whether there was a time delay on  
23 the second upstream breaker and what its relation -- the  
24 relationship of that time delay to the trip time?

25 A I don't recall specifically for that incident.

1 Q Apart from Ocone and other incidents, other plant  
2 incidents where, not surprisingly, you may not be able to  
3 identify the plant you are talking about -- I will withdraw  
4 the question I just started.

5 MS. WEISS: What was that?

6 MR. TROWBRIDGE: I just withdrew the question I  
7 just started. It wasn't a very useful question.

8 CHAIRMAN SMITH: I'm not quite sure which question  
9 --

10 MR. TROWBRIDGE: I started to ask a question. I  
11 am just striking it.

12 (Pause.)

13 BY MR. TROWBRIDGE: (Resuming)

14 Q Mr. Pollard, I am going to turn now to your  
15 rebuttal testimony. On UCS Exhibit 30, showing the before  
16 and after language, before and after amendment 22 language  
17 relating to the -- relating, among other things, to the  
18 circuit breakers --

19 You pointed to the language of the -- under the  
20 title "Safety Evaluation" on the amendment 18 version of the  
21 restart report, and the language under the same heading,  
22 "Safety Evaluation," on amendment 22. I think on commenting  
23 on the change of language you used the word "obfuscation."

24 You do recall, Mr. Pollard, do you not, that Mr.  
25 Torcivia was asked in the record of this proceeding whether

1 the statement contained in the pre-amendment 22 version,  
2 namely the statement, quote, "Taking into account the single  
3 failure criteria, faults on the BOP system will at most  
4 cause a loss of one 480 volt ES system," quote, that Mr.  
5 Torcivia, when asked whether he still stood by that  
6 statement, said, yes, with only one correction. He changed  
7 the word "system" to "bus."

8           You do recall that Mr. Torcivia addressed that?

9           A     I don't recall that one specifically. I do recall  
10 you asking him some questions about the changes. I do not  
11 recall that particular one.

12          Q     The record will speak for itself on that point.

13                   (Pause.)

14          Q     Mr. Pollard, you in your rebuttal testimony, you  
15 advanced some opinions on the reliability of diesel  
16 generators, the relative reliability of a fully loaded or  
17 less than fully loaded diesel generator. I have reviewed  
18 your statement of professional qualifications, both the  
19 statement that accompanied your testimony on UCS 4 and also  
20 the supplemental material which was provided in connection  
21 with UCS Contention 10. And I saw nothing in there which  
22 would suggest that you were qualified to talk or to have  
23 technical opinions on the reliability of diesel generators.

24                   And I wish you would explain on what basis you  
25 feel competent to give a technical opinion?

1           A       The first part deals with my experience in the  
2 naval submarine program, where our emergency power source  
3 also was an emergency diesel generator. I am familiar with  
4 the difficulties we had with that diesel generator and the  
5 types of failures that occurred.

6                    But I think more importantly, or perhaps more  
7 directly relevant, is my experience as a member of the NRC  
8 staff assigned to the electrical instrumentation and control  
9 systems branch where not only did I have direct  
10 responsibility, but also, associated with other individuals  
11 who had similar responsibilities for evaluating  
12 qualification tests of diesel generators, evaluating failure  
13 modes of diesel generators that occurred in operating plants.

14                   I am also familiar with the work that the staff  
15 did for developing a method for conducting qualification  
16 tests and recognize that if you were going to do  
17 qualification testing for a diesel that would be loaded to  
18 3,000 KW, just as an example, that you would not conduct the  
19 testing at 3,000 KW, but that you would conduct it at some  
20 higher rating to make sure, some higher level above what you  
21 knew the diesel generator would actually have to carry  
22 during the plant -- in an accident, to make sure you were  
23 not on the razor's edge of a failure and you would have some  
24 margin in the qualification testing.

25                   That, of course, implies there would be an effect

1 on the reliability by increasing the load.

2 Q What exact -- I understand that your position --  
3 what exact experience in diesel operations led to your  
4 conclusion or put you in a position to have a conclusion  
5 that a diesel is more reliable -- let's see. If I  
6 understood your testimony -- and if this is incorrect,  
7 please correct me.

8 As I understood your testimony, it was that the  
9 TMI diesel, with a rating of 3,000, would be more reliably  
10 operated at 2,000 than it would be at 3,000. Is that in  
11 effect what you said?

12 A I don't think that is the example I gave. The  
13 example I gave was 2600 versus 3,000. I don't know exactly  
14 how to point to some particular experience, because it seems  
15 to me to be almost self-evident that, for example, there  
16 would be types of failures that might not occur at lower  
17 loads that would occur at higher loads.

18 If the cooling water system of a diesel generator  
19 was slightly clogged or not adequately sized, it might be  
20 able to carry a 2600 KW, but if you increased the load on  
21 the diesel generator you have now increased the load on the  
22 cooling system to the point where the diesel will overheat,  
23 where it did not overheat, either the diesel and/or the  
24 generator.

25 There could be problems in the fuel supply, and

1 increasing the load makes further demands on the fuel supply  
2 system.

3 Q What kinds of demands? You mean you run out of  
4 fuel?

5 A You need to pump fuel at a higher rate in order to  
6 carry the higher load, and maybe the system can't pump the  
7 fuel at the higher rate reliably for over a continuous  
8 period of time.

9 MS. WEISS: You can continue to answer that  
10 question.

11 (Pause.)

12 THE WITNESS: I think it is also right down the  
13 line of the types of concerns I have heard the ACRS members  
14 express to the staff that, when you are qualifying --

15 BY MR. TROWBRIDGE: (Resuming)

16 Q Please stick to the question.

17 MS. WEISS: I would like to have the witness  
18 answer the question, and then he can move to strike it if it  
19 is nonresponsive.

20 MR. TROWBRIDGE: I object to his answering the  
21 question --

22 MS. WEISS: We don't know --

23 MR. TROWBRIDGE: He started out by testifying as  
24 to what ACRS members had to say.

25 MS. WEISS: What he has heard.

1 MR. TROWBRIDGE: What in his personal experience  
2 qualified him to -- I asked him for specific examples on  
3 which he could base --

4 MS. WEISS: His personal experience includes what  
5 he has heard ACRS members say.

6 MR. TROWBRIDGE: You may ask him that question.  
7 My question was what examples of actual experience with  
8 diesels led him to his conclusion and qualified him to have  
9 a conclusion.

10 MS. WEISS: I think it is only fair to let him  
11 finish the answer.

12 CHAIRMAN SMITH: Sooner or later, he is going to  
13 be able to give that information. But if Mr. Trowbridge  
14 wishes to ask the information in the context of his direct  
15 experience with diesels, he is allowed to do it.

16 You're going to get a chance to ask the question.

17 MS. WEISS: I understand that. But his direct  
18 experience with diesels involves more than simply  
19 manipulating an engine. It involves being a project manager  
20 and regulating and reviewing diesels. That qualifies as  
21 direct experience of diesels.

22 CHAIRMAN SMITH: All right. But it is going to be  
23 in the record in as good a place, in as good a time as it  
24 will be if Mr. Trowbridge does it his way.

25 MS. WEISS: I just believe, Mr. Chairman, the

1 witness should be able to complete his answer. We have been  
2 very fair in letting witnesses complete answers and not  
3 interrupting them in the middle of sentences.

4 CHAIRMAN SMITH: If it becomes obvious that the  
5 answer is not going to be responsive to the question --

6 MS. WEISS: I don't believe that's obvious until  
7 you let the sentence be completed.

8 CHAIRMAN SMITH: Mr. Trowbridge, I guess your  
9 question now is -- let's back up a little bit. Of course,  
10 you don't run diesels and you didn't run diesels when you  
11 were on the staff.

12 Mr. Pollard, I'm looking at you. You can assume  
13 that the question is directed to you.

14 THE WITNESS: I know. I was just thinking about  
15 the question before I answered it. I knew you were talking  
16 to me.

17 MR. TROWBRIDGE: Mr. Chairman, let's get on with  
18 it. Let Mr. Pollard answer the question, but let it be  
19 clear on the record that if he answers on the basis of ACRS  
20 he is basing it on ACRS members' statements and not on his  
21 personal experience or personal review of operating  
22 experience.

23 I certainly would not exclude his project manager  
24 function, in which he reviewed reports and records and  
25 performance of a Licensee's diesels.

1 THE WITNESS: I consider -- and it is strange,  
2 considering other testimony that has gone on, to exclude  
3 from your own personal professional experience the  
4 discussions you have had with your colleagues --

5 CHAIRMAN SMITH: Wait a minute. This discussion  
6 has gone on long enough. It is going to be done my way.  
7 You ask your question again. You define exactly what you  
8 want included in the answer.

9 And then you answer within the range of the  
10 question.

11 And if you don't like it, then when it's your turn  
12 you can get the rest of the information.

13 Now, begin anew.

14 MR. TROWBRIDGE: I'm sorry, Mr. Chairman.

15 (Pause.)

16 MR. TROWBRIDGE: I thought I had said that Mr.  
17 Pollard could answer the question, and instead of that --

18 CHAIRMAN SMITH: It's not working. He wants to go  
19 off.

20 MR. TROWBRIDGE: Let's start over again.

21 BY MR. TROWBRIDGE: (Resuming)

22 Q Mr. Pollard, I want to know what in your personal  
23 experience, which would obviously include the manipulation  
24 of a diesel generator or your personal associations, but  
25 which would also include review in your official capacity at

1 the NRC of any operating reactors history reports of diesel  
2 generator operation, what in your experience from the actual  
3 operation of diesels would support your conclusion that  
4 diesels are more reliable at something under their rated  
5 power than they are at rated power?

6 A As a member of the staff, I also participated in  
7 the discussions which led to development of a staff position  
8 on how you would go about qualifying diesel generators to  
9 determine their reliability.

10 Q Mr. Pollard, that may be generally -- that is not  
11 an answer to my question.

12 A I'm sorry, I thought it was.

13 I also have personally evaluated the tests that  
14 were performed by applicants in an attempt to qualify their  
15 diesel generators, to prove them reliable devices.

16 Q And what did you learn from those tests?

17 A That the loading can have an effect on the failure  
18 rate of the diesels. It is also almost self-evident from  
19 the way diesel generators are rated --

20 Q Stay with the --

21 A This is part of my personal experience of looking  
22 at rating of diesel generators. It is generally the case --  
23 in fact, I know of no exception --

24 Q Mr. Pollard, my question was limited. In fact, I  
25 was asking to the operating experience with diesels, your

1 personal knowledge from your association with diesels or  
2 your personal knowledge from your review of diesel reports.  
3 And I will include test reports.

4           What, in the operating experience of diesels that  
5 you know about through your personal experience supports the  
6 conclusion that diesels are less reliable --

7           CHAIRMAN SMITH: Does that include test data, too?

8           MR. TROWBRIDGE: That does include test data.

9           THE WITNESS: I have nothing further to add to the  
10 question.

11           BY MR. TROWBRIDGE: (Resuming)

12           Q     My next question, then, is what was the test data  
13 that you just referred to that made you conclude that  
14 diesels were less reliable at rated power than they would be  
15 at something less than rated power?

16           A     That there were failures of diesel generators of  
17 the type that I have already outlined, which occurred only  
18 at higher loading levels, and my evaluation of those  
19 failures --

20           Q     Higher than? Higher than rated?

21           A     Higher than a lower level. All I was trying to  
22 say is, in my evaluation of the types of failures that have  
23 occurred at diesel generators, from the nature of the cause  
24 of the failure, it was clear to me that the failure would  
25 not have occurred had the diesel generator load been less.

1 Q Were these test data where the diesel had been  
2 operated at a higher level than some other lower level? Was  
3 the higher level that you refer to above the rating of the  
4 diesel? And then I added, do you know the answer to that  
5 question?

6 A I don't recall specifically. But just from  
7 general knowledge, I would assume that it was not above the  
8 rating of the diesel generator because, as I pointed out, we  
9 try and keep the loads below the rating and then test at the  
10 rating.

11 CHAIRMAN SMITH: Off the record.

12 (Discussion off the record.)

13 BY MR. TROWBRIDGE: (Resuming)

14 Q Mr. Pollard, how do you reconcile your last  
15 statement, that probably at less than -- your last statement  
16 referred to test data, as did my question; is that correct?

17 A Either test data or failures that had occurred at  
18 these diesel generators, failures of diesel generators.

19 (Pause.)

20 Q Let's break this down, then. With respect to test  
21 data, did you not testify a few minutes ago that it would be  
22 the normal practice to test a diesel at higher than its  
23 rating?

24 A That may be what I said. The normal way is to  
25 test at a level higher than you know the diesel is going to

1 be used at.

2 Q And at the time of such testing, presumably it's  
3 in the construction period. Would that not normally be  
4 higher than the rating?

5 A I can't answer that question as a general matter.  
6 I don't know.

7 Q So your answer is, as to the test data you relied  
8 on, you do not know whether the failures occurred at in  
9 excess of the rated capacity of the diesel or not?

10 A That was the first part of my answer, that is  
11 correct.

12 Q Can you elaborate on your experience within your  
13 own knowledge of operating diesels as to the statement I  
14 believe you to have made that failure rates were higher at  
15 or closer to as you approached rated capacity than at lower  
16 rates?

17 A The question is, can I elaborate on my previous  
18 answer?

19 Q Can you give me examples? Can you identify the  
20 diesels you are talking about?

21 A No.

22 Q Let's turn to another subject. Let's turn back to  
23 your prepared testimony, more particularly the scenario that  
24 you describe on, beginning on page 4-3, more or less in the  
25 middle, ending on page 4-4, also more or less in the middle.

1           This scenario involved, did it not, a loss of  
2 offsite power, but no accident or break?

3           A     The scenario described in steps one through five  
4 on pages 4-3 to 4-4 didn't specifically indicate whether it  
5 did or didn't involve an accident such as a LOCA.

6           Q     Let me pause a moment.

7                     (Pause.)

8           Q     Mr. Pollard, I won't quarrel with you as to  
9 whether that is a reasonable reading of the scenario. I  
10 will simply ask you to assume a scenario such as you have  
11 described on those two pages, not involving a break, but  
12 otherwise the same as the scenario that you have got there.

13                     Under that scenario, with the reconnection of  
14 pressurizer heaters or the connection of pressurizer  
15 heaters, the transfer of pressurizer heaters to the diesel  
16 load, is it not correct that there would still remain an  
17 accident signal trip, any one of the several accident  
18 signals already described in the proceeding which, if the  
19 accident signal occurred, would trip the breaker?

20           A     That's correct.

21           Q     So that under the scenario of the offsite loss of  
22 power there would continue to remain an accident signal, in  
23 addition to the fault signals, undervoltage signals?

24           A     That's correct.

25           Q     Which would trip the main feeder breaker?

1           A     That's correct, it would trip the main feeder  
2 breaker, but not from the same cause. That is, the fault,  
3 if it then occurred in this scenario, if a fault occurred on  
4 the heater, the fault would not cause an accident signal.

5           Q     I understand that.

6                     (Counsel for Licensee conferring.)

7           MR. TROWBRIDGE: No further questions, Mr.  
8 Chairman.

9           CHAIRMAN SMITH: Mr. Adler?

10                               CROSS-EXAMINATION

11                               BY MR. ROBERT ADLER:

12           Q     Mr. Pollard, I would like to ask you about the use  
13 of the high impedance transformer type of isolation device  
14 that both you and Mr. Torcivia have testified to. Could you  
15 describe in some greater detail the mechanics of how this  
16 type of isolation device works?

17           A     I don't know how I have testified to that effect.  
18 I was simply repeating Mr. Torcivia's testimony.

19                     I guess I can't, without knowing what device we're  
20 talking about, no.

21           Q     You used that as one of the three examples, in  
22 response to Mr. Trowbridge's question, as to what type of  
23 device would meet the requirements of Reg Guide 1.75. You  
24 listed three. You listed upgrading the pressurizer heaters  
25 to fully safety grade.

1 MR. TROWBRIDGE: Dr. Jordan.

2 BY MR. ROBERT ADLER: (Resuming)

3 Q The second was the use of a separate onsite power  
4 supply. And the third was the high impedance transformer  
5 device.

6 What would be included in that third example?

7 A When I tried to answer Dr. Jordan's question, I  
8 was trying to give examples of how there may be ways to  
9 power the pressurizer heaters more reliably, and if there  
10 were a device that met the definition of isolation device as  
11 specified in Reg Guide 1.75 that would be one way.

12 My reference to the impedance transformer -- I  
13 guess at that point I was drawing upon the testimony of Mr.  
14 Torcivia as just an example. Now, from my own experience,  
15 there have been devices accepted as isolation devices,  
16 although I think from my own experience in reviewing plants  
17 all of those have been on rather low-power circuits and have  
18 consisted of devices such as isolation amplifiers, which  
19 have a characteristic such as, no matter what you do to the  
20 output either in terms of shorting it together, opening it,  
21 applying a high voltage to the output, you see basically no  
22 effect at the input to the amplifier. That is --

23 Q Can you slow down a little bit?

24 A I'm sorry.

25 But you see no reflect of the adverse event,

1 whether it be a fault or the impression of a higher voltage,  
2 reflected back through the isolation amplifier to its input,  
3 which presumably is the safe side of the isolation amplifier.

4           In my own personal experience, I do not know of a  
5 device that has been used in the past on a large power  
6 circuit which the staff has accepted as an isolation device.

7           Q     You don't in fact know whether the transformer  
8 type of device would be acceptable?

9           A     No. That's what I tried to clarify when I gave  
10 that example to Dr. Jordan. I was drawing upon Mr.  
11 Torcivia's testimony that there was such a device.

12          Q     I believe -- correct me if I am wrong. Let's say  
13 -- let's assume that such a device would be acceptable. If  
14 this device sensed a fault on the pressurizer heater side of  
15 the isolation device, your testimony is that this might  
16 reduce the amount of current that reaches the emergency bus;  
17 is that correct?

18          A     Yes. It might be a device which, for example, if  
19 there is a large amount of current, such as would occur  
20 during a fault on the secondary side of the transformer,  
21 this would not reflect an increase in the current on the  
22 primary side above the normal value or at least nominally  
23 above the normal value.

24          Q     Is there a possibility that this type of a device  
25 might mask a fault on the pressurizer heater side of the

1 current, of the circuit, thereby leading to some adverse  
2 consequences?

3 A If it meets the definition of an isolation device,  
4 whatever effects or consequences it had would not be on the  
5 emergency power supply. If that's what you mean by masking,  
6 yes.

7 Q Rather than actually breaking the circuit, as I  
8 understand the device, it would simply reduce the current  
9 that is transferred from the pressurizer heater to the  
10 emergency bus?

11 A It would prevent the current from exceeding  
12 basically the normal value of current being fed to the  
13 heaters when they don't have a fault, or at least prevent it  
14 from exceeding it by some very small percentage.

15 Q Wouldn't that result in energy supply still being  
16 supplied to the pressurizer heater, whereby a circuit  
17 breaker would remove the pressurizer heater from all sources  
18 of power?

19 A Yes.

20 Q Might not that, given a fault in the pressurizer  
21 heater, might that not create adverse consequences in terms  
22 of the pressurizer heater?

23 A Certainly I can imagine situations where, if you  
24 had a fault, the current going through a fault rather than  
25 the current going through the heater itself, you might have

1 consequences such as a fire.

2 Q Such as a fire?

3 A Yes.

4 Q So the consequences might be more severe than just  
5 losing the pressurizer heater?

6 A Not if the plant is designed correctly, because  
7 the plant is supposed to be designed such that failures in  
8 non-safety equipment have no effect, or at least not an  
9 unacceptable effect, on the safety equipment.

10 Q Is it your testimony that a circuit breaker type  
11 of device is not to be used as an isolation device for the  
12 purposes of meeting Reg Guide 1.75?

13 A No, that is not my testimony. A circuit breaker  
14 can be used as an acceptable isolation device as long as the  
15 circuit breaker is kept open by some signal other than that  
16 derived from fault current or its effects.

17 Q Do you know of any types of circuit breakers that  
18 would meet that requirement?

19 A This circuit breaker would if the plant planned  
20 never to reclose it after the loss of offsite power or after  
21 the accident signal. In other words, if once the circuit  
22 breaker was tripped open, the main feeder breaker, it was  
23 never going to be reclosed again, then it would meet Reg  
24 Guide 1.75.

25 It is only be reclosing it and placing the design

1 or the arrangement in a position where now there is no  
2 signal to open the circuit breaker in the event of a fault,  
3 other than those signals derived from fault current or its  
4 effects.

5 Q So if Licensee did not ever use emergency  
6 procedure 1202-29, you would testify that the reg guide had  
7 been complied with?

8 A I don't know if I could testify that it had been  
9 complied with. I think the question would be more moot than  
10 one of compliance, because the heaters are not even then  
11 ever connected to the safety system power supply, in which  
12 case I don't know -- if they are not connected, the question  
13 never comes up, is there an acceptable isolation device. An  
14 acceptable isolation device is the fact that they are never  
15 connected.

16 Q The question is this: Until the pressurizer  
17 heaters are manually reconnected to the emergency power  
18 supply, there is nothing wrong with the current design?

19 A That's correct.

20 MR. ROBERT ADLER: I have no more questions.

21 CHAIRMAN SMITH: Mr. Pollard, could you explain  
22 that concept to me? As I understand it, you said a circuit  
23 breaker would be all right to function in the event of a  
24 fault, providing it does not -- function in the event of  
25 what?

1 THE WITNESS: He asked me, was there ever a  
2 situation in which a circuit breaker could be an acceptable  
3 isolation device, and I said yes.

4 CHAIRMAN SMITH: Isolation for what?

5 THE WITNESS: To isolate safety equipment from  
6 non-safety equipment.

7 CHAIRMAN SMITH: For what purpose?

8 THE WITNESS: For the purpose of not degrading the  
9 safety equipment.

10 CHAIRMAN SMITH: In what event?

11 THE WITNESS: In the event of loss of offsite  
12 power that would trip the circuit breaker, which would then  
13 be open. And whatever happened downstream of that circuit  
14 breaker from that point on, as long as it remained open,  
15 would have no -- it would prevent all unacceptable  
16 influences on the safety side and therefore it is an  
17 acceptable isolation device.

18 The only time it becomes an unacceptable isolation  
19 device is when it is used, when it is tripped open by a  
20 signal derived from the fault current or its effects. If  
21 you trip it open on an accident signal, fine. If you trip  
22 it open on undervoltage for some other reason other than a  
23 fault, such as loss of offsite power, that's fine.

24 CHAIRMAN SMITH: The question I am trying to  
25 understand is, do you want the device to be isolated in the

1 event of a fault?

2 THE WITNESS: Yes, you would like to have it  
3 isolated in the event of a fault. And now I have to back  
4 up, because your question leads me to conclude that I  
5 haven't made myself clear.

6 CHAIRMAN SMITH: Perhaps you have to everyone, but  
7 not to me.

8 DR. JORDAN: No. I have the problem, too.

9 THE WITNESS: Let me slow down, then.

10 Let's take two hypothetical loads that are safety  
11 grade. Let's say we had a plant that had only two high  
12 pressure injection pumps and they are connected to the  
13 opposite diesel buses. If there is a fault in the pump  
14 motor, it is desirable to isolate that fault from the bus so  
15 that you can continue to operate the rest of the equipment  
16 from that bus.

17 But it is not necessary for the safety of the  
18 public or to meet NRC's regulations, because the postulated  
19 fault is in fact the single failure that the plant has to be  
20 designed for. It is a safety grade piece of equipment and  
21 therefore we must, in following the NRC's practice, assume  
22 that the other diesel generator has started and that the  
23 other safety injection pump is operable.

24 Now, to take a different case where we have, in  
25 addition now to our two high pressure injection pumps, we

1 have a non-safety load so connected to one of the buses.  
2 Now, if I again take my single failure of a fault in the  
3 high pressure injection pump and that results in loss of one  
4 diesel generator bus, it is permissible to also postulate a  
5 fault in the pressurizer heaters or the other non-safety  
6 grade equipment on the opposite bus, just simply because of  
7 the fact that it is non-safety grade.

8           And that fault results in the loss of the second  
9 ES bus.

10           CHAIRMAN SMITH: You don't want that.

11           THE WITNESS: You definitely don't want loss of  
12 both ES buses, or even a portion of the ES power supply.

13           CHAIRMAN SMITH: You want to isolate the bus so  
14 the fault doesn't take it out.

15           THE WITNESS: That's right.

16           CHAIRMAN SMITH: You want to isolate the bus from  
17 the effects of a fault.

18           THE WITNESS: Well, yes. Basically how you go  
19 about doing that is attempting to isolate the fault.

20           CHAIRMAN SMITH: This is where I think I don't  
21 understand. In engineering sense it may make perfectly good  
22 sense, but in English language it is a contradiction of  
23 terms.

24           If you can't isolate from the effects of a fault --

25           THE WITNESS: Then you shouldn't have that piece

1 of non-safety equipment connected to the safety bus.

2 (Pause.)

3 MR. ROBERT ADLER: May I ask one follow-up to  
4 that?

5 BY MR. ROBERT ADLER: (Resuming)

6 Q Mr. Pollard, is the implication of that that you  
7 can never connect a piece of non-safety equipment to the  
8 safety power bus? And if you can, what kind of isolation  
9 device would you use?

10 A As the staff testimony says, there is no general  
11 prohibition against connecting any non-safety or non-Class  
12 1E load to a 1E bus. You may do this. It is done all the  
13 time.

14 A good example, I think, is emergency backup lube  
15 oil pumps for turbines. They are very frequently powered  
16 from either AC or DC safety buses. In order to protect the  
17 financial investment in the turbine, they want to have a  
18 reliable power source.

19 But when the accident signal comes along or there  
20 is a loss of offsite power, all of the non-safety equipment  
21 is isolate by either undervoltage or the accident signal  
22 itself. And therefore, since the breaker is now open, you  
23 need not be concerned about a fault in that circuit having  
24 an effect on the safety power supply, because its breaker  
25 has already been opened by some other signal other than the

1 fault current.

2 Q The implication is you can never connect a  
3 non-safety grade piece of equipment to the Class 1E bus  
4 after an accident signal?

5 A By "after," now you are going to begin talking  
6 about how long after.

7 Q During the accident circumstances?

8 A Yes, and of course we have already gone through  
9 one contention about how difficult it is to determine when  
10 the accident is over. But yes, that is correct.

11 DR. JORDAN: I urge you to stay with it a bit. I  
12 think we are all having perhaps the same problem.

13 Do you see any way of accomplishing the function  
14 that is being mandated here, namely connecting pressurizer  
15 heaters to the safety grade buses in the event of a loss of  
16 offsite power, without making those heaters safety grade?

17 THE WITNESS: Not unless they can find a device  
18 that would satisfy the definition of --

19 DR. JORDAN: Such as an isolation device.

20 THE WITNESS: Right. There is no way.

21 CHAIRMAN SMITH: One could conceivably make up an  
22 isolation device that would insulate against a fault, that  
23 would not act upon the effects of a fault.

24 THE WITNESS: The only example I can give from my  
25 experience I have already given to Mr. Adler.

1 CHAIRMAN SMITH: Do it again.

2 THE WITNESS: There are things -- like I said,  
3 from my own experience, this has been circuits which are  
4 drawing relatively low power, where you can use an isolation  
5 amplifier which, just because of its physical  
6 characteristics, its design, you can put a fault on the  
7 output of it, you can impress the high voltage on the output  
8 of it, which is the non-safety side of it, and you will see  
9 no effect.

10 CHAIRMAN SMITH: It would ignore a fault?

11 THE WITNESS: Yes.

12 DR. JORDAN: In considering a transformer in which  
13 the magnetic circuit is running very close to saturation --

14 THE WITNESS: That is what I was going to give as  
15 an example. But he asked me from my own experience and  
16 that's why I had to draw on Mr. Torcivia's. You might count  
17 that as a high impedance device where you start pulling a  
18 fault current, which increases the magnetic field in the  
19 secondary, which saturates the transformer and prevents any  
20 further coupling of energy beyond the normal load from the  
21 primary to the secondary.

22 DR. JORDAN: So we have at least theoretically  
23 here a device that would meet the requirements, and you  
24 could do it this way?

25 THE WITNESS: Yes.

1 DR. JORDAN: I think I understand now.

2 THE WITNESS: Dr. Jordan, it is very difficult for  
3 me all the time to separate the kinds of concerns that are  
4 in UCS 3 from the kinds of concerns that we are having in  
5 UCS 4. If we accept that UCS is wrong on 3 --

6 DR. JORDAN: We have to assume that for the day,  
7 for today.

8 THE WITNESS: In my view, if you ever need these  
9 heaters to protect the public, then they should not be put  
10 on the onsite power supply and jeopardize your ability to  
11 protect the public. If your goal is simply that they are  
12 nice to have, that it would be nice to have an onsite power  
13 supply for them because this is the normal way that the  
14 operators are used to operating the plant, it sounds to me  
15 from an engineering point of view that what you would be  
16 better off doing is getting a new, brand new power supply  
17 for 127 KW worth of heaters.

18 DR. JORDAN: But now then, let's go back to the  
19 task force for the short-term lessons learned. Do they say  
20 at any time that the pressurizer heaters must be safety  
21 grade?

22 THE WITNESS: No, I don't believe so.

23 DR. JORDAN: I don't think they do, either.

24 Wasn't the task force saying that, we believe it  
25 would improve the reliability? In fact, I think the words

1 are somewhere there that -- if the pressurizer heaters were  
2 connected to the emergency buses and to the diesels,  
3 because it would thereby challenge some of the other safety  
4 systems less often.

5           They don't say that the plant is in jeopardy of  
6 the pressurizer heaters fail to work. But they have reached  
7 a situation where, if by connecting them there, one can  
8 wonder whether they have not perhaps made the situation  
9 worse. That is a possibility, of course, because if you  
10 have really jeopardized the safety buses -- and I think I  
11 have heard the argument made, not by this Licensee but by  
12 others, that the net effect of this is negative.

13           I don't believe that the task force had in mind  
14 that the pressurizer heaters should be safety grade.

15           THE WITNESS: They nowhere said that, that's  
16 correct. And I would guess the best way I can paraphrase  
17 this is basically what UCS is saying is, the recommendations  
18 of the task force are necessary but not sufficient, both  
19 with respect to UCS 3 and 4.

20           DR. JORDAN: Now then, let's assume for the moment  
21 that one does improve the reliability, the frequency of  
22 challenges to safety equipment, by making this connection to  
23 the diesels. Then one certainly needs to make sure that  
24 that connection will not completely knock out the diesels in  
25 the event of a loss of power. That now becomes a matter of

1 prime importance.

2           THE WITNESS: I wouldn't say knock out the  
3 diesels; knock out any portion of the engineered safety  
4 feature power supply. The reason I make that distinction,  
5 Dr. Jordan, is losing the diesel, of course, is not  
6 desirable. But keeping the diesel and losing power to, for  
7 example, a suction valve for a pump, by losing only the 480  
8 volt bus you might still be able to run the pump. But if  
9 you have lost the power supply so that you can open the  
10 suction valve for the pump, I don't know if you are that  
11 much better off than if you had lost the whole diesel.

12           DR. JORDAN: We certainly do not want to lose both  
13 diesels, because then we have the blackout situation. We  
14 have not gone into that. There is -- that is another  
15 unresolved safety issue, of course, which we are not trying  
16 to litigate today.

17           But it is important that the connection be made in  
18 such a way that the diesels will not be endangered, and I  
19 think that is your contention, essentially. I am in a sense  
20 paraphrasing it.

21           It is important that, if those non-safety grade  
22 pressurizer heaters are to be connected to the diesels --  
23 and as a matter of fact, whether they are safety grade or  
24 not, I would say that it is almost equally important that  
25 their connection to the diesels not reduce the reliability

1 of those diesels for supplying the emergency safety  
2 features. Wouldn't you agree with that or am I going astray  
3 somewhere?

4 THE WITNESS: Yes, I agree with everything you  
5 have said. The only thing I am trying to make sure that I  
6 clarify for you is, I think that the concern against losing  
7 the diesel is, of course, valid. I just want to point out  
8 that, for example, on the Licensee's testimony, Figure 1 --  
9 perhaps I will just give you an example -- is a fault in the  
10 pressurizer heaters, resulted in loss of bus 1-P but not  
11 1-D. That would also be of concern.

12 In other words, I am saying that you could result  
13 in some loss of some portion of the ES power supply without  
14 resulting in loss of the diesel, and I don't think that that  
15 necessarily would be a safe situation either.

16 DR. JORDAN: 1-D is the 4160 volt supply, and I --

17 THE WITNESS: That is an ES bus.

18 DR. JORDAN: But what does it supply? It doesn't  
19 say on this diagram.

20 THE WITNESS: No, it doesn't say on this diagram.  
21 There are engineered safety feature loads besides this one  
22 transformer supplying bus 1-P.

23 DR. JORDAN: Would you conclude from this diagram  
24 that engineered safety bus 1-P, which shows as being  
25 connected to other engineered safety circuits, is the bus

1 which operates all of the engineered safety circuits? You  
2 would not?

3 THE WITNESS: No.

4 DR. JORDAN: But there are some engineered safety  
5 circuits, and they could be important engineered safety  
6 circuits.

7 THE WITNESS: That's the point I'm trying to  
8 make. When you were talking with me, you kept referring to  
9 loss of the diesel. It is a very minor point. I'm trying  
10 to make sure that I state my views.

11 I think in evaluating the effect of connecting the  
12 pressurizer heaters to the onsite power supply, it is of  
13 course a valid concern to make sure that you don't lose the  
14 entire diesel generator. But I also wanted to add, it is  
15 also a valid concern to make sure that you don't lose even  
16 bus 1-P.

17 DR. JORDAN: Good, because that might be a very  
18 critical bus at the time.

19 THE WITNESS: Yes, sir.

20 DR. JORDAN: So I think actually there is not any  
21 disagreement between you and me or even the Licensee in a  
22 certain sense now, and I will try to restate that sense,  
23 namely, that connection - when we lose offsite power and  
24 the diesels are connected to the pressurizer heaters, that  
25 that connection must be done in such a way as to not

1 endanger the buses 1-P or 1-S.

2           And so I believe that the main difference between  
3 you and the Licensee is that you do not believe that the way  
4 in which those diesels are connected meets the requirements  
5 of Reg Guide 1.75.

6           THE WITNESS: Did you mean to say the way in which  
7 the heaters are connected?

8           DR. JORDAN: I'm sorry, yes.

9           THE WITNESS: That's correct.

10          DR. JORDAN: So I believe that is the major  
11 difference.

12          THE WITNESS: That is my understanding of the  
13 difference.

14          MR. TROWBRIDGE: Dr. Jordan, may I make a comment,  
15 since you included the Licensee?

16          DR. JORDAN: I would like to hear a comment from  
17 the Licensee.

18          MR. TROWBRIDGE: I think you correctly described  
19 the major difference between Licensee and UCS as to how good  
20 our isolation device is. We also made the point, however,  
21 which I think is not clear here, if the isolation device in  
22 the end failed to prevent the tripping at the main bus  
23 breaker, it is a very quick matter to reinstate that bus  
24 breaker from a switch handle turned in the control room.

25                   (Pause.)

1 DR. JORDAN: If that bus breaker fails to open,  
2 then there is nothing you can do from the control room.

3 MR. TROWBRIDGE: If the main bus breaker --

4 DR. JORDAN: I was talking now about the main  
5 feeder breaker.

6 MR. TROWBRIDGE: I was postulating that somehow  
7 the main feeder breaker, which is not satisfactory to UCS as  
8 an isolation device, as it is to us, if it failed that the  
9 result is a tripping of the main bus breaker and a temporary  
10 loss of power to that main bus. And the testimony of Mr.  
11 Torcivia was, given the hypothetical that the main bus did  
12 trip, what would it take to put it back on line; and his  
13 answer was, it is a simple operation performed from the  
14 control room by turning a switch handle.

15 DR. JORDAN: I'm sorry Mr. Torcivia isn't here  
16 right at the moment.

17 MR. TROWBRIDGE: I kept him around.

18 DR. JORDAN: I see him here. I guess then, let me  
19 ask, Mr. Torcivia, and if you would state -- you have a  
20 microphone, as a matter of fact.

21 Let's assume, Mr. Torcivia, that there is a fault  
22 on the heaters. Do you have your diagram in front of you?

23 (Pause.)

24 Let's assume there is a fault at point A in the  
25 heaters, and the main feeder breaker, just above that little

1 square bracket, A in the square, fails to close. That is  
2 breaker 21. And then assume now that the main -- assume  
3 first that the main breaker now does operate.

4           Then we have lost power on bus 1-P red; isn't that  
5 correct?

6           WITNESS TORCIVIA: That's correct.

7           DR. JORDAN: What can the operator do to restore  
8 power on bus 1-P?

9           WITNESS TORCIVIA: All he will have to do is close  
10 the main breaker in the control room.

11          DR. JORDAN: To do what?

12          WITNESS TORCIVIA: With a control switch, close  
13 the main breaker.

14          DR. JORDAN: It will trip right open again.

15          WITNESS TORCIVIA: No. I was following that  
16 through. The 27 device, which is the undervoltage device,  
17 now is completely void.

18          DR. JORDAN: You are saying that the undervoltage  
19 device at that time will have tripped the other, the main  
20 feeder breaker, and it will not reclose?

21          WITNESS TORCIVIA: That's correct.

22          MR. TROWBRIDGE: You understood that answer very  
23 well, but I'm afraid the reporter didn't get it and it won't  
24 show in the record. I wonder if we could have Mr. Torcivia  
25 repeat his statement.

1           Why wouldn't it immediately trip again?

2           WITNESS TORCIVIA: I'm sorry, Mr. Trowbridge.

3           MR. TROWBRIDGE: I don't think the reporter caught  
4 your answer to Dr. Jordan's essentially question, that if  
5 you closed the main bus breaker wouldn't it immediately trip  
6 again. And you explained why that would not occur and I  
7 don't think that got into the record.

8           WITNESS TORCIVIA: It would not immediately trip  
9 again because, simultaneous to the opening of the main  
10 breaker, the voltage on the bus 1-P would fall down to zero  
11 or would fall below the voltage setting of the 27 relay,  
12 which is an undervoltage device, and that in turn would trip  
13 out the main feeder breaker and therefore clear the fault.

14          DR. JORDAN: Very well. I understand now Mr.  
15 Pollard's answer, who did understand that all along, I am  
16 sure.

17          (Pause.)

18          DR. JORDAN: I believe, in summary, Mr. Pollard's  
19 view is that you have not met the requirements of Reg Guide  
20 1.75, and he has stated his reasons for so saying. And you  
21 in turn, I asked you the question, have you read Reg Guide  
22 1.75, and the answer was yes and you gave your reasons. And  
23 so I believe that the record is clear at the moment.

24          (Board conferring.)

25          CHAIRMAN SMITH: We had interrupted Mr. Adler's

1 examination with this digression.

2 MR. ROBERT ADLER: I had completed.

3 CHAIRMAN SMITH: You had completed.

4 Mr. Cutchin?

5 MR. CUTCHIN: I have no questions of Mr. Pollard.

6 (Board conferring.)

7 CHAIRMAN SMITH: Ms. Weiss?

8 (Pause.)

9 MR. TROWBRIDGE: There is a need for a short  
10 break, a five-minute break.

11 CHAIRMAN SMITH: All right.

12 (Recess.)

13 CHAIRMAN SMITH: Back on the record.

14 Ms. Weiss?

15 REDIRECT EXAMINATION

16 BY MS. WEISS:

17 Q Mr. Pollard, you were asked by Mr. Trowbridge if  
18 you would refer to the standard language in the Regulatory  
19 Guides to the effect that they provide guidance to  
20 applicants and are not mandatory. In particular, I would  
21 like to address your attention to the language at the end of  
22 that paragraph that states, quote: "Methods and solutions  
23 different from those set out in the guides will be  
24 acceptable if they provide a basis for the findings  
25 requisite to the issuance or continuance of a permit or

1 license by the Commission." Quote.

2 In the case of this Regulatory Guide, that is Reg  
3 Guide 1.75, what regulations is it implementing?

4 A Regulatory Guide 1.75 describes a method  
5 acceptable to the NRC staff of complying with IEEE Standard  
6 279-1971, which is incorporated in 10 CFR 50.55a, codes and  
7 standards; and also an acceptable method of complying with  
8 general design criteria 3, 17 and 21 of Appendix A to 10 CFR  
9 Part 50.

10 Q In your opinion, does the TMI-1 design for  
11 connection of the pressurizer heaters to emergency power  
12 supplies meet those regulations?

13 A No, it does not.

14 Q And does it provide an acceptable basis for the  
15 findings requisite to the issuance or continuance of a  
16 permit or license by the Commission?

17 A No, not in my opinion.

18 (Pause.)

19 Q As a general matter, there were comments about  
20 your knowledge of diesels and some limitations of various of  
21 your answers. I would like you to describe for us, please,  
22 where your knowledge of diesels comes from and what is its  
23 nature?

24 A It comes from primarily my experience as a member  
25 of the staff assigned as a reactor engineer to the

1 electrical instrumentation and control systems branch, from  
2 which I think I was not transferred until the end of 1974.  
3 In my job in that branch, I was responsible for evaluating  
4 proposed designs for compliance with Regulatory Guide 1.9  
5 and the regulations it references with respect to the  
6 qualification of diesel generators.

7           As a member of that branch, I participated in  
8 discussions that led to the development of a staff position  
9 as to what is an acceptable way of qualifying diesel  
10 generators with respect to their reliability. I was  
11 responsible for evaluating the results of such test programs  
12 to determine whether the diesel generators were adequately  
13 qualified with respect to their capacity and reliability.

14           I also had occasion, in my work in that branch, to  
15 evaluate diesel generator failures that had actually  
16 occurred. It was on the basis of this experience, both of  
17 myself and associating with other colleagues in that branch,  
18 that I reached the conclusion that diesel generator  
19 reliability is affected by the amount of load they have to  
20 carry.

21           I think, as I indicated earlier, that it is  
22 somewhat self-evident. And I think another example is the  
23 way diesel generators are rated. They are rated with  
24 continuous 2,000 hour and short-term ratings, sometimes half  
25 an hour. And in general, it is always the case that the

1 higher loading can be sustained only for a shorter time.

2 Q Mr. Torcivia just described the manner in which  
3 power to an emergency bus can be restored in the control  
4 room in the event of a loss of such a bus due to a fault in  
5 the pressurizer heaters. Do you have a comment on that and  
6 does it change your opinion in any way? Please elaborate?

7 A It does not at all change my opinion of the TMI-1  
8 design, because essentially Mr. Torcivia's testimony that it  
9 is a simple matter, you have to walk over and turn a switch,  
10 that may be an accurate description of the hardware  
11 manipulation that is required. It does not mean that the  
12 plant is adequately safe.

13 In order to support a finding that, because it is  
14 simple to reclose the main breaker, that the plant should be  
15 allowed to restart, in my opinion you would have to go and  
16 first determine what else is going on in the control room at  
17 the time: How likely is it that the operators are going to  
18 notice this immediately? How long before they are going to  
19 be able to recognize it and correct the situation?

20 You would then, after having established the time  
21 at which the bus may be dead and determined its effects on  
22 the safety systems in the plant, go back and redo these, for  
23 example, the ECCS calculations, for a spectrum of break  
24 sizes to be sure that if you interrupted the operation of  
25 safety systems for that period of time you could still meet

1 the appropriate regulations for limits on core damage.

2           Furthermore, his testimony implies that if the  
3 main breaker tripped he would walk over and reclose it. If  
4 the reason the main breaker had tripped was a fault on the  
5 bus, rather than in the pressurizer heaters, I don't think  
6 that that is the appropriate action to take. You first have  
7 to determine, where was the fault that caused the main  
8 breaker to trip, and you can't simply assume that it was in  
9 the pressurizer heaters and that the main feeder breaker had  
10 failed to trip.

11           Also, I think it is in general a violation of the  
12 Commission's policy of defense in depth. You don't design a  
13 plant such that if you had a failure you are going to lose a  
14 safety power supply on the grounds that it is simple to  
15 restore it. Nor do you design plants without adequate  
16 physical separations and fire protection, on the grounds  
17 that it might be easy to put a fire out.

18           I just don't think that is an appropriate way to  
19 safeguard the health and safety of the public.

20           Q     Do the safety analyses for the plant assume the  
21 continuous operation of the emergency safeguards systems?

22           A     Based upon the experience I have in working on the  
23 staff, as well as listening to the testimony in this  
24 proceeding, I think the answer is that the analyses that  
25 have been done to demonstrate the adequacy of the safety

1 systems assume that once the safety systems have been  
2 started they operate continuously after that point.

3           They have not considered the effect of  
4 interruption of ECCS or any other safety system caused by a  
5 fault in the pressurizer heaters.

6           Q     There has been some discussion about whether the  
7 connection of the pressurizer heaters to the emergency  
8 buses is any different than the connection of other  
9 non-safety systems, non-safety loads, emergency buses. I  
10 would like you to describe, if you can, what is it that is  
11 different or unique about this proposal for connection of  
12 the pressurizer heaters to the emergency buses while those  
13 buses are carrying engineered safeguards loads?

14           A     The thing that is unique about the connection of  
15 the pressurizer heaters to this bus, although there are many  
16 ways in which it is unique, first of all, this is the first  
17 time in my entire experience that the NRC has ever required  
18 the connection of a non-safety piece of equipment to a  
19 safety grade power supply. The short-term lessons learned  
20 report is the first time I have ever seen an NRC requirement  
21 that there must be an onsite power supply for non-safety  
22 grade equipment.

23                 Second of all, it is unique in the sense that they  
24 have now developed emergency procedures which I believe by  
25 reading emergency procedure 1202-29 the operators will be

1 trained to search for ways to connect the pressurizer  
2 heaters to the onsite power supply should their normal power  
3 supply be lost.

4           It is also unique in terms of the magnitude of the  
5 load of the pressurizer heaters compared to the loads  
6 represented by the other non-safety grade equipment which  
7 can be powered from onsite power supplies. Generally all  
8 that equipment has been in the past significantly less than  
9 127 KW.

10           Also, where there has been connection in the past  
11 of non-safety grade to the onsite power supplies, in the  
12 course of the accident, whether we were referring to loss of  
13 offsite power or a combination of loss of offsite power and  
14 an accident, this has generally occurred well into the  
15 accident, where the situation has been stabilized or some  
16 other malfunction has occurred, such as loss of instrument  
17 air.

18           Under those conditions, if you lost your normal  
19 air compressor, of course, you might want to find a way to  
20 restore the air supply. So it would require a subsequent  
21 failure somewhere in the plant to create the need for  
22 connection of the non-safety equipment. And I think the air  
23 compressors is a very good example. As long as the  
24 accumulators that are typically on air systems continue to  
25 have sufficient pressure, there is really no need to

1 reconnect the non-safety grade air compressor.

2           The other one I guess I have mentioned -- I can't  
3 remember whether I mentioned it in my direct testimony or  
4 asked questions about it -- is that normally when the loads,  
5 the non-safety loads, are shed from the bus, the breakers  
6 which then serve as adequate isolation devices remain open.  
7 It is, of course, true that if they were reclosed, you would  
8 have the same situation that you do have with the  
9 pressurizer heaters.

10           I was going to add that knowing the limitations of  
11 the scope of the issues in this proceeding, we do not intend  
12 to try to introduce a contention that the other parts of the  
13 plant which were not affected by the short-term lessons  
14 learned could be litigated in this proceeding.

15           Q     In your opinion, does the provision for connection  
16 of the non-safety grade pressurizer heaters to the emergency  
17 buses in its entirety constitute a detriment or an advantage  
18 to safety?

19                     (Pause.)

20           A     I'm not sure I can answer that question in a very  
21 short way by just saying it is a benefit or a detriment.  
22 But my opinion is that, considering that the reason why the  
23 staff recommended in the short-term lessons learned that the  
24 heaters be connected onto the onsite power supply, that is  
25 for the purpose of reducing challenges to the emergency core

1 cooling system, I consider the overall change a detriment,  
2 in the sense that we -- that the staff was trying to reduce  
3 the challenges to the ECCS so that they would not be  
4 challenged at a rate higher than their design basis.

5           And so in that sense, I think keeping the  
6 challenge rate within the design basis must itself be a  
7 safety function. I think that has more to do with UCS 3  
8 than 4. But by connection a non-safety grade pressurizer  
9 heater, which there is no physical separation between the  
10 redundant group of heaters within the pressurizer or the  
11 cables leading from the pressurizer through the various  
12 connections until you get to the containment penetrations,  
13 designing or having an arrangement of isolation devices  
14 which does not comport with the principles underlying either  
15 Regulatory Guide 1.75 or 1.6, you have now introduced the  
16 possibility not only that you will fail to accomplish your  
17 objective of reducing challenges to the ECCS system; you  
18 have also introduced the probability -- the possibility that  
19 if the ECCS systems were challenged, some of them would be  
20 unavailable as a result of the fault in the pressurizer  
21 heaters, or at least temporarily unavailable until the bus  
22 was restored.

23           Q     My final question is: Would making the  
24 pressurizer heaters safety grade achieve the staff's  
25 objective of increasing their availability for certain

1 events?

2 A Yes.

3 Q Without endangering the emergency power supply?

4 A Yes, that's correct. If the heaters were  
5 environmentally qualified, physically separated, met all the  
6 requirements applicable to Class 1E safety-related  
7 equipment, it would have accomplished the objectives set  
8 forth in the short-term lessons learned report and would in  
9 my opinion meet the requirements that it not degrade the  
10 capacity, capability, and reliability of onsite power  
11 supplies.

12 MS. WEISS: No further questions.

13 CHAIRMAN SMITH: any further questions of Mr.  
14 Pollard?

15 (No response.)

16 CHAIRMAN SMITH: You may step down.

17 (Witness excused.)

18 (Pause.)

19 MS. WEISS: Can we be off the record?

20 (Discussion off the record.)

21 CHAIRMAN SMITH: Is there any objections to the  
22 effort to finish today?

23 MR. TROWBRIDGE: No. The Licensee would be happy  
24 to accommodate UCS in this respect. I had more than four  
25 hours sleep last night, so I am good for it.

1 CHAIRMAN SMITH: Dr. Jordan does have some  
2 questions, more than just a few questions, of Mr.  
3 Fitzpatrick. If there is no objections, let's try it.

4 MS. WEISS: Thank you. We appreciate that.

5 (Pause.)

6 Whereupon,

7 ROBERT G. FITZPATRICK,  
8 called as a witness by counsel for the NRC staff, having  
9 first been duly sworn by the Chairman, was examined and  
10 testified as follows:

11 DIRECT EXAMINATION

12 BY MR. CATCHIN:

13 Q Mr. Fitzpatrick, do you have before you a document  
14 containing the caption of this proceeding, dated 9-15-80 and  
15 entitled "NRC Staff Testimony of Robert G. Fitzpatrick  
16 Relative to Emergency Power Supply for Pressurizer Heaters  
17 (UCS Contention 4)"? The document consists of five pages,  
18 and attached thereto is a one-page statement of your  
19 professional qualifications?

20 A Yes, sir, I have that before me.

21 Q Were these documents prepared by you?

22 A Yes, they were.

23 Q First of all, do you have any modifications or  
24 corrections to make?

25 A No, sir.

1 Q Are they true and correct to the best of your  
2 knowledge and belief?

3 A Yes, they are.

4 Q Do you adopt them as your testimony on this  
5 proceeding?

6 A I do.

7 MR. CUTCHIN: Mr. Chairman, I ask that Mr.  
8 Fitzpatrick's direct testimony on emergency power supplies  
9 and his professional qualifications be received into  
10 evidence and bound into the transcript, along with the  
11 outline which accompanies them.

12 CHAIRMAN SMITH: Are there any objections?

13 MS. WEISS: No objections.

14 MR. TROWBRIDGE: None.

15 CHAIRMAN SMITH: The testimony and the attachments  
16 are bound into the record.

17 (The testimony of Roberg G. Fitzpatrick and  
18 attachments thereto follow:)

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copy # 2

OUTLINE

This testimony of Robert G. Fitzpatrick contains the NRC Staff's response to UCS Contention 4.

The purpose of this testimony is to demonstrate that, contrary to the assertions in the contention, connection of the pressurizer heaters to the on-site emergency power supplies does not violate GDC-17 and will not degrade the performance of the emergency power supplies.

Conclusions to be drawn from this testimony:

Pressurizer heaters are non-Class IE electrical loads and on-site emergency power supplies are Class IE power supplies.

Connection of non-Class IE electrical loads to Class IE power supplies is not prohibited by any NRC regulation.

Design in accordance with appropriate criteria will assure that connection of a non-Class IE loads to a Class IE power supply does not result in degradation of the Class IE power supply.

The TH1-1 design satisfies such criteria.

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of

METROPOLITAN EDISON COMPANY,  
ET AL.

(Three Mile Island Nuclear  
Generating Station)

}  
Docket No. 50-230  
(Restart)  
}

NRC STAFF TESTIMONY OF ROBERT G. FITZPATRICK RELATIVE  
TO EMERGENCY POWER SUPPLY FOR PRESSURIZER HEATERS

(UCS CONTENTION 4)

Q.1 Please state your name and position with the NRC

A. My name is Robert G. Fitzpatrick. I am an employee of the U. S. Nuclear Regulatory Commission assigned to the Power Systems Branch, Division of Systems Integration, Office of Nuclear Reactor Regulation.

Q.2 Have you prepared a statement of professional qualifications?

A. Yes. A copy of this statement is attached to this testimony.

Q.3 Please state the nature of the responsibilities that you have had with respect to the Three Mile Island Nuclear Generating Units.

A. Prior to the March 28, 1979 accident at unit 2, I had no involvement with Unit 1 and limited involvement with unit 2. My involvement with unit 2 consisted of reviewing the design for conformance with the Power Systems Branch position concerning protection of the onsite Class 1E power distribution system from a postulated degraded offsite power system.

Following the unit 2 accident, I was dispatched to the site as a member of the Office of Nuclear Reactor Regulation (NRR) Technical Review Group. This group was chartered with the responsibility of reviewing all the plant modifications proposed for providing various alternative methods for bringing the reactor to a fully shutdown condition.

The NRR Technical Review Group was subsequently renamed the TMI Support Group and its charter was expanded to include Unit 1 restart. Since that time I have been involved with both units 1 and 2 principally dealing with matters related to electrical engineering. My official duties related to unit 2 were terminated upon the recent re-organization of NRR.

Q What is the purpose of your testimony?

A. The purpose of my testimony is to respond to the UCS contention number 4, which states:

UCS Contention 4

Rather than classifying the pressurizer heaters as safety-grade, the staff has proposed simply to add the pressurizer heaters to the on-site emergency power supplies. It has not been demonstrated that this will not degrade the capacity, capability, and reliability of these power supplies in violation of GDC 17. Such a demonstration is required to assure protection of public health and safety.

My testimony addresses the question of the acceptability of the licensee's design with respect to emergency power supplies for the pressurizer

heaters, that is, the question of whether the non safety-grade heaters degrade the capacity, capability and reliability of the on-site emergency power supplies.

Q.5 What is the staff's position on the UCS contention and its bases for its position?

A. First, the staff disagrees with the characterization that we have simply required addition of the pressurizer heaters to the emergency buses. There are four positions and seven clarifications which must be met in order to satisfy the staff's requirements. (These are documented on pages CB-3 and CB-6 of NUREG-0680, "Staff's SER on TMI-1 Restart.") Second, although the staff agrees that a demonstration that the emergency power system has not been degraded is required, we do not agree that this has not already been accomplished. Our evaluation of this aspect of the TMI-1 design supporting this conclusion is documented on pages CB-6 through CB-8 of NUREG-0680.

Q.6 Do any of the NRC's regulations prohibit connecting non-Class 1E (non-safety) electrical loads to the Class 1E emergency buses? If not, are there documented acceptance criteria governing such practices?

A. NRC regulations do not prohibit the connection of non-Class 1E electrical loads to the Class 1E emergency buses. However, there are specific staff requirements outlined in Regulatory Guide (R.G.) 1.75 (revision 2) "Physical Independence of Electric Systems" which the staff uses as criteria for judging the adequacy of the design. Further guidance on the

subject can be found in Section 8.3.1 (revision 1) of the Standard Review Plan which reads as follows:

"In the absence of specific criteria in IEEE Std 308 governing the connection and disconnection of non-Class 1E loads to and from the Class 1E distribution buses, the review of the interconnections will consider isolation devices as defined in IEEE Std 384 and augmented by Regulatory Guide 1.75 to determine the adequacy of the design. In assuring that the interconnections between non-Class 1E loads and Class 1E buses will not result in the degradation of the Class 1E system, the isolation device through which standby power is supplied to the non-Class 1E load, including control circuits and connections to the Class 1E bus, must be designed to meet Class 1E requirements. Should the standby power supplies not have been sized to accommodate the added non-Class 1E loads during emergency conditions, the design must provide for the automatic disconnection of those non-Class 1E loads upon the detection of the emergency condition. This action must be accomplished whether or not the load was already connected to the power supply. Further, the design must also prevent the automatic or manual connection of these loads during the transient stabilization period subsequent to this event."

The R.G. 1.75 requirement referenced above and applicable to this aspect of the TMI-1 design, calls for the automatic tripping of non-Class 1E loads from the Class 1E buses by some other means than the detection of fault current. The signal that is preferred for this action is the safety injection signal.

As can be readily seen from the excerpt above, the Lessons Learned requirements fully reflect those of the Standard Review Plan and the staff's evaluation (NUREG-0680 pages CB-6 through CB-8) clearly demonstrates that the TMI-1 design in all cases meets these requirements. Thus, connection of the pressurizer heaters to the on-site emergency power supply will not degrade the capacity, capability and reliability of these power systems.

EDUCATIONAL AND PROFESSIONAL QUALIFICATIONS  
OF ROBERT G. FITZPATRICK

EDUCATION

B.S. Electrical Engineering 1971; Northeastern University, Boston, Mass.

M.S. Electrical Engineering, 1972; Northeastern University, Boston, Mass.

Major: Electrical Power Systems Engineering

PROFESSIONAL QUALIFICATIONS

I am presently Section Leader of the Electrical Section of the Power Systems Branch. In this position, I provide technical supervision and review of the work of reactor systems engineers conducting evaluations of operating reactor problems, license amendments for operating reactors, license applications, generic assessments and special project assignments.

I joined the NRC (AEC) in 1974 as a member of the Electrical, Instrumentation and Controls System Branch and in January 1977 I was assigned to the newly formed Power Systems Branch. My duties during the above periods involved the technical review of electrical systems (onsite and offsite power, and instrumentation and control). For approximately fifteen months following the March 1979 accident at Three Mile Island, I was detailed to the special Three Mile Island Support Group.

From 1972 - 1974 I worked for Yankee Atomic Electrical Company in Westboro, Massachusetts. I was assigned to the Electrical and Control Engineering Group and my duties included work on the Yankee operating nuclear plants and the Seabrook Project. (Prior to this I spent 3 years with Yankee as a cooperative education student while attending Northeastern University.)

I am a member of the IEEE and also represent the NRC as a member of IEEE Nuclear Power Engineering Committee Subcommittee 4 "Auxiliary Power Systems." This Committee is charged with developing standards for onsite and offsite power systems.

1 MR. CUTCHIN: I have a couple of rebuttal  
2 questions before I turn the witness over for  
3 cross-examination.

4 BY MR. CUTCHIN: (Resuming)

5 Q Mr. Fitzpatrick, on page 4-5 of his testimony, Mr.  
6 Pollard -- I will give everyone a few moments to turn to it  
7 -- Mr. Pollard says that the staff may disagree with his  
8 view that a fault in the pressurizer heaters or their  
9 circuitry will result in the loss of the emergency power  
10 supply, because the staff may claim that the non-safety  
11 grade heaters will be isolated from the safety grade onsite  
12 power supplies in accordance with the provisions of Reg  
13 Guide 1.75.

14 Do you agree or disagree with Mr. Pollard's view?

15 A I disagree with that view.

16 Q Why? Would you explain, please?

17 A Yes, sir. I think Mr. Pollard has misapplied  
18 portions of the reg guide. It has been staff practice since  
19 I have been with the staff that non-safety loads on the  
20 safety buses, some time after you get into an event, say of  
21 a LOCA or what have you, you are then able to reapply any of  
22 those loads.

23 This is also addressed in my prepared testimony on  
24 page 4, when I quote a portion of the Standard Review Plan  
25 that gives the staff reviewers guidance in how to review

1 these things. The idea behind this is that once everything  
2 is steadied out and it is thought that there is a need by  
3 the operators to add any of these loads, they are at that  
4 time only required basically to take a look at the -- any  
5 margin left on the diesels. And if there is margin they are  
6 allowed to apply loads at that time.

7           The pressurizer heaters fit into that category.  
8 The non-safety loads generally on the buses would be tripped  
9 off by the requirements of the safety injection signal in  
10 accordance with the terms of the Regulatory Guide. In terms  
11 of the pressurizer heaters, they are not on the bus under  
12 normal conditions, although they do receive the SI signal in  
13 case for some reason they might be.

14           And then if , following any transient stability  
15 associated with the diesel loading and the diesel coming up  
16 to steady state operation, there is then felt a need for any  
17 of the loads, including the pressurizer heaters, this would  
18 be an operator discretion. The basic requirement has been  
19 he would be able to load those loads as long as there was  
20 margin in the diesel generator rating.

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1 Q Then it would be correct to conclude from what you  
2 have said that it is because the staff believes that Reg  
3 Guide 1.75 does not forbid or even address the matter of  
4 reconnection of nonsafety loads that have been automatically  
5 isolated?

6 A It certainly doesn't specifically address the  
7 concept of some time later on your ability to end these  
8 loads. One of the main provisions of the reg guide is the  
9 thought of the sanctity of the system right after an event.  
10 What you are doing there is you are taking away all possible  
11 trips that would otherwise not be needed. And, for  
12 instance, the safety injection signal does that quite  
13 handily.

14 Once everything has stabilized out, as I have  
15 said, then it is fair game to start reapplying any of these  
16 loads that are put on the diesel generators. There is no  
17 basis for a licensee to put a nonsafety load on the diesel  
18 generator if he feels he will never be able to energize that  
19 load given a loss of off-site power or loss of off-site  
20 power plus anything when he is using the diesel generator.

21 That is, in fact, the basis for putting any load  
22 on the diesel generator buses is the fact you want to  
23 protect them from a loss of off-site power.

24 Q I am now going to refer to page 4.7 of Mr.  
25 Pollard's testimony. On 4.7 of his testimony, Mr. Pollard

1 says that, "The TMI-1 design -- meaning for the isolation  
2 device -- does not comply with Reg Guide 1.75 because  
3 neither the fully coordinated breakers nor the undervoltage  
4 trip derived from the effects of fault current is an  
5 acceptable method of preventing a fault in the  
6 nonsafety-grade pressurizer heater circuits from causing a  
7 loss of the safety-grade power supply."

8           Do you agree with Mr. Pollard's position? And  
9 would you state why?

10          A    No, I don't agree with his position on the  
11 undervoltage trip that has come up. And we have talked  
12 quite extensively about the undervoltage bus. My  
13 interpretation of the regulatory guide is not directly an  
14 effect of the fault current. The fault current itself, the  
15 main effect from fault current is thermal effects.

16           What you have is, in the case of a fault on the  
17 pressurizer heaters, you do get an undervoltage on the bus.  
18 It is not really due to the overcurrent; it is the fact that  
19 now you have got a low-impedance short from the bus to, say,  
20 ground. And as the curve that Mr. Torcivia passed out, I  
21 believe it was yesterday, shows, the voltage dips. This is  
22 just a system of being Ohm's law.

23           And my interpretation of the reg guide -- it is  
24 not my interpretation of the reg guide that if you have an  
25 event that is going to be in conformance with Ohm's law,

1 that the reg guide was out to say you couldn't use that  
2 effect.

3           The other thing Mr. Torcivia talked about, the  
4 ground fault, this is another case where you are not sensing  
5 a fault current itself, you are coming through isolation  
6 transformers, current transformers in this case, and through  
7 nominal currents, you are detecting that there is a fault.  
8 That also was not a direct result of the fault current. It  
9 is not being involved with the actual high-magnitude  
10 current, and the thermal effects thereof.

11           I think that should be made clear on the record,  
12 the distinction in the interpretation between Mr. Pollard  
13 and the staff on this.

14           Another item in this regard is the fact that Mr.  
15 Pollard has also said, he has quoted 1.75 and 1.6, the reg  
16 guides, in terms of these are cases where we don't use fault  
17 protection, overcurrent protection.

18           There is another reg guide, 1.63, where the staff  
19 explicitly relies on overcurrent protection, and that is for  
20 protecting the containment penetrations from a fault. So  
21 the staff does use overcurrent devices and gives full credit  
22 for them.

23           Q     Thank you, Mr. Fitzpatrick.

24           MR. CUTCHIN: I have no further rebuttal  
25 questions. The witness is available for cross.

## CROSS EXAMINATION

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BY MS. WEISS:

Q Do you have a copy of Regulatory Guide 1.63?

A I don't believe so.

MS. WEISS: Do you have a copy of it, Mr.

Cutchin?

MR. CUTCHIN: No.

CHAIRMAN SMITH: 1.63?

MS. WEISS: The regulatory guide that the witness

referred to with respect to overcurrent devices.

CHAIRMAN SMITH: What is the reg guide you were

referring to?

THE WITNESS: 1.63, dealing with protecting  
containment penetrations from electrical faults, basically,  
among other things.

MR. TROWBRIDGE: There is no copy in the room?

CHAIRMAN SMITH: That seems to be the inference we  
can draw from the silences.

MR. TROWBRIDGE: Ms. Ridgeway can run over to our  
office, and I think we probably have a copy of it in our  
support facility. And we will make a few copies.

(Pause.)

MR. TROWBRIDGE: Is it a long document or a short  
document?

CHAIRMAN SMITH: Can you work around that

1 question?

2 MS. WEISS: Yes.

3 MR. TROWBRIDGE: If it was our turn first, we have  
4 no questions.

5 MS. WEISS: We're going. I am sorry.

6 BY MR. POLLARD:

7 Q This clarification you just gave, where Mr.  
8 Cutchin directed your attention to, I think it was, page 4-7  
9 of my testimony, as I understood your testimony, you are  
10 saying that the undervoltage is not an effect of the fault  
11 current? Did I understand you correctly?

12 A That's right, it is not a direct effect of either  
13 the high current itself or the thermal effects of the  
14 current, the undervoltage effect. It comes out of the  
15 low-impedance short of that bus. The bus then becomes a  
16 voltage divider.

17 Q Is the undervoltage caused by the fault current?

18 A The undervoltage is caused by the low-impedance  
19 short on the bus.

20 Q It is caused by the fault, in other words?

21 A Right.

22 Q Do you have with you a copy of the Licensee's  
23 testimony?

24 A Yes, I do.

25 Q Would you turn to page 6, please? Nine lines from

1 the bottom of page 6 of the Licensee's testimony on UCS 4 is  
2 a sentence which reads: "Voltage on the emergency bus for a  
3 fault on the pressurizer heaters would also cause the  
4 undervoltage relays to cause opening of the main pressurizer  
5 heater supply breaker to isolate the fault by a shunt trip  
6 independent of the overcurrent trip."

7           You have already testified you disagree with the  
8 sentence referred to in my testimony. Do you agree or  
9 disagree with this sentence in the Licensee's testimony?

10          A       I agree with this statement. What I have  
11 disagreed with is your characterization of what is and is  
12 not a direct effect of the fault current. In accordance  
13 with my understanding --

14          Q       Can you please direct your attention to my  
15 testimony?

16               MR. CUTCHIN: Are you finished? I would like to  
17 be sure that the witness is finished with the answer to the  
18 first question before the second is answered.

19               THE WITNESS: I wanted to add that that was in  
20 accordance with my understanding of the interpretation of  
21 Regulatory Guide 1.75.

22               BY MR. POLLARD:

23          Q       Can you please direct your attention to my  
24 testimony and tell me where I made a distinction between  
25 direct or indirect effects of fault current?

1           A       On page 4-7, the last sentence in the first  
2 paragraph on the page, starting out, "Neither the fully  
3 coordinated breakers nor the undervoltage trip derived from  
4 the effect of fault current is an acceptable method of  
5 preventing a fault if the nonsafety-grade pressurizer heater  
6 circuits from causing a loss of the safety-grade power  
7 supply."

8           Q       I do not see in that sentence any distinction  
9 between the phrases you are using of "direct effect" versus  
10 just plain "effect" or an "indirect effect."

11          A       I would have to agree with that observation.

12          Q       Can you tell me anywhere in Regulatory Guide 1.75  
13 where it makes a distinction between direct effects and  
14 indirect effects of fault currents?

15          A       No. That is what I believe is something lacking  
16 in the guide itself, actually, giving --

17          Q       Can you tell me of a single NRC document that has  
18 ever been made -- has ever made a distinction between the  
19 direct and indirect effects?

20                   CHAIRMAN SMITH: Wait a minute. "Of"?

21                   MR. POLLARD: Of the fault current.

22                   THE WITNESS: I am not aware of any guidance that  
23 the staff has supplemented on Reg Guide 1.75 in this area.

24                   BY MS. WEISS:

25          Q       Mr. Fitzpatrick, you stated on rebuttal that it

1 has been staff practice that nonsafety loads can be  
2 connected back to emergency buses if that is the source of  
3 their original power after the plant is steadied up. I  
4 would like you to give me a definition of what you mean by  
5 "after the plant is steadied up."

6       A       That comes from, if you refer back to page 4 of my  
7 testimony, the last sentence of the quote out of the  
8 Standard Review Plan, where it states, "Further, the design  
9 must also prevent the automatic or manual connection of  
10 these loads during the transient stabilization period  
11 subsequent to this event." That stabilization period is  
12 talking about the diesel generator when it goes through its  
13 loading sequence. So that is a relatively short period of  
14 time.

15       Q       Would it generally be accurate that during the  
16 accident -- or I think you testified to this effect and I  
17 want to make sure I understand it -- the major goal is to  
18 maintain the operability of the power supply to the  
19 engineered safeguards and that therefore one removes all  
20 risk by shedding all the nonsafety loads. And what follows  
21 from that and what I also understood you to have said is at  
22 some point it no longer becomes of primary importance once  
23 the plant has stabilized, it no longer becomes of primary  
24 importance to maintain the engineered safeguard systems and  
25 then you can begin to reconnect the nonsafety loads to the

1 emergency power buses. Is that generally accurate?

2       A     No, I think you have mischaracterized what I have  
3 said. You never lose sight of the importance of the  
4 sanctity of the system, but once things have stabilized out,  
5 you are then in a position to determine whether you need  
6 some of these other loads, whether you have diesel generator  
7 capacity to add them, whether the things in the sequence of  
8 events of whatever the event we might be in are going as you  
9 have been trained if you are the operator and you are not  
10 getting something like happened at the TMI-2 accident where  
11 the operators weren't sure exactly what was going on.

12               That is all part of that process, that once the  
13 operator decides he knows what is going on in the event, the  
14 diesel generator is stabilized out, which happens very  
15 shortly after the event, and he now decides he has need for  
16 some of these nonsafety loads. He can go ahead and have  
17 them with our regulations out of the Power Systems Branch.  
18 The only thing he would be required to do would be to make  
19 sure he had the diesel generator capacity to supply the  
20 loads.

21       Q     Let me go back then again and see if I can -- and  
22 see if you can define the point at which the plant reaches  
23 stability, the point at which the operator can then exercise  
24 his discretion to reconnect loads that have been shed onto  
25 the emergency buses.

1           A     Would you like me to try and do that?

2           Q     Yes. I mean, you may have been reading the  
3 transcript of earlier portions of this testimony. There is  
4 a definition of stability for purposes of terminating  
5 high-pressure injection, for example. Is that the kind of  
6 thing that you were thinking of, that the plant is  
7 essentially through with the accident?

8           A     No. Exactly what the entire definition of the  
9 stabilization period is, I do not have that definition. In  
10 terms of the electrical aspects of the stabilizaton period,  
11 it would be when the diesel has hit steady-state loading.  
12 It is still then up to the operator -- and this is totally  
13 out of my area -- to decide any other stabilization of the  
14 plant and the reactor systems or whatever, he is at a point  
15 where he can add nonsafety loads or maybe some emergency  
16 loads that were not sequenced automatically. It is done at  
17 his discretion. And the Power Systems Branch, our worry  
18 goes away when he makes the conscious determination that  
19 there is room on the diesel to add the load.

20          Q     Without respect to whether the plant is in a  
21 condition where it is necessary to have the operation of  
22 engineered safety features?

23          A     Those are still the considerations of the  
24 operator. But there are other -- in terms of my worries as  
25 a power systems engineer, my worries would be satisfied with

1 the power system aspect with diesels. He would still have  
2 to satisfy the reactor systems needs, but what they might  
3 be, I don't know. I am not trying to testify to that or how  
4 long that would take; I really don't know.

5           Electrically, the stabilization period is over  
6 shortly. Reactor systemwise, I don't know how long that  
7 might be.

8           Q     Isn't the purpose of requiring independence  
9 between the emergency power supplies and the non-Class 1-E  
10 loads to ensure the integrity of the power supplies to the  
11 engineered safety features?

12          A     That is one of the purposes, yes.

13          Q     Is there any limitation that you know about on  
14 when the operator for Three Mile Island Unit 1 is free to  
15 connect the pressurizer heaters to the emergency buses?

16          A     It is my understanding and the basis of my review  
17 of this design that he would only be connecting the feeders,  
18 given that there is a loss of off-site power, and that then  
19 he determined that there was a need or a want for the  
20 heaters.

21          Q     It is not your understanding that upon loss of  
22 power to the pressurizer heaters, the operator would  
23 immediately connect, seek to connect, the pressurizer  
24 heaters to emergency power supply?

25          A     That was not brought to my attention when I did

1 the initial review of this design.

2 Q If that's the case, would it change your feeling  
3 in any way? If you assumed that procedures would call for  
4 the operator, upon loss of power to the pressurizer heaters,  
5 to immediately connect those to emergency power buses, if  
6 that were the case, would that change your opinion in any  
7 way with respect to the adequacy of isolation?

8 A No.

9 Q Is your definition of stabilization period ended  
10 -- let me strike that. In your opinion, has the  
11 stabilization period been reached at the end of the  
12 automatic loading to emergency buses?

13 A It has in terms of the on-site emergency power  
14 system. It may not have in terms of what those loads are  
15 doing with the reactor systems in mitigating some event in  
16 the plant.

17 Q So for purposes of your analysis, essentially, you  
18 stop at that point?

19 A That's right.

20 MR. POLLARD: I am not trying to badger. I will  
21 take over at this point if nobody has any objection.

22 BY MR. POLLARD:

23 Q If I understand the implications of this  
24 testimony, Mr. Fitzpatrick, it is your view then that the  
25 provisions of Regulatory Guide 1.75 apply for only about the

1 first minute or so of an accident, and that as soon as the  
2 automatic loading is completed on the diesel generator, it  
3 is then no longer necessary to assure that the isolation  
4 devices used for nonsafety to isolate nonsafety loads from  
5 the safety-grade power supply that they no longer apply?

6 A No, that is not what I am saying.

7 Q That's what I am trying to understand, why you are  
8 not saying that, based upon what you have already said. You  
9 are saying after the stabilization period, which, in your  
10 view, for your testimony, the stabilization period ended when  
11 the automatic loading sequence of the diesel generators was  
12 completed, and that beyond that point it was permissible to  
13 connect non-Class 1-E loads to the diesel generator. Am I  
14 correct so far?

15 A I don't believe that's what I said, no.

16 Q Can you please tell me where I am wrong in what  
17 you said?

18 A I said the stabilization period has many factors  
19 to it, most of which are outside the scope of the Power  
20 Systems Branch. The Power Systems Branch part of the worry  
21 is when the diesel's finished its loading sequence. There  
22 are a lot of other concerns -- I am sure more than I even  
23 know about -- in terms of the reactor's operation within the  
24 reactor itself, reacting to some event that has happened.

25 It is the reactor operator that would have to

1 decide when that stabilization period was met. Power  
2 systemwise, it is met soon after the event. That does not  
3 allow anyone that soon after the event to start loading  
4 nonsafety loads on the buses. There are other factors  
5 there, other considerations that have to be made that enter  
6 into that. And the time period involved in that is  
7 something I just can't speak to. I don't know what that  
8 might be.

9 Q In answer to a question by Ms. Weiss when she  
10 asked you to assume that the procedures for Three Mile  
11 Island Unit 1 might lead to the operator seeking to  
12 immediately connect the pressurizer heaters to the on-site  
13 bus, you said that wouldn't change your testimony.

14 A No. That's correct. I said that he could start  
15 to -- he could immediately start to do that, but it is going  
16 to take -- I am not sure how long -- to send somebody down  
17 to the turbine building to start using these keys to open up  
18 cubicles, to start taking out disconnect devices, to take  
19 them into the control building and start inserting them in  
20 all of these keys, the Kirk Key interlocks.

21 It takes a while to start this process. And while  
22 the plant has not yet installed this equipment, the time  
23 involved is still an open item in the SER.

24 Q Let me assume a different scenario than the one  
25 you described, which first we have a loss of off-site power,

1 the operator did all of the manipulations needed to connect  
2 the pressurizer heaters to the on-site power supply, and  
3 then we subsequently had a loss-of-coolant accident which  
4 would open the main feeder breaker, as the testimony has  
5 been.

6           At that point it would be a very simple matter, as  
7 we have had testimony, to send a man down two flights of  
8 stairs after the ES signal had been bypassed and reclosed  
9 the main feeder breaker and reconnect the pressurizer  
10 heaters to the on-site power supply.

11           What I am trying to focus on is: Is it your view  
12 that at least within the scope of your responsibility, that  
13 the provisions of Regulatory Guide 1.75 only apply during  
14 the time it takes to achieve stabilization and that they do  
15 not apply after that point in time?

16           A     Mr. Pollard, that was a long question. I am not  
17 sure of the sense of it to answer "Yes" or "No" to that.

18           Q     Would you agree with me it would be not  
19 permissible to rely upon tripping of circuit breakers by  
20 signals derived from fault current prior to reaching  
21 stabilization?

22           A     Yes.

23           Q     But then you agree that it is all right to rely  
24 upon such devices after the period of stabilization?

25           A     Yes, that is in accordance with the guidance we

1 have in the Standard Review Plan. There is no specific  
2 guidance in the reg guide, and that is why I went and  
3 incorporated the Standard Review Plan guidance, and that is  
4 what that says.

5 Q It is your testimony that you have no information  
6 about the emergency procedures at Three Mile Island Unit 1  
7 that would prevent connecting the pressurizer heaters to the  
8 on-site power supply before stabilization is achieved?

9 A Again, I am sorry, Mr. Pollard, I don't know  
10 whether I can answer "Yes" or "No," because I don't  
11 understand the sense of the question.

12 Q Can you tell me what part of the question you  
13 didn't understand?

14 A Well, I am -- it is probably because it is late in  
15 the day -- I am not sure which way to answer. I am not sure  
16 what -- I am not even sure I am not sure -- I am not sure if  
17 a "Yes" answer or a "No" answer, which one to answer,  
18 because --

19 Q Let me try to rephrase the question so it is  
20 perhaps not so confusing. Do you know whether or not it is  
21 permissible at Three Mile Island Unit 1 to connect the  
22 pressurizer heaters to the on-site power supply prior to  
23 achieving stabilization?

24 A No, I do not. My review was based on the fact  
25 that it would not be done.

1 CHAIRMAN SMITH: Your review was based on the fact  
2 or the premise?

3 THE WITNESS: Excuse me. My premise that that  
4 would not be done and the procedures would reflect that  
5 accordingly.

6 BY MR. POLLARD:

7 Q Considering the design of Three Mile Island Unit 1  
8 and the method by which pressurizer heaters will be  
9 connected to the on-site power supply, would you agree that  
10 if the heaters were connected to the on-site power supply  
11 prior to having achieved stabilization, that the design  
12 would not comply with Regulatory Guide 1.75?

13 A I think you have already asked me that. And, yes,  
14 I would agree that it would not.

15 MS. WEISS: It looks like I should tell the  
16 parties that it looks like we will be probably 10 or 15 more  
17 minutes ourselves. We are willing to keep slugging along,  
18 but I don't know what everybody else feels like.

19 CHAIRMAN SMITH: What has this questioning done to  
20 your plans, Mr. Trowbridge?

21 MR. TROWBRIDGE: Up to this point, nothing. It  
22 still has not generated further questions by us.

23 CHAIRMAN SMITH: Mr. Adler, what time do you think  
24 you need?

25 MR. ROBERT ADLER: I am not sure whether UCS

1 intends to have us do our cross examination today. Did you  
2 need to listen to our cross examination, or should we do it  
3 tomorrow?

4 MS. WEISS: I was anticipating that we would sort  
5 of -- I was anticipating that you would go forward. Is that  
6 a problem for you? Everybody is doing a favor for us,  
7 obviously.

8 MR. CUTCHIN: I would like to interject here,  
9 too. The witness has already stated that he is not sure  
10 whether part of his answer was the lateness of the day and  
11 so forth. And I would like a question as to whether the  
12 witness feels he is able to carry on for another 10 or 15  
13 minutes.

14 CHAIRMAN SMITH: Well, what is your feeling on it,  
15 sir?

16 THE WITNESS: I would be glad to continue. I  
17 would love to get a drink of water at this moment, though.

18 MS. WEISS: I think we should probably stop and  
19 come back tomorrow.

20 CHAIRMAN SMITH: I think if he is willing to --  
21 you know, we all get tired, but we can compensate for that  
22 by being careful and slow. However, I don't think it is  
23 realistic for you to expect Dr. Jordan to get very far in  
24 his questioning, or even begin tonight.

25 MR. POLLARD: If that's the case, we might as well

1 stop now and resume in the morning.

2 CHAIRMAN SMITH: All right.

3 MS. WEISS: Let's stop now then.

4 CHAIRMAN SMITH: It's your option, if you are  
5 willing to allow Dr. Jordan to go ahead in your absence. If  
6 you want to explore -- well, I think we better just come  
7 back tomorrow.

8 MS. WEISS: I think that's what we would choose to  
9 do.

10 CHAIRMAN SMITH: We will adjourn and meet tomorrow  
11 at 9:00.

12 (Whereupon, at 5:38 p.m., the hearing was  
13 adjourned, to reconvene at 9:00 a.m., Thursday, January 8,  
14 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: January 7, 1981

Docket Number: 50-289

Place of Proceeding: Harrisburg, Pennsylvania

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

Barbara Whitlock

Official Reporter (Typed)

Barbara L. Whitlock

Official Reporter (Signature)