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UNITED STATES DISTRICT COURT  
SOUTHERN DISTRICT OF NEW YORK

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GENERAL PUBLIC UTILITIES CORPORATION, :  
JERSEY CENTRAL POWER & LIGHT COMPANY, :  
METROPOLITAN EDISON COMPANY and :  
PENNSYLVANIA ELECTRIC COMPANY, :

Plaintiffs, :

-against- :

80 Civ. 1683  
(R.O.)

THE BABCOCK & WILCOX COMPANY and :  
J. RAY McDERMOTT & CO., INC., :

Defendants. :

- - - - -x

Continued deposition of Metropolitan  
Edison Company, by EDWARD R. FREDERICK,  
taken by Defendants pursuant to adjournment,  
at the offices of Davis Polk & Wardwell, Esqs.,  
One Chase Manhattan Plaza, New York, New York,  
on Tuesday, May 11, 1982, at 9:15 o'clock in  
the forenoon, before Joseph R. Danyo, a Shorthand  
Reporter and Notary Public within and for the  
State of New York.

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\* \* \*

1

2       E D W A R D       R.       F R E D E R I C K,       resumed,

3               having been previously duly sworn by the

4               Notary Public, was examined and testified

5               further as follows:

6       EXAMINATION (Continued)

7       BY MR. FISKE:

8               Q       You said at the end of the day yesterday

9               that when you learned that there had been no

10              emergency feedwater to the steam generators that that

11              helped you understand why the pressurizer level had

12              been increasing.

13              A       Yes.

14              Q       What did the absence of feedwater to the

15              steam generators have to do with an increase in

16              pressurizer level as you understood it at that time?

17              A       At that time I was concluding that the

18              lack of feedwater meant that we weren't removing

19              heat from the RCS, so it heated up and the heat

20              caused expansion of the water, and that is what

21              filled the pressurizer along -- I was kind of

22              compounding the problem. I was shooting water in

23              and the water was expanding. That explained to me

24              why it came up faster than I thought it should have,

25              because I had two contributors. I had me shooting

1  
2 in water and the expansion happening.

3 MR. SELTZER: When you say "shooting  
4 in the water," you mean --

5 THE WITNESS: High pressure injection.

6 Q So this is exactly the opposite, is it  
7 not, of the type of cooldown that you described  
8 before that causes a drop in reactor coolant system  
9 pressure?

10 MR. SELTZER: What is the type of  
11 cooldown that he was referring to before?

12 MR. FISKE: The phenomenon -- withdrawn.

13 Q The system dynamics that we have been  
14 discussing for about three days now in this deposition  
15 under which pressure drops as a result of the  
16 contraction in the volume of water resulting from  
17 a drop in temperature in the reactor coolant system.

18 Mr. Frederick, you have testified,  
19 have you not, on numerous occasions during this  
20 deposition that you understood that what caused  
21 the drop in pressure in those incidents that have  
22 previously been described as cooldowns was the fact  
23 that there had been a drop in temperature in the  
24 reactor coolant system which caused the volume of  
25 water to contract and thereby produced a drop in



1  
2 pressure.

3 Isn't that right?

4 A That was one of the reasons, yes.

5 Q The analysis that you just went through  
6 with respect to the increase in pressurizer level is  
7 exactly the opposite of that, is it not, that is,  
8 the volume of the water is expanding rather than  
9 contracting?

10 A Yes, but we are six or seven minutes  
11 into the transient. We already went through the  
12 cooldown and now we are in a heatup.

13 When you heat up, you are going to expand.  
14 That is true. They are opposite effects.

15 Q You learned, did you not, that there had  
16 been no feedwater at all to the steam generator from  
17 the time the reactor trip started during that entire  
18 first seven minutes? You knew that, didn't you?

19 A No. When we learned of the loss of  
20 emergency feedwater, it was in reaction to a  
21 discovery of the loss of main feedwater. You don't  
22 lose main feedwater on a normal turbine trip.

23 At this point we still didn't  
24 know -- somewhere in here in this five-, six-, or  
25 seven-minute time frame we discovered the loss of

1  
2 feedwater, the loss of emergency feedwater.

3 Q Once you discovered that those valves  
4 were closed, you knew at that point that there  
5 had been no feedwater to the steam generators  
6 from the time the reactor trip started up to that  
7 point, isn't that correct?

8 MR. SELTZER: Objection.

9 Mr. Frederick explained yesterday that  
10 there was feedwater in the steam generators  
11 at the start of the accident.

12 Q You said, did you not, yesterday, that  
13 you concluded that during that period of time from  
14 the time of the reactor trip to the time you  
15 discovered that the 12's were closed, that the steam  
16 generators had been in the process of boiling dry?  
17 Didn't you use that phrase?

18 A Yes, I knew that they were boiling dry,  
19 but I didn't know when we lost main feedwater.  
20 That happened some time after the trip as far as  
21 I knew then.

22 Q Isn't it a fact that this process by  
23 which there was less heat transfer from the primary  
24 system to the secondary system resulting in -- withdrawn.

25 Didn't you understand that it was the

1  
2 loss of heat transfer from the primary side to the  
3 secondary side that had produced the increase in  
4 reactor coolant system pressure in the first place?

5 MR. SELTZER: What do you mean "in the  
6 first place"?

7 Q What caused the reactor to trip? Did  
8 it trip on high pressure or low pressure?

9 A High pressure.

10 Q What did you understand had caused the  
11 increase in pressure that had caused the reactor  
12 to trip?

13 A Reduced steam demand due to the  
14 turbine trip.

15 Q When you discovered that the 12's had  
16 been closed during the first eight minutes of the  
17 accident, didn't you understand at that point that  
18 the loss of heat transfer from the primary side to  
19 the secondary side had produced the increase in  
20 pressure?

21 A Yes, but you can't conclude that those  
22 are in the same process. Reduction of steam demand  
23 that I mentioned as causing high pressure and a  
24 loss of heat are two different conditions.

25 Q Did you notice when it was that the

1

2

emergency feedwater pumps had first come on?

3

A No.

4

5

Q When you learned that the valves were closed, did you look at the board to try to

6

determine when the pumps had first come on?

7

MR. SELTZER: Objection; no foundation.

8

9

Q Did you take any steps to try to

determine when the pumps had first come on?

10

A Working only on recollection now,

11

I don't remember going over there, but other people

12

have testified that I did.

13

Q What is your recollection now as to

14

whether, once you learned that the 12's were closed,

15

you made any effort to determine when the pumps

16

had first come on?

17

A I said I don't recall going over there

18

now, but other people tell me that I did.

19

Q What point in time?

20

MR. SELTZER: He just said he doesn't have

21

a recollection.

22

Q Let's go back to your answer before

23

when you said that the increase in volume -- you

24

attributed the increased pressurizer level to

25

an increase in volume of water in the reactor

1  
2 coolant system, right?

3 MR. SELTZER: What point in time?

4 MR. FISKE: The time he saw the increase  
5 in pressurizer level. Withdrawn.

6 Q You said that after you learned that  
7 the 12's had been closed for a period of time and  
8 that there had been no emergency feedwater to the  
9 steam generator, you said that that helped you  
10 understand why the pressurizer level had gone up  
11 because it indicated to you that there had  
12 been an expansion of water in the primary system,  
13 partly as a result of a lack of emergency feedwater  
14 to the steam generators, correct?

15 MR. SELTZER: No. He also said he  
16 had been adding water to the system.

17 MR. FISKE: I said "partly."

18 Let me just ask the questions.

19 MR. SELTZER: All you are doing is  
20 regurgitating what we already spent the  
21 morning trying to get out. Let's go on to  
22 something new.

23 MR. FISKE: I am trying to lay a predicate  
24 for the next question.

25 MR. SELTZER: I want it to be a

1  
2 complete predicate then.

3 MR. FISKE: My question stands.

4 Would you read it back.

5 (Record read back.)

6 A Yes.

7 Q And you knew, as you testified before,  
8 that an expansion of water in the reactor coolant  
9 system was inconsistent with a cooldown, isn't  
10 that correct?

11 MR. SELTZER: I object. This is  
12 asked and answered. You are going over the  
13 same territory again.

14 MR. FISKE: You are just slowing us  
15 down with that.

16 MR. SELTZER: I object also to your  
17 interrupting me while I am in the middle of  
18 talking. I don't interrupt you, and your  
19 partner, Bob Wise, gets positively  
20 vituperative if he thinks I am interrupting  
21 him.

22 MR. FISKE: Go ahead.

23 MR. SELTZER: Mr. Frederick already said  
24 that it is not inconsistent with a cooldown,  
25 that his understanding was that there was a

cooldown and then a subsequent heatup.

MR. FISKE: Why don't you let me ask the questions instead of trying to interject and bail out the witness every time we get to something important?

MR. SELTZER: I think it is you who needs to be bailed out. If you would stop asking the same questions over and over again.

MR. FISKE: I think Mr. Frederick is fully capable of understanding my questions. He doesn't need you to keep butting in and rephrasing prior answers that he has given.

MR. SELTZER: I am not rephrasing. I am giving them to you almost verbatim.

MR. FISKE: Repeat the question.

(Record read back.)

A You are asking if I thought about this while this was occurring?

Q Yes. That was a basic understanding that you had at that time, was it not, from your knowledge of the way the system worked?

A I think I already said that I expected when the system cooled down it would contract, and when it heated up it would expand, and that was



2 consistent with what I understood.

3 Q So to the extent during the first few  
4 minutes of the trip there had been no emergency  
5 feedwater and that that had the effect of producing  
6 an expansion in the reactor coolant system water,  
7 that was inconsistent with a cooldown, isn't that  
8 correct?

9 A No. The thought process I was going  
10 through then was not a review of the first few  
11 seconds of the trip. I was thinking about where we  
12 are now and how the loss of feedwater has explained  
13 the solid or near full pressurizer that I had.

14 Q When you learned that there had been  
15 no emergency feedwater, you were making an effort  
16 to analyze what impact that fact had had on the  
17 early minutes of the accident, were you not?

18 A Only in the time from when I noticed  
19 that we were filling rather quickly until a few  
20 minutes later when we were actually full. I explained  
21 that slope on the graph, pressurizer level graph,  
22 by the fact that we had had a heatup. The cooldown  
23 that we had prior to that doesn't enter into that  
24 thought process.

25 Q Is it your testimony that knowing that

2 there had been no emergency feedwater during this  
3 entire period of time in the first few minutes of  
4 the accident and going through a thought process  
5 that that loss of emergency feedwater contributed  
6 to an expansion of water in the reactor coolant  
7 system during some part of that time creating an  
8 increase in the pressurizer level, that you gave  
9 no thought to the fact that that same loss of  
10 emergency feedwater that would have -- that might  
11 have that same effect in other portions of the early  
12 minutes of the accident making the early minutes  
13 of the accident inconsistent with a cooldown?

14 MR. SELTZER: When you say "other  
15 portions," what portions are you referring to?

16 MR. FISKE: Mr. Frederick said that he  
17 applied the lack of emergency feedwater to the  
18 period of time in the first few minutes of the  
19 accident when he saw the pressurizer level  
20 beginning to rise, and he attributed that rise  
21 in pressurizer level to an expansion of the  
22 reactor coolant system water, attributable in  
23 part to the loss of emergency feedwater.

24 I am asking him did he attribute -- did  
25 he try to attribute that loss of emergency

2 feedwater and the impact of it to the portion  
3 of the accident sequence before the time that  
4 the pressurizer level began to rise.

5 A In my mind, I was already satisfied as  
6 to how I understood the sequence at that time.  
7 We had a reactor trip; somewhere after that, we  
8 lost normal feedwater, and some time after that  
9 the steam generator boiled dry; and then we noticed  
10 that there was no feedwater; so in the time in my  
11 mind, looking back over the few seconds that had  
12 gone by since the reactor trip, because that is  
13 all it seemed like to me, all those three things  
14 had happened and for a very short time we had been  
15 without any feedwater at all, and that is what I  
16 attributed to the rapid rise in pressurizer level  
17 and then the solid or near solid condition I was  
18 observing.

19 Q You learned something new when you  
20 learned that those 12's were closed, right? That  
21 is something that you hadn't known earlier in the  
22 accident, right?

23 A Yes.

24 Q When you learned that new fact, did you  
25 make any effort when you were analyzing the impact

2 of that new fact on pressurizer level, did you also  
3 make any effort to analyze the impact of that  
4 fact on the drop in pressure in the early minutes  
5 of the accident?

6 A The drop in pressure was explained by  
7 the trip. The fact that the pressurizer level came  
8 up and the pressure didn't, I didn't apply that  
9 to the emergency feedwater. The injection  
10 system had put a lot more water in the system, so  
11 the pressurizer was cooled down, and it wasn't  
12 capable of maintaining a high pressure any more.  
13 You have to heat it back up.

14 Q Is it your testimony then that at no  
15 time after you realized that there had been no  
16 emergency feedwater during the first few minutes  
17 of the accident, that at no time did you make any  
18 effort to analyze the impact of that on the drop  
19 in pressure?

20 A The emergency feedwater condition  
21 entered into my thought process as explaining  
22 one of the parameters I was viewing.

23 The other parameter that I was viewing,  
24 which was the pressure, was explained by the  
25 pressurizer level. There was no reason to apply  
emergency feedwater to the pressure.

2 Q Did you stop and think whether or not  
3 the drop in pressure could be due to a cooldown in  
4 light of the fact that there had been no emergency  
5 feedwater going into the steam generators from the  
6 time the reactor tripped?

7 MR. SELTZER: No new feedwater?

8 MR. FISKE: No new feedwater.

9 A The initial drop in pressure was caused  
10 by the cooldown. I already explained that. What we  
11 are talking about is six or seven minutes into it,  
12 what is causing the pressure, right?

13 Q No, I am asking you, once you learned  
14 that the 12's had been closed, did you make any effort  
15 to determine whether or not the initial drop in  
16 pressure was caused by a cooldown in light of the  
17 fact that from the time the reactor trip occurred  
18 on, there had been no new feedwater going into the  
19 steam generators?

20 A You don't understand. It is not the  
21 feedwater that cools down the reactor coolant  
22 system. It is the steam flow through the safety  
23 valves. That is what is causing the cooldown. The  
24 fact that we are not putting any feedwater in there  
25 has little effect. You are removing 100 percent

1  
2 power and you have zero percent production. So,  
3 therefore, it is going to cool down.

4 Q Is it your testimony that at no time  
5 during the first eight minutes of the accident did  
6 you look at the gauge that reflected reactor  
7 coolant system temperature to determine whether in  
8 fact there had been a cooldown at the time pressure  
9 was dropping?

10 A No, I don't think I ever testified  
11 that I never looked at it. The gauge that I would  
12 have looked at may not be the one you are talking  
13 about. The primary indicator for T-Av is the  
14 digital indicator, and I don't recall taking the  
15 time to pull the graph out of the panel which  
16 indicates the time history of T-Av. I would look  
17 at the two-inch digital gauge.

18 Q My question is, did you make any effort  
19 after you learned that the 12's had been closed or  
20 at any time up to that point to determine what  
21 the temperature had been at the time that pressure  
22 dropped to the point where HPI became actuated?

23 A I don't have a specific recollection  
24 of looking at the gauge, but since I usually did  
25 look at the gauge, I can't say that I did not.

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Q Let me go back to some questions that we were asking yesterday about HPI coming on after reactor trips. That is the subject. I think the exhibit that was marked from the Rogovin report reflected I believe a total of 19 or 20 reactor trips at Unit 2 in the year before the Three Mile Island accident.

Is it correct that you can have a reactor trip on high pressure and you can also have a reactor trip on low pressure?

A Yes, there are eight things that will cause the reactor to trip.

Q And one of them is if pressure falls below a certain level? The normal operating pressure is 2155?

A Yes.

Q And if the pressure drops down to some level below that, it will cause a reactor trip, right?

A There are two separate low-pressure trips.

Q What is the pressure level for those?

A One is called the variable low-pressure trip and it is figured out by the computer. It is



2       figured out and it varies up and down the scale.  
3       The other is 1900 pounds.

4           Q       Conversely, if the pressure increases  
5       above 2155 to a certain level, that will cause a  
6       trip on high pressure, right?

7           A       Yes.

8           Q       What is that set point?

9           A       2355.

10          Q       HPI is actuated at 1600, approximately,  
11       right?

12          A       Yes.

13          Q       In any of your training at Met Ed on  
14       any of these 20 reactor trips, did anyone ever try  
15       to explain to you whether there was any more  
16       likelihood of HPI coming on when there had been  
17       a reactor trip at low pressure than there was if  
18       there had been a reactor trip at high pressure?

19          A       No, the training that I received on  
20       how to respond to a reactor trip, using the  
21       procedure doesn't differentiate as to what causes  
22       the trip. You respond to them all exactly the same  
23       way.

24          Q       You had no understanding from anything  
25       you learned at Met Ed before the accident that

1  
2 there was any more likelihood or less likelihood  
3 of automatic HPI in a high-pressure trip than in  
4 a low-pressure trip?

5 MR. SELTZER: That is the opposite of  
6 what your last question was.

7 MR. FISKE: Read it.

8 (Record read)

9 A No, I don't think that accurately  
10 represents my understanding. I can understand  
11 that if there is a transient occurring that is  
12 driving pressure down, you are more likely to have  
13 HPI. If you are discussing a scenario in which  
14 low pressure is going to be the cause of the trip,  
15 we had discussed things like that prior to the  
16 accident.

17 Q Automatic HPI on a high-pressure trip  
18 would be a more unusual event than automatic  
19 actuation on a low-pressure trip?

20 A No, I don't think I said unusual or  
21 usual. What I said was that I can understand that  
22 a low-pressure transient could easily cause  
23 high-pressure injection to be turned on  
24 automatically. It would just require a few extra  
25 steps to get there in a high-pressure transient.

1  
2 Q In other words, it would -- there  
3 would be a -- there would have to be a significantly  
4 greater drop in pressure from a high pressure  
5 reactor trip than there would be from a low  
6 pressure reactor trip in order to actuate HPI?

7 MR. SELTZER: I don't know what your  
8 definition of "significant" is, but he  
9 already testified as to what the numbers are.

10 Q In the low pressure trip, the pressure  
11 would have to fall approximately 300 pounds per  
12 square inch, and in a high pressure trip it would  
13 have to fall more than 700 pounds, correct?

14 MR. SELTZER: You are just assuming  
15 low pressure trip in 1900 pounds, not a  
16 variable low pressure trip which could be at  
17 a pressure other than 1900 pounds.

18 MR. FISKE: I am talking of the 1900  
19 pounds, yes.

20 A That is not the way I was thinking about  
21 it. Actually, they are only slightly more than  
22 300 pounds apart, the starting point that you are  
23 talking about, 1900 and 2355, so that to me isn't  
24 very much difference, because it is less than 12  
25 percent of the whole scale.

2 Q But the drop is more than double, is  
3 it not?

4 A You are asking me about my understanding.  
5 I was picking a starting point and comparing the  
6 two starting points, and if I can develop a scenario  
7 that would get me to HPI, I could do it with either  
8 one.

9 Q It is a fact, is it not, that the loss  
10 of any feedwater to the steam generators for the  
11 first eight minutes of this accident had left the  
12 steam generators in an abnormal condition?

13 A A loss of feedwater to the steam  
14 generators is an abnormal condition?

15 Q Had left the steam generators in an  
16 abnormal condition.

17 A A loss of feedwater was an anticipated  
18 transient. The blockage of emergency feedwater was  
19 an unanticipated transient. In that way.

20 Q And you concluded, did you not, that  
21 the steam generators in fact had boiled dry?

22 A No.

23 Q You never reached that conclusion at any  
24 time during the accident?

25 A Later on -- by "later on," I mean after

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this point at which I was made aware of the loss of emergency feedwater -- I engaged in some discussion with Mr. Faust as he was having his difficulties getting the system back in automatic, and he was trying to decide whether the steam generators had boiled dry or how he could conclude that decisively one way or the other, so in that way we did think about that a few minutes later.

Q And you knew at that point that there had been a sharp drop in pressure in the steam generators and also a drop in level, isn't that correct?

A The drop in level is a normal indication of transferral of controls of the emergency feedwater system. That is what we were watching to make sure that the emergency feedwater system was working. I don't recall a sharp drop in pressure.

Q I am talking about a drop in pressure right from the time that the accident started.

MR. SELTZER: What is your question?

Q Is it your testimony that you weren't aware of any drop in pressure at that time?

A At the onset of the transient?

Q Yes.

1  
2 A Pressure went up. That is why the  
3 safety relief valves opened.

4 MR. SELTZER: I think you have to be  
5 clear.

6 Are you talking of steam generator  
7 pressure?

8 MR. FISKE: Yes.

9 MR. SELTZER: I don't think there is  
10 any foundation that Mr. Frederick was in a  
11 position to be monitoring steam generator  
12 pressure.

13 MR. FISKE: I am just asking him.

14 Q Is it your testimony that you were not  
15 aware of any drop in steam generator pressure in  
16 the early minutes of the accident?

17 A I thought that you were talking about  
18 the onset of the transient where the turbine trip  
19 occurred and the steam generator pressure went up.  
20 That was the onset of the accident.

21 Q After the reactor trip, did you become  
22 aware that there was a drop in steam generator  
23 pressure?

24 A As far as I know, the steam pressure  
25 remained at a thousand to 1100 pounds for quite some

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time.

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Q I show you a document which has previously been marked as B&W 266, which is a graph submitted by GPU to the NRC as part of the LER on this transient, and this graph reflects the steam generator pressure and level. The steam generator pressure is reflected by the dash-dot line for steam generator A and the dash line for steam generator B.

Do you see the dash-dot line and the dashed line on this chart?

MR. SELTZER: Do you want to ask him first whether he has ever seen this chart before?

MR. FISKE: Not particularly.

A I see the dash-dot line and the dash line.

Q Is it correct that those two lines show on this graph a drop in pressure from above a thousand pounds per square inch down to below 500 pounds per square inch for the period of time from approximately one minute to seven and a half minutes?

A No.

MR. SELTZER: I object. The document



1  
2 speaks for itself.

3 A The characterization is incorrect.

4 Q How is it incorrect?

5 MR. SELTZER: I object.

6 The witness has not even been asked  
7 to testify if this is a document that he ever  
8 saw before.

9 To call him as an expert to help you  
10 read a document that he perhaps has never seen  
11 before is entirely inappropriate.

12 Q During the course of the first ten  
13 minutes of the accident, were you aware of a drop  
14 in pressure in the steam generators as reflected on  
15 this graph?

16 A No. This graph shows a drop from just  
17 above a thousand pounds to just below normal  
18 operating pressure down near 800 pounds, and then  
19 returning back to the post-trip set point, and I  
20 wouldn't say that this was a console indication or  
21 that it is representative of what is displayed on  
22 the console.

23 Q Is it your testimony that during the  
24 first ten minutes of the accident, you were not  
25 aware of any drop in pressure in steam generators

1  
2 from a thousand pounds down to the range of 800  
3 pounds?

4 A I was only aware of it through what  
5 Mr. Faust would have been telling me from his  
6 position at the feedwater steam generator controls,  
7 and as we already established, I was on the other  
8 side of the room.

9 Q So based on your understanding of the  
10 system on the day of the accident, would you have  
11 expected a drop in pressure in the steam  
12 generators to have resulted from the fact that  
13 there was no emergency feedwater going into the  
14 generators during the first eight minutes?

15 MR. SELTZER: Would he have expected a  
16 drop in what?

17 MR. FISKE: Pressure.

18 A I understood that we would see a decrease  
19 in steam generator pressure if the steam generator  
20 actually boiled dry. And that there was a place for  
21 the steam to go.

22 In other words, you have to exhaust the  
23 water supply in the steam generator and then have  
24 a place to vent off the pressure due to that boiling  
25 and then the pressure would go down. I had no idea

how fast it would go down or how it would recover.

Q You did become aware during the course of the accident sequence that the pressure came back up again after the 12's had been opened, isn't that right?

MR. SELTZER: Objection. I don't think you have established a foundation that he knew the pressure had gone down, so to ask him "Did you know that it came back up" lacks foundation.

Q Did you understand at any time in the first ten minutes that the steam generator pressure was anything other than normal?

A During the time this was occurring, I was not specifically made aware of -- I don't recall being aware of -- the numerical value of the pressure.

Mr. Faust was having some problems with both the level and the pressure as a result of the emergency feedwater situation, and he was informing me about it. He was talking to me as we were trained to do, to talk back and forth and keep each other informed, so that was the only sense in which I was aware of what was going on over there.

1  
2 He asked me questions or gave me  
3 information, and, again, as I have said several  
4 times before, this was only a very short time  
5 to me. I felt only less than a minute had  
6 gone by since the trip.

7 Q There came a time after the 12's had  
8 been opened when Mr. Faust was making efforts to  
9 try to get the steam generators stabilized, right?

10 A Yes, as I remember, it was a large  
11 piece of time.

12 Q And there was a time when you and he  
13 concluded that in fact the steam generators had  
14 been returned to a stable condition, isn't that  
15 right?

16 A Again, I don't recall any specific  
17 discussions with Mr. Faust. He has told me that  
18 I went over there and talked to him about it, but  
19 I don't recall that.

20 Q You did come to the conclusion, did you  
21 not, at some point during the accident based on your  
22 discussions with Mr. Faust or on whatever  
23 observations you made yourself that the steam  
24 generators had come back to a stable condition?

25 A Yes, it was my impression that this upset

1  
2 with emergency feedwater had lasted a short time,  
3 a few minutes or so, and then we were back to normal.

4 Q Let me just show you the graph again  
5 that is Exhibit 266.

6 Do you have the other one that is 268?

7 MR. SELTZER: If you give it to us, we  
8 will.

9 Q Looking at Exhibit 266 and on the  
10 right-hand side of the page, when you see the two  
11 lines for dash-dot and dash showing steam  
12 generator pressure at approximately 30 minutes --

13 A On the first graph?

14 Q Yes, Exhibit 266.

15 A Yes, I see them.

16 Q -- is pressure for the steam generator  
17 in that range considered to be normal, within normal  
18 limits?

19 A The normal pressure should be 1,010  
20 pounds. They are near that. They are within 50  
21 pounds of it. I don't recall that there is a  
22 window, a range.

23 Q Looking at the second graph, Exhibit  
24 268, which shows a pressure over time for the first  
25 120 minutes of the accident, looking at the period

1  
2 of time from, let's say, 20 minutes to about an  
3 hour, the steam generator pressures for both  
4 generators are in the vicinity of 940 pounds or  
5 above.

6 MR. SELTZER: On the graph, there are  
7 supposed to be two lines, one solid and one  
8 dashed. Yet it looks like at the start there  
9 are four lines. Which of the lines are  
10 you referring to and why are there more  
11 lines than should be indicated?

12 MR. FISKE: This is a GPU document.  
13 All I can go by is what it says at the top,  
14 steam generator A steam pressure is a  
15 solid line, and steam generator B pressure is  
16 a dashed line.

17 MR. SELTZER: I wonder whether in the  
18 photocopying of this, the sheet underneath  
19 bled through to create a shadow of an  
20 impression of another graph.

21 MR. FISKE: I am only asking Mr.  
22 Frederick about the dashed line and the solid  
23 line in the period from about 20 minutes to  
24 about 60 minutes.

25 (Continued on next page)



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BY MR. FISKE:

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Q Do those reflect pressures for the  
steam generators 940 pounds or above?

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MR. SELTZER: I object. No foundation  
that the witness has seen this chart before  
or on the day of the accident he was familiar  
with this data since it was Faust who was  
standing in front of the secondary side  
panels. Nor has Mr. Frederick prepared this  
chart. It speaks for itself.

Q Did it come to your attention in any  
way during the period between 20 minutes to 60  
minutes into the accident that the steam generator  
pressures were not within normal limits?

A. The only way that I recall receiving  
information about this is Mr. Faust telling me what  
he was seeing on the panel. I don't at this time  
recall exactly what he said, but he said he was  
having trouble with pressure and trouble with  
level. Whether that happened in the 20- to 60-  
minute time frame that you are talking about, I  
don't recall.

(Discussion off the record between the  
witness and his counsel.)



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Q Looking at this graph, which shows pressure for both steam generators during that period of time as being above 940 pounds per square inch, does that refresh your recollection that Mr. Faust was not having trouble with steam generator pressure during that period of time?

MR. SELTZER: What period of time?

MR. FISKE: The period from 20 minutes to 60 minutes.

A No, this graph, with its apparent inconsistencies and my inability to match up all the information you are showing me here, doesn't refresh my recollection about what Mr. Faust was saying at all.

Q What are the inconsistencies on this graph?

A Just looking at it quickly, you can see at the 30-minute mark, B generator was at something between 950 and a thousand, and the A generator was above a thousand. Here they both look like they are near 940. There is a 60 pounds difference somewhere.

Q Do any of those pressures indicated that you just read off for those time periods

1  
2 indicate to you or refresh your recollection that  
3 Mr. Faust said that he was having trouble with the  
4 steam generator pressures during that time period?

5 MR. SELTZER: Objection. The witness  
6 didn't indicate that he had any problems with  
7 his recollection or that it needed refreshing.

8 Q You can answer the question.

9 MR. SELTZER: He already testified that  
10 he has a recollection about what Faust was  
11 telling him.

12 MR. FISKE: But he testified he didn't  
13 remember during what time period that was.  
14 I am trying to show him these GPU graphs  
15 showing what the pressures were in an effort  
16 to perhaps refresh his recollection as to  
17 during what time period Mr. Faust said he was  
18 having trouble with the steam generator  
19 pressures.

20 A These graphs aren't helping my  
21 recollection at all. I would venture to guess that  
22 these are B&W reactimeter data and not GPU graphs  
23 as you stipulated.

24 Q I will tell you, just to clear that up,  
25 these are graphs submitted by GPU to the NRC as

2 part of the official LER for this accident.

3 MR. SELTZER: They could still have  
4 been prepared from a B&W-supplied and  
5 installed and maintained reactimeter.

6 MR. FISKE: Wherever they came from,  
7 GPU obviously endorsed them when they  
8 submitted them to the NRC as their official  
9 record of this accident.

10 MR. SELTZER: GPU relied on a lot of  
11 things that they have come to regret.

12 MR. FISKE: I think we'll stand on the  
13 fact that if GPU was ready to submit B&W  
14 data to the NRC as their official record of  
15 this accident in September 1980, that we can  
16 all draw appropriate conclusions as to the  
17 significance of that. If GPU chose to rely  
18 on B&W a year and a half after the accident,  
19 we'll all draw the appropriate inferences  
20 from that.

21 BY MR. FISKE:

22 Q Let me just see if we can move this  
23 along. Go back to the transcript of your interview  
24 with the President's Commission people on May 10,  
25 1979.

1  
2 I direct your attention to page 31,  
3 the middle of the page. This is referring to a  
4 period of time after you discovered that the 12's  
5 had been closed. I will just read part of your  
6 answer on that page and over to the next page.

7 "Mr. Frederick: I stayed monitoring  
8 the primary plant to see if anything had changed  
9 that would give me a clue as to what was going on.  
10 Everything remained the same. The pressurizer  
11 stayed full. The temperature stayed high, and the  
12 pressure stayed low, and I couldn't change  
13 anything. I couldn't get control. I was waiting  
14 for them to get control of the generator to bring  
15 the pressure back up, to stop the rapid cooldown  
16 that we were seeing.

17 "Ms. Dicker: How long were you waiting?  
18 You say 'a long time.'

19 "Mr. Frederick: This was a half hour  
20 or more, okay? It wasn't until a half hour or  
21 more, a quarter to five or five o'clock or  
22 something that they did stabilize the generators  
23 and it had little or no effect on my side of the  
24 plant. So we are now in a position where our first  
25 assumption of the generators wasn't our problem.

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2 That was wrong. There was something else wrong,  
3 so what we wanted to try to do was eliminate  
4 variables here and there. We were trying to  
5 pinpoint where the problem actually was."

6 Did you give that statement to the  
7 representatives of the President's Commission on  
8 May 10?

9 MR. SELTZER: This last sentence you  
10 left out was "We didn't have any direct  
11 indication of what was causing our low  
12 pressure; I don't know."

13 MR. FISKE: That's right.

14 Q Do you remember making that statement  
15 to the representatives of the President's  
16 Commission?

17 A No, but it does reflect the time  
18 confusion I was having. I didn't know whether 15  
19 minutes or a full hour had gone by at this point,  
20 and this is May 10.

21 Q So you did make this statement on May  
22 10?

23 A I don't remember making it.

24 Q You are not telling us now that you  
25 didn't, are you?

2 A No, I just don't specifically recall.

3 Q There was a time then, was there not,  
4 during the accident sequence when you learned that  
5 you did not have a problem with the steam  
6 generator?

7 MR. SELTZER: Say that again.

8 Q This statement says, "It wasn't until  
9 a half hour or more, a quarter to five or five  
10 o'clock or something that they did stabilize the  
11 generators and it had little or no effect on my  
12 side of the plant, so we are now in a position  
13 where our first assumption of the generators  
14 wasn't our problem. That was wrong. There was  
15 something else wrong."

16 All I am asking you is, there was a  
17 point in time in the accident sequence when you  
18 came to the conclusion that if you had thought  
19 there was something wrong with the steam  
20 generators, that that assumption had been wrong,  
21 that the problem was somewhere else?

22 A I don't remember coming to the  
23 conclusion that there was something else wrong. I  
24 do remember that after this time went by, whether  
25 it was 15 minutes or an hour or more or five



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o'clock, somewhere along the line I began to think that the steam generator was stable enough that it was in a normal configuration.

The other conclusions were not conclusions I was making before the accident. These are other conclusions.

Q Let me read you testimony from the Udall hearings, page 133.

MR. FISKE: We'll mark that as B&W 662.

(Page 133 from the Udall hearings marked B&W Exhibit 662 for identification, as of this date)

Q I direct your attention to page 133.

MR. SELTZER: Take a moment to read the surrounding testimony.

Q I am reading a paragraph from the answer that you gave in the middle of the page on page 133.

"When we got the steam generators stabilized as far as level and feed rate, the steam generators seemed to be masking what was going on in the pressure cooling system. For the next hour or so, we worked on trying to stabilize the steam generators, which we finally did about 50 minutes in or so. We eliminated the steam



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generators as being the cause of our problem."

Do you see that statement?

A Yes.

Q Does that refresh your recollection that in or about 50 minutes into the accident, you eliminated at that point anyway the steam generators as being a cause of the problem?

A No, this is just a summary that I gave to somebody. It definitely includes postaccident conclusions. It doesn't reflect my recollection today of this situation we are discussing at all.

Q Is it your recollection today that you did not eliminate the steam generators as being the cause of the problem in or about 50 minutes into the accident?

MR. SELTZER: Are you implying that at 50 minutes into the accident Mr. Frederick still thought that there was a problem?

MR. FISKE: No, I am implying just the opposite. I believe what he said to the Udall committee was that 50 minutes or so into the accident, they had eliminated the steam generators as being the cause of the problem.

MR. SELTZER: So you are not implying

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2 that there is any other ongoing problem at  
3 the time they solved the steam generator  
4 problem. That is not part of your question  
5 to imply that?

6 MR. FISKE: My question is what it is.

7 MR. SELTZER: I thought it was  
8 ambiguous. Your saying it is exactly what it  
9 is doesn't resolve the ambiguity.

10 MR. FISKE: Would you read back the  
11 question?

12 (Record read)

13 A It is not my recollection that I made  
14 that conclusion in or about 50 minutes. It doesn't  
15 seem consistent with my recollections or the graphs  
16 that you showed me that we were stable in just ten  
17 minutes. It doesn't give me any new recollections  
18 or anything.

19 Q Do I understand your testimony to be  
20 that your present recollection is that you may have  
21 concluded that there was no problem with the steam  
22 generators at some point earlier than 50 minutes  
23 into the accident?

24 A No, I can't say that, because we  
25 continued having other steam generator problems for

1  
2 several more hours. We even isolated one at 5:30.

3 Q I understand that there were later  
4 events and we'll get to them later. Indeed, I  
5 tried to make that clear in one of my questions  
6 before. I am only talking about this period of  
7 time now from the time that the reactor trip  
8 occurred up to this particular point in time that  
9 you were discussing in your testimony before the  
10 Udall committee, and I understand that at some  
11 later period in time, indeed it is reflected on  
12 the graph, there were some other problems with the  
13 steam generators. I am not getting to those yet.  
14 I am talking just of the earlier period. Do you  
15 understand that?

16 A Yes. My problem all along has been to  
17 separate the times that we are talking about, and  
18 because of the time confusion that I was having  
19 during this accident in the first couple of hours,  
20 I just can't separate the events any more.

21 Q That is why I thought it might be  
22 helpful to go back to testimony you gave only a few  
23 weeks after the accident when presumably your  
24 recollection of what had happened during the  
25 accident sequence may have been a little fresher

2 than it is today, three years later. I am just  
3 going to this question or this answer that you gave  
4 to the Udall committee, which says

5 "For the next hour or so, we worked on  
6 trying to stabilize the steam generators, which we  
7 finally did about 50 minutes in or so. We  
8 eliminated the steam generators as being the cause  
9 of our problem."

10 I am simply asking you now, isn't it a  
11 fact that at some point up to 50 minutes into the  
12 accident and maybe it was less than 50 minutes, you  
13 had come to the conclusion --

14 MR. SELTZER: Maybe even ten minutes.

15 Q -- you had come to the conclusion at  
16 that point that the steam generators were not the  
17 cause of your problem?

18 MR. SELTZER: When you say "your  
19 problem," what problem are you referring to?

20 MR. FISKE: I am referring to the same  
21 problem that Mr. Frederick was referring to  
22 in his statement to the Udall Committee when  
23 he said, "We eliminated the steam generators  
24 as being the cause of our problem."

25 MR. SELTZER: Why don't you establish

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2 then as a foundation that he recalls this  
3 testimony, and if he does, what was the  
4 problem he was referring to in this testimony.  
5 Otherwise, I object. No foundation what  
6 problem you are referring to.

7 MR. FISKE: Could you read back the  
8 last question?

9 (Record read)

10 MR. SELTZER: Are you going to ask him  
11 what the problem is that is referred to here  
12 and whether he recalls this testimony?

13 MR. FISKE: I will let him answer the  
14 question I requested.

15 A I don't recall when or if I made the  
16 conclusion that you are referring to. It is  
17 unfortunate that you are using this particular  
18 section of testimony to try and refresh my  
19 recollection, because this testimony is not based  
20 on recollections. This is a summary, which  
21 includes many conclusions that I made after the  
22 accident, and it is not really things that I  
23 remembered. So I am not going to be able to  
24 remember now either.

25 (Continued on next page)

2 BY MR. FISKE:

3 Q I take it then, even by that answer,  
4 tht within six weeks or so after the accident, you  
5 had learned that during the accident sequence the  
6 steam generators had been eliminated as being the  
7 cause of a problem within 50 minutes or so after  
8 the accident started?

9 A No, I can't say that I learned that.  
10 The problem referred to higher up on the page is  
11 that we were generating steam, and that was  
12 certainly caused at least in part by the loss of  
13 heat sync.

14 Q You said to the Udall committee, "For  
15 the next hour or so, we worked on trying to  
16 stabilize the steam generators, which we finally  
17 did about 50 minutes in or so. We eliminated the  
18 steam generators as being the cause of our problem."

19 Who were you referring to when you used  
20 the word "we" in those sentences?

21 A Everybody that was in the control room,  
22 mostly Mr. Faust.

23 Q Including yourself?

24 A In the summary statements I was using  
25 in this testimony, I think that I was including



1  
2 myself in the group that was in the control room.  
3 Whether I actively participated in discussions or  
4 made conclusions, it is certainly not stated in  
5 this portion of the testimony.

6 (Recess taken)

7 BY MR. FISKE:

8 Q Let me go back to this answer that we  
9 were looking at before that you gave the Udall  
10 committee back in May 1979. In the sentence, in  
11 the paragraph immediately before the one I read a  
12 minute ago, you say, "But we attributed the low  
13 pressure to the problems he was having with the  
14 steam generators."

15 Do you see that statement?

16 A Yes.

17 Q "We" in that sentence refers to you,  
18 among others?

19 A I would only be assuming what it means  
20 now. I don't recall even saying it.

21 Q The fact of the matter is, you were  
22 aware of the fact in the first 50 minutes of the  
23 accident that you had a low reactor coolant system  
24 pressure, isn't that correct?

25 A Again, tacking on the 50-minute



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qualifier, I wasn't really aware of the time until after the accident we analyzed how much time had gone by in each one of these incidents. I had looked at the pressure indicator several times, and I knew that the pressure was low. Whether it was 50 minutes or not, I can't say.

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Q Was there any time during the accident sequence in the first two hours when you felt that pressure was at a normal level?

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A I remember feeling that it was under control. The fact that it was not in the normal window was a consideration.

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Q Isn't it a fact that at some point you were attributing the low pressure that you were seeing on the reactor coolant system to possible problems in the steam generator?

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A No, the connection I made was between the pressurizer level and the emergency feedwater situation.

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Q When you said to the Udall committee, "We attributed the low pressure to the problems he was having with the steam generator," who was the "he" in that sentence?

25

A I think I said I don't remember saying

2 this. I can say now that the "we" was probably  
3 everybody except the "he" who I assume was Craig, but  
4 I don't even remember saying this.

5 Q Isn't it a fact that during this period  
6 of time between 4:30 and 5:00 o'clock, you did not  
7 see symptoms on the steam generator side of the  
8 plant sufficient for you to conclude that you had  
9 in fact a steam line break?

10 MR. SELTZER: Objection. No foundation  
11 that Mr. Frederick was aware of symptoms  
12 on the secondary side since he testified and  
13 he drew you a picture where he was standing  
14 observing the primary side.

15 MR. FISKE: I think if you listen to  
16 the question, you should not have any  
17 problem.

18 (Record read)

19 A I remember that we considered the  
20 possibility of a steam line break sometime during  
21 the morning, but again I can't isolate it to any  
22 given time frame.

23 Q And the fact that you told the Udall  
24 committee that you had eliminated the steam  
25 generators as being a cause of our problem 50

2 minutes in or so," does not help you today to  
3 remember when it was that you reached that  
4 conclusion?

5 A In the paraphrase of my testimony that  
6 you just gave me, are you saying that the problem  
7 that I was referring to here was a steam leak?

8 Q I am asking you whether, isn't it a  
9 fact that between 4:30 and 5:00 o'clock in that  
10 period of time, you did not see symptoms in the  
11 steam generators that would lead you to believe  
12 that there was a steam leak?

13 MR. SELTZER: I object. Asked and  
14 answered. He said it was considered sometime  
15 in the morning, but he couldn't specify what  
16 time.

17 A That is the answer I gave before, yes.

18 Q Did you understand before the accident  
19 that steam generator pressure in the normal range  
20 was inconsistent with a steam line break?

21 A No. My understanding then is as it  
22 is now, that a steam line break of up to a certain  
23 size will be manageable in the steam pressure  
24 control system. In other words, if the steam leak  
25 is not of the size described in the accident

2 analysis in the FSAR, smaller than that, some  
3 degree, you will be able to control the system  
4 pressure in spite of the leak.

5 Q In other words, your testimony is that  
6 a small steam line break was consistent with normal  
7 steam generator pressures?

8 A I understood that we could have a steam  
9 line break and still maintain system pressure at  
10 the posttrip level.

11 Q In the case of a break size that you  
12 described earlier?

13 A Again, I don't recall any specific  
14 break size. It was just I would think something  
15 smaller than a turbine bypass valve opening or one  
16 or two turbine bypass valves.

17 Q Did you understand that having  
18 temperature in the normal range was inconsistent  
19 with a steam line break?

20 A Are we talking now about reactor  
21 coolant system temperature?

22 Q Yes. T-Av.

23 A Again, it depends on the size of the  
24 steam leak. You can control temperature with the  
25 bypass valves or with a leak and the bypass valves.

2 It all depends on the size of the leak.

3 Q Were you aware that there were unique  
4 symptoms in the LOCA and steam line break  
5 procedures for identifying a steam line break?

6 MR. SELTZER: What does that mean?

7 Unique?

8 MR. FISKE: I think I am using the  
9 words the procedure used.

10 A I think you and I discussed that last  
11 week with the LOCA procedure.

12 Q Yes.

13 A Certain unique symptoms listed in the  
14 LOCA procedure.

15 Q Yes, certain symptoms that were unique  
16 to a steam line break, correct.

17 A I think there were three different  
18 symptoms.

19 Q For a steam line break?

20 A For three different types of -- unique  
21 symptoms to separate you from three different  
22 types of transients.

23 Q And for the steam line break, weren't  
24 there three symptoms in the procedure that were  
25 described as being unique to a steam line break?

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A I don't recall how many there were. I think we already discussed each one of them.

Q Feedwater latch system actuation? That was one, was it not?

A That was one what?

Q That was a symptom unique to a steam line break?

A It was a symptom listed as being an additional symptom that one could use to help differentiate between those three types of incidents, but I think we explained as we discussed the LOCA procedure, in my mind none of those symptoms is unique to a given transient unless a conclusion has been made, and all you are trying to do is look for supportive evidence.

Q Did you see any feedwater latch actuation in the first hour of this accident?

A I am not aware that a feedwater latch occurred.

Q Another symptom that is described as being unique to a steam line break was a low hot well level. Do you remember that?

A Again we discussed that one in the same way. It may not be unique to a steam line break.

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Q But it is a symptom of a steam line break?

MR. SELTZER: This is asked and answered. I thought we spent at least a half hour on this earlier.

Q Did you see a low hot well level in the first hour of this accident?

A I don't recall seeing one, no.

Q Isn't it a fact that there was a high hot level alarm in the first four minutes?

A That I can't tell you. I am not sure that anyone in the control room was aware of that.

Q Did you know that Mr. Zewe had left the control room at about 4:40 to go to the turbine room for the specific purpose of working on high hot well level?

A Again I recall that sometime during the accident Mr. Zewe left the room and informed us that he was leaving the room, but I don't remember when that was.

Q Did he tell you why he was leaving? Did he tell you what he was going to do?

A It was his practice to tell us what he was doing, just as we all told each other what



2 each of us was doing, and I don't recall what he  
3 said now.

4 Q Didn't he tell you that he was leaving  
5 to go work on a high hot well level?

6 A I don't recall what he said.

7 Q On the day of the accident, did you  
8 understand that a high hot well level was  
9 inconsistent with a steam line break?

10 A No, there is no reason to conclude that  
11 a high hot well level is inconsistent with a steam  
12 line break. High hot well level can be due to  
13 many, many contributing factors.

14 Q You mean, so I can have your  
15 understanding on the day of the accident, if you  
16 have a procedure which says low hot well level is  
17 a symptom unique to a steam line break, but high  
18 hot well level is not inconsistent with a steam  
19 line break? Is that your testimony?

20 A I believe this is the same discussion  
21 we had before and that the uniqueness of these  
22 symptoms is not obvious to an experienced operator.  
23 You can attribute these symptoms to many different  
24 causes. They are listed there as an aid to the  
25 operator in his reasoning process. There is

1  
2 certainly nothing black and white about the  
3 appearance of one or another symptom.

4 Q I don't think you have answered my  
5 question.

6 MR. SELTZER: I think he answered it  
7 very well. You just don't like his answer.

8 MR. FISKE: I think it is a little  
9 hard to follow, yes.

10 Q Did you understand on the day of the  
11 accident that if you had steam generator pressure  
12 in the normal range, T-Av in the normal range, and  
13 a high hot well level, that those three symptoms  
14 in combination were inconsistent with a steam  
15 line break?

16 MR. SELTZER: What were the three  
17 conditions again?

18 Q Normal pressure, normal temperature  
19 and a high hot well level.

20 A In the --

21 MR. SELTZER: Normal temperature  
22 where?

23 MR. FISKE: T-Av.

24 MR. SELTZER: Normal pressure where?

25 MR. FISKE: Steam generators.

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A The discussions that we have been having about symptoms, we said that symptoms are parameters that are not within their normal band. Certainly normal pressure and normal temperature would not in my understanding be considered symptoms of anything. They are again indications that I will just enter into the thought process that I have in coming to a conclusion of what is happening. The symptom of normal pressure and normal temperature and high hot well level tells the operator absolutely nothing except you have a high hot well level.

Q You mean those three things in combination aren't of any use to the operator in trying to decide whether or not he has a steam line break?

A Certainly they are, if he is trying to make a decision about whether or not he has a steam line break, but as I said before, I don't know when I was trying to make that decision or if I was even engaged in discussions at this time when these parameters were exhibited.

Q And the fact that you told the Udall committee that, "We stabilized the steam

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2 generators about 50 minutes in or so and we  
3 eliminated the steam generators as being the cause  
4 of our problem," doesn't refresh your recollection  
5 that in that period of time you had concluded that  
6 there was not any steam line break?

7 A Again, this reference to the passage of  
8 the 50 minutes indicates to me that this is not a  
9 thought process that I was actually going through  
10 on the day of the accident. This is a summary that  
11 I am giving to somebody about what was going on on  
12 the day of the accident. This is my explanation of  
13 what happened. It includes all kinds of conclusions  
14 that I made before and after the accident. It is  
15 just a summary. That is all.

16 Q So what is the answer to my question?

17 MR. SELTZER: What was the question?

18 MR. FISKE: Read it back.

19 (Record read)

20 A That's right. This testimony doesn't  
21 include any recollections and doesn't refer to a  
22 steam line break in any way, and therefore it  
23 doesn't refresh my recollection.

24 Q You said before that on the day of the  
25 accident you had memorized the symptoms in the

2 various emergency procedures.

3 A Yes.

4 Q Including the symptoms in the  
5 pressurizer system failure procedure, correct?

6 A Yes, I meant that to include all the  
7 procedures.

8 Q You knew that one of the symptoms of  
9 an open pilot-operated relief valve was  
10 temperatures of the discharge line above the 200  
11 degree Fahrenheit temperature alarm, correct?

12 A My understanding of that symptom was  
13 that I would get the alarm window to flash, the  
14 alarm on the back of panel 8-A, if the temperature  
15 was increasing due to the valve being open. This  
16 symptom specifically says 200-degree alarm. I took  
17 it to mean increasing temperature, and then you  
18 hit the alarm point.

19 Q Did you look to see whether that alarm  
20 had gone off?

21 A When?

22 Q Anytime during the accident? Anytime  
23 during the first two and a half hours of the  
24 accident?

25 A I don't recall looking at it. I have

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been told that I went back there, but I don't remember going back there.

Q Going back where?

A To panel 8-A where the annunciator alarm that is mentioned in this symptom is located.

I guess I should clarify that. The symptoms in this procedure refer both to the alarm on panel 8-A and the alarm that can come up in the computer. What I am talking about is the annunciator.

Q Did you look to determine whether the computer alarm had come up for the temperatures on the discharge line?

A I don't recall using the computer at all early in the day, because it was not an instrument I used on transients.

Q Were you aware on the day of the accident that there was a means by which you could obtain readings from the thermocouples on the discharge line for the pilot-operated relief valve and the code safeties?

A My understanding wasn't as specific as you just related in your question.

I knew that temperatures in common



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Frederick

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2 discharge line of the three relief valves were  
3 available in the computer, and if I took the time  
4 to punch in the right numbers, I could read what  
5 those temperatures are.

6 (Continued on next page)

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2 Q Did you know that at any time you wanted  
3 to get them during the course of the accident  
4 sequence, you could get them from the computer?

5 A If you are asking me if I thought about  
6 that transient, no.

7 Q But before the accident, before the day  
8 of the accident, were you aware that the computer  
9 had that capability?

10 A The capability of displaying the  
11 temperatures in the common discharge line?

12 Q Yes.

13 A Yes, I think we took readings on that  
14 almost every day. Or whenever we had the midshift.

15 Q You referred to a common discharge line  
16 in your last answer. Is it your testimony that you  
17 understood on the day of the accident that all  
18 three temperature reading devices were on the same  
19 discharge line?

20 A Yes, I think I said before, I understood  
21 that they all came together in a common pipe. All  
22 the discharges of the safety valves, the relief  
23 valves, came together. That is why they are common.  
24 They are all hooked together. No valves in between.

25 Q I think we are talking of two different

1  
2 things. I think you testified that you understood  
3 that at some point the discharge from the PORV and  
4 the discharge from either of the code safeties  
5 would all flow into a common pipe which went into  
6 the reactor coolant drain tank, correct?

7 A Yes.

8 Q Is it your testimony that you  
9 understood that the temperature reading devices  
10 for each of these three valves were all located on  
11 that common line, on that common pipe?

12 MR. SELTZER: I don't understand that  
13 question.

14 A I didn't really have any idea where  
15 each of the three detectors were located. It is  
16 like the exhaust manifold on a car. The pipes  
17 come off the side of the engine and come together  
18 in one pipe. That is what it is like.

19 Q Did you make any effort at any time in  
20 the first two and a half hours of the accident  
21 sequence to try to find out what the temperatures  
22 were on the discharge line leading from the  
23 pilot-operated relief valve?

24 A No, I had no reason to go look at those.

25 Q The pressurizer system failure

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procedure lists as a second symptom of an open pilot-operated relief valve that the reactor coolant drain tank pressure and temperature are above normal on the control room rad waste disposal control panel 8-A. Do you have that in front of you?

A Yes.

Q And you knew that symptom on the day of the accident, did you not?

A Are you asking me if I thought about that on the day of accident or if it is one of the ones I memorized along with all the rest of the symptoms?

Q On the day of the accident, you had that symptom memorized with all the others, did you not?

A Yes.

Q Just one more question with respect to temperatures. Did you know before the accident that in addition to being able to go to the computer and ask for the temperature readings at any particular point in time, you could also have those readings put on a trend recorder so that you could see the readings as they moved progressively

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2 through a time period?

3 MR. SELTZER: Objection. No foundation  
4 that he knew you could go to the computer and  
5 get out the temperature readings for any  
6 point in time other than a contemporaneous  
7 reading.

8 MR. FISKE: He just said that. Maybe  
9 my question isn't clear. I am not trying to  
10 build more into your last answer than you  
11 intended, Mr. Frederick.

12 Q You testified that you understood that  
13 at any time you wanted to, you could go over to the  
14 computer and you could obtain from the computer a  
15 reading at that point in time for temperatures at  
16 the discharge lines, correct?

17 A Yes.

18 Q Did you also understand on the day of  
19 the accident that you could also go over to the  
20 computer and obtain information via a trend  
21 recorder which would give you the temperatures at  
22 the discharge line for a continuing period of time  
23 so that you could see changes in temperature over  
24 that period of time?

25 A There is a limited availability for the

1  
2 use of four trend recorders in which you can put  
3 any one of the 3,000 BOP points onto the trend  
4 recorders. There is a normal operating procedure  
5 which I think is outlined in the power operations  
6 procedures as to what four parameters should be  
7 displayed on those graphs, and normally they were  
8 in use and you have to erase one of those in order  
9 to put another point on.

10 Q But you understood that you could do  
11 that? It was possible to do that?

12 A It was possible, but you have to  
13 consider stepping out of your normal operating  
14 procedure in order to do that. You are going to  
15 lose normal operating information.

16 Q Did you give any consideration to doing  
17 that during the course of the accident? Putting  
18 these temperatures at the discharge lines on that  
19 trend recorder?

20 A No, I didn't even consider going to  
21 look at the temperatures. There was no reason to  
22 look at them.

23 Q Did you understand you could also get  
24 that same kind of trend information through the  
25 utility printer without displacing any of these

1  
2 other four readings?

3 A The graph, you mean?

4 Q Yes.

5 A No, it is not available on the utility  
6 printer.

7 Q Do you understand I am not necessarily  
8 limiting my question to the form in which it is  
9 displayed, but simply, did you understand that  
10 through the utility printer, you could obtain  
11 successive readings over a period of time for the  
12 temperatures at the discharge line so that you  
13 would be able to see changes in temperatures over  
14 a period of time?

15 A Yes, we often used that time printer  
16 for observing any number of points in the plant,  
17 secondary and primary plant, but again, you have to  
18 have some reason to call up an individual point  
19 and then want to monitor it for a given length of  
20 time.

21 Q Did it come to your attention at any  
22 point during the first two and a half hours of the  
23 accident that any one of the other operators had  
24 obtained any information with respect to  
25 temperatures at the discharge line from the PORV?



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A Did it come to my attention that morning?

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Q Yes, during the course of the first two and a half hours of the accident, that any of the other operators had obtained that information?

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A No.

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Q I think we were about to start on the drain tank pressure and temperature symptom B-14 of the inoperative pilot-operated relief valve. This symptom refers to drain tank pressure and temperature as reflected on the control room rad waste disposal control panel 8-A.

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Could we look at the chart of the control room that has the numbers of the panels on it, which I think is 659-A. Do you have that chart in front of you, 659-A?

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A Yes.

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Q Is panel 8-A the one on the far lower left of this chart?

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MR. SELTZER: It depends which way you hold the chart.

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MR. FISKE: I am holding it what I assume right side up.

25

MR. SELTZER: If you hold it with the



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2 page number at the bottom, it would be the  
3 right-hand corner.

4 MR. FISKE: I am holding it in the way  
5 you can read it.

6 MR. SELTZER: You can read it a lot of  
7 ways. If you hold it vertically, the  
8 lettering across the top is printed from left  
9 to right.

10 BY MR. FISKE:

11 Q In reference to panel 4, panel 8-A is  
12 behind it and to the left, isn't that correct?

13 A In reference to panel 4?

14 Q Yes.

15 A Panel 8-A is behind it and to the left?

16 Q Well --

17 A That is not true. Panel 4 is near the  
18 center of the control room. You didn't mean  
19 panel 4, did you?

20 MR. SELTZER: If panel 4 is at twelve  
21 o'clock, panel 8-A is at nine o'clock.

22 MR. FISKE: That is acceptable.

23 Q What kind of instrumentation was there  
24 on that panel that displayed pressure and  
25 temperature for the reactor coolant drain tank?

2           A       There are on that panel, among other  
3 switches, dials and lights, three 3-inch partial  
4 scale meters used to read normal operating band  
5 temperature, pressure, and level in a portion of  
6 the tank. The level would indicate a portion of  
7 the tank. Pressure and temperature would be the  
8 whole thing.

9           Q       Was there any other instrumentation on  
10 that panel related to pressure or temperature of  
11 the drain tank?

12          A       The rest of the panel is a mimic  
13 diagram of the coolant system and the drain system  
14 for the tank and how it is connected to the rest  
15 of the plant, and at the top of the panel,  
16 actually above the panel, is an annunciator board  
17 similar to the ones located throughout the rest of  
18 the control room.

19          Q       You mean with alarms?

20          A       The lights are there. The noise that  
21 it makes is the same as the alarm on the master  
22 board up front.

23          Q       What lights are on that panel  
24 reflecting alarms for the pressure or temperature  
25 of the drain tank?

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A I think we talked about this before, and I couldn't remember the way the boxes are labeled on top of the panel. There are about a dozen alarms.

Q Was there an alarm for high pressure?

MR. SELTZER: This was asked and answered. He said there is either a trouble alarm or a temperature alarm. He couldn't remember which it was.

Q Is that still your best recollection?

A Yes. I haven't reviewed any diagrams of the control room. I haven't been there in about two weeks.

Q Under normal operating conditions, what was the pressure in the drain tank?

A To the best of my recollection, it was zero.

Q Under normal --

A PSIG.

Q What was the normal temperature?

A I don't remember what the normal temperature was. It is listed right next to the gauge, there is a sign that says what the normal range is, so I never really memorized it. I just

2 referred to the sign.

3 Q Do you know what temperature the  
4 temperature alarm was set for? What was the set  
5 point for the temperature alarm?

6 A Again I don't remember that it was a  
7 separate temperature alarm or what the set point  
8 was. All of this is displayed on a little panel  
9 in an information box that tells you what the  
10 normal operating parameters are and what the set  
11 points are. I didn't use it that often, so I  
12 didn't memorize it.

13 Q All of that was there and available on  
14 the day of the accident?

15 A Yes, I think those notes have been  
16 there for quite some time.

17 Q Just so I understand your last answer,  
18 that information that was displayed there on the  
19 day of the accident would have shown what the normal  
20 temperature and the normal pressure was and it  
21 would also have shown you the point at which a  
22 temperature alarm would have been activated if  
23 there was a temperature alarm, is that correct?

24 A If you ask it that way, I think as I  
25 recall it now, the alarm set points are displayed

2 in that information on the panel, and I think we  
3 got the normal readings from the log sheet. So  
4 when we go back there, it would be to take logs on  
5 it. It tells you what it would be reading for days,  
6 the last few hours and what the normal range is.  
7 I am not sure that the normal range is shown on  
8 the panel, but it is on the log sheet, I think.

9 Q Did you understand before the accident  
10 that it would be possible to obtain information  
11 from the computer on pressure at the reactor  
12 coolant drain tank over a period of time?

13 MR. SELTZER: When you say "over a  
14 period of time," you mean a trend recording?

15 A That is a rather specific bit of  
16 knowledge. I knew we could call up any one of  
17 thousands of points, and I think that is probably  
18 one of them. There are only a few parts of the  
19 plant that were unobservable in the computer. I  
20 don't recall ever having done that particular point  
21 or group of points.

22 Q Did you know it was possible to obtain  
23 information as to the temperature in the reactor  
24 coolant drain tank on a trend recorder?

25 A In my previous comments, I said I don't

1  
2 have recollection of specific points being  
3 available on the computer, but I would assume that  
4 is one of the points you could call up in the  
5 computer.

6 Q And that was your understanding on the  
7 day of the accident?

8 A Yes, basically if I wanted to call a  
9 point up for any purpose, the way I would test it  
10 to see if it is available, I would find it in the  
11 index and call it up and see if it actually  
12 displayed any numbers.

13 If it is not an active point, it would  
14 give you question marks or some other indication  
15 that it is not an observable point, so I didn't  
16 really carry an index of active points in my mind.  
17 I just would call it up and see if it was a good  
18 point.

19 Q Anytime during the course of the first  
20 two and a half hours of the accident, did you make  
21 any effort to obtain readings on reactor coolant  
22 drain tank pressure or reactor coolant drain tank  
23 temperature from the computer?

24 A No, the place to receive that  
25 information is on panel 8-A. There would be no



1  
2 reason to get it from the computer.

3 Q To be more specific, did you make any  
4 effort at any time in the two and a half hours of,  
5 the first two and a half hours of the accident to  
6 obtain from the computer analog trend recorder  
7 information with respect to reactor coolant drain  
8 tank pressure or temperature over a period of time?

9 A No, I had no reason to go and get that  
10 type of time-related information nor even call up  
11 temperatures in the drain tank or downstream in the  
12 loop valves or anything, because I was not aware  
13 that the relief valves were blowing. That was  
14 something that we discovered after the accident.

15 Q You went to panel 8-A and looked at  
16 readings for reactor coolant drain tank pressure  
17 and temperature in the early minutes of the  
18 accident, didn't you?

19 MR. SELTZER: What do you mean by  
20 "early"?

21 Q Sometime in the first ten minutes?

22 A No, I don't think that is true. I just  
23 went through the first few minutes of the accident  
24 with you earlier, and I don't recall having left  
25 the panel during that time. I was told in other



2 testimony that I went back there at some point, but  
3 I don't remember actually making the trip.

4 Q Let's do this. I think you testified  
5 yesterday that you stayed at panel 4 at least  
6 through the period of time when HPI came on  
7 automatically and you assumed manual control and  
8 then throttled back the flow, and we established  
9 from the chronology that that last event, that is,  
10 throttling back the flow, occurred at about four  
11 and a half minutes into the accident. I think we  
12 established --

13 MR. SELTZER: Wasn't there an  
14 excursion, as you called it, when he went  
15 over to the secondary side board very early  
16 in the turbine trip?

17 MR. FISKE: That's correct.

18 MR. SELTZER: Within the period that  
19 you just related where you said he stayed in  
20 front of panel 4?

21 MR. FISKE: Just so we understand, and  
22 correct me if I am wrong --

23 Q My understanding of your testimony is  
24 that with the exception of the excursion that Mr.  
25 Seltzer has just referred to, which took you over

2 to the secondary side of the board to panel 6, you  
3 were in front of panel 4 through at least the time  
4 you throttled back HPI flow, and the chronology  
5 filed by GPU establishes that that event occurred  
6 at four and a half minutes, and so I am accepting  
7 your testimony up to now that in the first four and  
8 a half minutes you did not go back over to the  
9 other side of the control room and look at the  
10 readings on panel 8-A. Isn't that correct?

11 A My testimony so far is based on my  
12 recollection. I have given you where I was each  
13 moment in time as best I can remember. I don't  
14 recall now ever having gone back to panel 8-A.  
15 All I am saying is that in other testimony people  
16 have said I went back there. I don't recall it.

17 Q Didn't you yourself in testimony  
18 shortly after the accident testify that you  
19 yourself went back there and looked at the readings  
20 for temperature and pressure in the early minutes  
21 of the accident?

22 MR. SELTZER: That is where I asked  
23 you what you meant by "early minutes." I  
24 think there is a problem of time compression  
25 that the witness has described for you quite

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2 a few different times today and yesterday.

3 Q Without getting hung up for the  
4 moment on the precise moment in time when this  
5 happened, isn't it a fact that you did go back  
6 and look at the pressure and temperature for the  
7 reactor coolant drain tank sometime after the  
8 accident started?

9 A I think I tried to make it very clear  
10 that I don't have a recollection of that particular  
11 trip or any trip back to panel 8-A. Whether I went  
12 back there once or several times is not a part of  
13 my memory at this time.

14 What I am saying is that previous  
15 testimony and the relations of other people  
16 indicate that I went back there, but things were  
17 happening very quickly, and I just don't remember  
18 that little trip.

19 Q So your testimony is that a trip to the  
20 reactor coolant drain tank --

21 MR. SELTZER: The panel, you mean.

22 Q Is it your testimony now that you draw  
23 a blank on any trip to the reactor coolant drain  
24 tank panel where you saw pressure and temperature  
25 readings for the drain tank?

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A If you mean drawing a blank, that I don't remember doing it, that's right, I don't remember doing it.

Q I would like to refer to a document which has been marked previously as B&W Exhibit 655, which is an interview of you conducted by a TMI team headed by T. Van Witbeck on April 6, 1979, approximately one week after the accident.

A I have it.

Q I would like to direct your attention to page 5 of that interview. Referring to the bottom of the page, "The Team: where does your makeup tank get letdown from?

"Frederick: The suction of 1-A pump.

"Team: I thought the drawing said 2-B. I have to check that.

"Frederick: We went through quite an excursion in the reactor coolant drain tank. I ran behind the panel to make sure we weren't recirculating coolant or anything, and I noticed there was no level in the tank. The temperature was pegged high. The pressure gauge was pegged high. It should have been coming down after the relief lifted.

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2 "Team: When did this occur?

3 "Frederick: A few minutes after the  
4 trip."

5 Were you asked those questions and  
6 did you give those answers to the TMI team headed  
7 by Mr. Van Witbeck on April 6, 1979?

8 A I don't recall saying this. This was  
9 a meeting between myself and Mr. Van Witbeck and  
10 another part of his group. It was an effort to  
11 try to reconstruct everything that happened on the  
12 day of the accident. It is not necessarily limited  
13 to my own recollections. I was selected to work  
14 with him, because I think I had been working with  
15 the training department and they said I had enough  
16 time to go with him. I don't even know if he  
17 interviewed anybody else.

18 Q Let's go back to my question.

19 Were you asked those questions and did  
20 you give those answers to the TMI team approximately  
21 one week after the accident?

22 MR. SELTZER: Could you read back the  
23 first sentence of his answer?

24 (Record read)

25 A That is true. I don't recall saying

1  
2 this.

3 Q Do you have any basis today for  
4 telling us that you did not make that statement  
5 to the TMI team on that date?

6 A No. Like I said, I don't have any  
7 reason to doubt any of these transcripts of  
8 discussions that I had with the various committees.  
9 I just think it is fair that we characterize the  
10 difference between testimony on recollection or  
11 facts that I can recall and discussions that I had  
12 in which I was relating general knowledge without  
13 separating the two.

14 Q I take it your testimony is that the  
15 fact that you went back and looked at the pressure  
16 and temperature readings for the drain tank and  
17 the fact that you told this team a week after the  
18 accident that you had done that are both blanks,  
19 is that correct?

20 A Without getting into any of the usual  
21 word games of what I actually recollect and what  
22 can be inferred from these testimonies, I would not  
23 argue with anyone who said that I went back there  
24 or that there was evidence that I went back there.  
25 I am only trying to say I don't recall doing it.



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Q When you said to the TMI team on April 6 that the temperature was pegged high, pressure gauge was pegged high, what do those phrases mean? Pegged high?

MR. SELTZER: You mean what did the phrase "pegged high" mean, irrespective of its use in this testimony?

MR. FISKE: Yes, let's start with that.

A The phrase as I use it means that a meter or a gauge has reached its uppermost limit, and that it is indicating the highest number that it will indicate.

Q What conclusion did you draw at the point in time when you went back and saw that both the temperature and pressure were pegged high?

MR. SELTZER: You know that that is an objectionable, improper question, since he has no recollection of going back. You haven't even asked him whether he recalls pressure and temperature being pegged high.

Q I ask you this. When you went back and saw that the pressure and temperature were pegged high for the reactor coolant drain tank, did the symptoms of an open PORV flash through



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your mind at that point?

MR. SELTZER: Objection. No foundation that the witness recalls going back and noticing the pressure and temperature were pegged high.

A I don't have any recollection of observing the meters, making conclusions about what they were telling me, or applying those conclusions to any specific emergency procedures or enacting any of those emergency procedures.

Q Did you go back to panel 8-A and look at readings for the pressure or temperature of the drain tank on a second occasion?

MR. SELTZER: Objection. No foundation that he can recall going back at all during the accident.

MR. FISKE: He told us about his lack of recollection in the first trip. I am asking if he remembers the second trip.

MR. SELTZER: I think you asked him, during the accident does he recall going back there. Why don't we get it all over with in one throw. See if he has any recollection of going back at all during the day of the

1  
2 accident in the first two hours of the  
3 accident.

4 (Record read)

5 BY MR. FISKE:

6 Q In the first two and a half hours of  
7 the accident?

8 A I think I already stated that I don't  
9 recall making any trips going back there to panel  
10 8-A at all.

11 Q Is it your testimony that as you sit  
12 here today you don't remember having any information  
13 at any time in the first two and a half hours of  
14 the accident as to pressures or temperatures in  
15 the drain tank?

16 A As I sit here today, I don't recall  
17 the value or any information drawn from that panel  
18 as entering into any of the thought processes that  
19 I was engaged in on the morning of the accident.

20 Q Did it come to your attention in the  
21 first 45 minutes of the accident that the level in  
22 the sump was increasing?

23 A I only recall receiving one report, and  
24 that was that the level was high. I don't recall  
25 receiving any report saying that it was increasing.

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Q Let me show you a document which we will mark as the next exhibit, B&W 663.

(Diagram was marked B&W Exhibit 663 for identification, as of this date)

Q Do you have that in front of you?

A Yes.

Q Do you recognize this as a diagram of certain portions of the TMI-2 plant?

A I recognize the components and the attempt to represent the configuration of the TMI-2 plant, but it is a very simplified and not very representative diagram of the layout.

Q Let me direct your attention to the bottom of the reactor building where you see the word "sump."

A Yes.

Q That is sort of a well at the bottom of the reactor building, is that right?

MR. SELTZER: Are you asking whether there is a well at the bottom of the reactor building?

MR. FISKE: Yes.

Q That is what the sump is, is it not?

A The sump is actually about a four foot

1  
2 by six foot cube, four by four by six foot deep.  
3 It is located in the basement of the reactor  
4 building. It is actually below the rest of the  
5 floor level.

6 Q Is it correct that the purpose of the  
7 sump is to collect water that may be accumulating  
8 in the reactor building?

9 A No, the purpose of the sump is to  
10 provide a water level that will submerge the pump  
11 suction. In other words, if a small amount of  
12 water collects on the reactor building floor, it  
13 may not be deep enough to provide suction for the  
14 pumps, so they provided a little bit of a depression  
15 in the floor so that the pump suction would be  
16 submerged and allow it to pump even a small amount  
17 of water out of the building.

18 Q So that there is a certain minimum level  
19 of water in the sump at all times under normal  
20 conditions?

21 A Ideally, the sump would be empty, but  
22 due to the high humidity and the leak-off from  
23 some of the primary valves and other sources of  
24 water, there is usually some small amount of water  
25 in there and it is a function of the sump pump to

1  
2 remove that water accumulation automatically. It  
3 works on a level switch.

4 Q And at what level of water is the pump  
5 activated?

6 A I don't know.

7 Q Before the accident, did you have any  
8 understanding that the level in the sump was higher  
9 than it would be under normal conditions?

10 A I wasn't aware of what the sump level  
11 was. The pumps are designed to maintain -- there  
12 are two pumps in there, one normal and one backup,  
13 and we don't even display that parameter in the  
14 control room. It is just an automatic function of  
15 the pumps.

16 Q Is there an indicator in the control  
17 room panel when the pumps come on?

18 A No.

19 Q Is there any way you can find out if  
20 you want to whether the pumps have come on?

21 A The pumps come on and go off  
22 automatically. It is a matter of routine. The  
23 auxiliary operator in the auxiliary building can  
24 observe the pumps going on and off, and he can  
25 read the level on the rad waste panel on the

1  
2 auxiliary board, so if I wanted to know the status  
3 of the pumps, I could call and ask him.

4 Q You knew that you could call him and  
5 ask him whether they were on or off, is that  
6 correct?

7 A If he was at the panel or if I asked  
8 him to go to the panel, he could make that  
9 determination for me.

10 Q In other words, did you understand on  
11 the day of the accident that if you wanted to find  
12 out at any given point in time whether the sump  
13 pumps were on, you could do that?

14 A As I sit here and think about it now,  
15 as it was before the accident, you could call the  
16 primary operator, and if he was on that side, he  
17 could go to the panel and look at the status lights  
18 for the pumps and tell me whether they were  
19 running or not.

20 I could also, if I had an instance  
21 where I had to do it, I could go to the computer  
22 index and find if those points for the pumps were  
23 located in the computer somewhere, and there might  
24 be a status whether the pumps were on or off in  
25 there. It might only say whether they were in

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automatic or not.

Q Did you understand on the day of the  
accident that you could find out, if you wanted to,  
how long the pumps had been on?

A No, there is no way to tell how long  
they have been on unless you stand there and watch  
the lights.

(Time noted: 12:05 p.m.)

EDWARD R. FREDERICK

Subscribed and sworn to  
before me this day of  
1982.



CERTIFICATE

STATE OF NEW YORK     )  
                              : ss.:  
COUNTY OF NEW YORK    )

I, JOSEPH R. DANYO, a Notary  
Public of the State of New York, do hereby  
certify that the continued deposition of  
EDWARD R. FREDERICK was taken before  
me on TUESDAY, MAY 11, 1982 consisting  
of pages 685 through 774;

I further certify that the witness had  
been previously sworn and that the within  
transcript is a true record of said testimony;

That I am not connected by blood or  
marriage with any of the said parties nor  
interested directly or indirectly in the matter  
in controversy, nor am I in the employ of any  
of the counsel.

IN WITNESS WHEREOF, I have hereunto set my  
hand this 16 day of MAY 1982,

Joseph R. Danyo  
JOSEPH R. DANYO

E

## I N D E X

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## E X H I B I T S

B&W  
FOR IDENTIFICATION

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