

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  
(RO)

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

Defendants. " :  
-----x

Continued deposition of The Babcock &  
Wilcox Company by LUCIUS ROSCOE CARTIN, taken  
by Plaintiffs, pursuant to adjournment, at the  
offices of Kaye, Scholer, Fierman, Hays &  
Handler, Esqs., 425 Park Avenue, New York,  
New York, on Wednesday, April 14, 1982, at  
10:05 o'clock in the forenoon, before  
Nancy A. Rudolph, a Shorthand Reporter and  
Notary Public within and for the State of New  
York.



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PDR ADCK 05000289  
PDR

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Also Present:

DAVID TAYLOR

\* \* \*

LUCIUS ROSCOE CARTIN,

resumed, having been previously duly sworn  
by the Notary Public, was examined and  
testified further as follows:

EXAMINATION (Continued)

BY MR. SELTZER:

Q Mr. Cartin, I am sure you are aware that  
today's testimony, like all of yesterday's testimony,  
is under oath?

A Yes.

Q Do you recall yesterday that I was  
asking questions and you were giving testimony  
with regard to an analysis of small break loss of  
coolant accidents with the pumps on and with the  
reactor coolant pumps off?

A Yes, we discussed that.

Q Is it correct that in December 1978 you  
thought that leaving the reactor coolant pumps on  
after the start of a small break loss of coolant  
accident was better than shutting the pumps off?

A Yes. I believed that tripping the pumps  
as assumed in the past analysis was the worst case than  
having the pumps run continuously.

Q And it was worse in terms of what?

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A In terms of event consequences; namely, a challenge to core uncovering and the potential for a cladding temperature excursion.

Q By July 1979 you knew that it was safer to shut the pumps off rather than leave the pumps on once a small break loss of coolant accident was in progress, isn't that right?

MS. WAGNER: I object to the form.

A Would you repeat that, please?

Q I am asking you now about a period after the Three Mile Island accident, and I am focusing on July 1979.

The question is by July 1979 you knew that it was better to shut the reactor coolant pumps off rather than leave them on once a small break loss of coolant accident was in progress, isn't that right?

MS. WAGNER: I object to the form.

A At about that time we had concluded that with the pumps running continuously the consequences of a small break were acceptable. We also found that there were some small break accidents for which a pump trip at some time during the accident could result in worse consequences than when had previously



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anticipated.

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Q In fact, you discovered that for certain

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small breaks a pump trip during the transient was

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worse than having the pumps off from the beginning

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of the transient, isn't that true?

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A For certain cases that's true.

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Q In other words, you knew by July 1979

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that part of what you had been thinking in September

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1978 was wrong?

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MS. WAGNER: I object to the form.

12

Part of what he was thinking about what?

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A I have no correlation of why you are

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raising these particular dates.

15

Q In December '78 you thought that leaving

16

the pumps on was better than shutting the pumps off

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at the start of the accident?

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A In December of '78, that's correct.

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Q By July '79 you found out that

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for certain transients leaving the pumps on left

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open the possibility that there could be a loss of

22

off-site power and a tripping of the pumps in the

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middle of the transient, isn't that true?

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MS. WAGNER: I object to the form.

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A Again, I don't know why you are bringing

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2 up July.

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After TMI we did some analyses and found out that for some cases a pump trip during the accident would lead to more severe consequences than a pump trip at the beginning of a reactor trip.

Q The only reason I am using July is it was my understanding that it was in or about July that B&W issued the revised instructions saying the operators should trip the pumps at a start of the transient rather than leave the pumps running during the transient.

A That is true. I apologize. I don't remember the dates very well.

MS. WAGNER: You don't have to worry about dates. Also, you should wait for Mr. Seltzer to ask you a question rather than responding to his comments.

Q You did not learn until after the Three Mile Island accident that a pump trip during a small break loss of coolant accident could produce worse results than a pump trip at the start of that same small break, isn't that correct?

A Would you repeat that?

(Record read back.)

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A That's correct.

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Q To that extent you learned after the Three Mile Island accident that part of what you had assumed in December 1978 was no longer valid, isn't that also true?

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A We found out through analyses that there were certain cases for which the previous assumptions were found to be invalid.

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Q The reason that some of the earlier assumptions proved to be invalid had something to do with the fact that leaving the reactor coolant pumps on during a small break loss of coolant accident resulted in less water remaining in the reactor coolant system than if the pumps had been tripped, isn't that right?

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MS. WAGNER: Objection to the form.

THE WITNESS: May I have that read back?

(Record read back.)

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A That's a very general statement. It has to be clarified as to what the timing, the specific events in question, the assumptions made, and were you trying to make that claim. In general, for some cases and for some time during the transient with the pumps on versus the pumps off you can at one point

1  
2 in time have less water.

3 It does not necessarily mean that would  
4 be unacceptable.

5 Q Isn't it correct that if there is a loss  
6 of coolant accident and the reactor coolant pumps are  
7 on the circulation under forced flow conditions is  
8 going to push a greater mass of coolant out of the  
9 break than if there were no forced flow caused by  
10 the reactor coolant pumps?

11 MS. WAGNER: I object to the form.

12 Mr. Seltzer, is your question referring  
13 to all breaks in any place?

14 MR. SELTZER: All small break loss of  
15 coolant accidents.

16 A Your question has some points in it  
17 that are not in agreement with my interpretation of  
18 what occurs.

19 When the pumps are running, they don't  
20 push water out the break. With the pumps running,  
21 you tend to make the system more homogeneous for  
22 which the break can relieve more water because the  
23 inlet fluid has more water at that point in space,  
24 the water has more opportunity to see the break. It  
25 is not pushed out.

1  
2 MS. WAGNER: You answered Mr. Seltzer's  
3 question.

4 He may ask another question.

5 Q Let me accept then your qualification  
6 that it's not a pushing out mechanism.

7 Isn't it a fact that with the reactor  
8 coolant pumps on a greater mass of coolant is going  
9 to leave the reactor coolant system through a break  
10 than if the pumps are off?

11 A The question as stated I cannot respond  
12 to. There is a given mass within the system.

13 In general, you will relieve mass,  
14 whether it be steam or water, through a reactor  
15 coolant system of which it can be recirculated and  
16 therefore whether one case relieves more mass  
17 integrated over some time period, they may be the same  
18 or one may be slightly greater.

19 If you could redirect your question to  
20 be more specific to a time frame or to a particular  
21 event, I may be able to give you a better answer

22 Q What types of events would produce  
23 greater discharge of water with pumps on during a  
24 small break loss of coolant accident as contrasted  
25 with pumps off?

1  
2 MS. WAGNER: Could I hear the question  
3 again, please?

4 (Record read back.)

5 A What do you mean by "types of events"?

6 Q Well, you said it would vary and that  
7 there would be some events where you would get  
8 a greater discharge of water for pumps on versus  
9 pumps off.

10 A You have to be very specific for size,  
11 location, and the time period.

12 At some time during a small break you can  
13 have a small amount of water. 24 hours later, you  
14 might predict that there might be a considerable  
15 amount of water. It depends on how much you have  
16 put back into the system and what the current pressure  
17 and temperature conditions are.

18 Q What were the conditions which led B&W  
19 to instruct all the operators of its plants that  
20 it was safer to shut off the reactor coolant pumps  
21 rather than leave them on?

22 MS. WAGNER: If you know.

23 A We found that for certain break sizes  
24 and for that particular break size, range, that the  
25 system could evolve to a high void fraction for a given

time period and should a pump trip occur during that time period when the system void fraction is high, that it would be inadequate water to cover the core should the pumps trip and there would be inadequate safety system injection to refill the core in a time period to prevent cladding temperatures from exceeding 2200.

All these analyses were done with models conservatively built to meet Appendix K requirements.

Q In other words, you were doing the analyses required by the NRC for the licensing of nuclear plants?

A That's right. They used those conservative set of assumptions.

Q So for certain break sizes, leaving the reactor coolant pumps on could result in a higher void fraction in the reactor coolant system than would shutting the reactor coolant pumps off at the start of the transient, is that right?

MS. WAGNER: Mr. Seltzer, I object to you rephrasing the witness' answer which I believe he has given you twice as to what he believes has happened in this event.

Q You may answer.

A Repeat that.

Q So, in other words, for certain break sizes,



1  
2 a higher void fraction would result in the reactor  
3 coolant system if the reactor coolant pumps are left  
4 on during the transient than if the pumps are turned  
5 off at the start of the transient, is that right?

6 A For a given period in time that is correct.

7 Q The reason that a higher void fraction would  
8 result for those certain break sizes is the same reason  
9 that was illustrated to you by Bob Jones in his  
10 December 11, 1978 memo, GPU Exhibit 330, right?

11 MS. WAGNER: Mr. Seltzer, are you referring  
12 to one of the several reasons in this memo or  
13 all of them?

14 MR. SELTZER: I am referring to the  
15 discussion in the second paragraph of GPU 330.

16 A The second paragraph identifies both  
17 positive and negative aspects of keeping the pumps  
18 running. Some of the positive things that are said  
19 here is that you can maintain natural circulation  
20 longer which would give you primary to secondary heat  
21 transfer and would aide system depressurization that will  
22 give you a higher safety injection flow.

23 It goes further to say that you can have  
24 lower quality fluid will exit through the break. That  
25 in itself does not necessarily lead to unacceptable

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consequences.

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Q I am not talking about whether this memo predicts unacceptable consequences right now. My question was isn't it correct that GPU Exhibit 330 described the mechanism by which leaving the reactor coolant pumps on would result in less water remaining in the reactor coolant system for certain break sizes?

MS. WAGNER: Objection to the form.

Mr. Seltzer, the witness is trying to respond to you because you are basing your question on this whole memo. He has answered that question. I don't think he can really respond to your question any differently unless you want to be more specific.

MR. SELTZER: I have tried to be very specific in my last question. I would like to have the question reread and I would like you to answer, please.

(Record was read back.)

A This one sentence says that you can have lower quality fluid exiting through the break. That does contribute to the phenomena that was observed when the analysis of the pumps running case was conducted. It is part of the reasons why for those cases a high

void fraction was seen for certain time periods and for certain small breaks.

Q In your answer you used the phrase "lower quality fluid" and you also used "higher void fraction." To put it in correct but simpler English, it is a fact, isn't it, that this memo, GPU Exhibit 330, described a loss of water from the system being greater for pumps on than for pumps off, that was the same mechanism for water loss that led to the revised instructions on terminating-pump operation after the Three Mile Island accident?

MS. WAGNER: I object to the form of the question.

Mr. Seltzer, I think you know you are trying to limit the meaning of this memo to something which it is not limited to.

Q Would you like to have the question reread?

A Yes.

(Record was read back.)

MS. WAGNER: I object further insofar as you are trying to suggest that that was the entire basis for any later B&W instruction.

You may answer the question.

A I believe my comments previously were

1  
2 correct. Your question, I interpret it as meaning this  
3 memo does describe a way at which for certain time  
4 periods during the transient more water can be lost  
5 for a given time period with the pumps running as  
6 opposed to the pumps being off.

7 I know at the time this memo was written  
8 we were at that point in time not considering the  
9 possibility of the pumps tripping during a transient.

10 MR. SELTZER: Let's go off the record.

11 (Discussion off the record.)

12 Q You testified at the start of this morning  
13 that you believed in December 1978 that leaving the pumps  
14 on during a small break loss of coolant accident was  
15 better than shutting the pumps off.

16 It is a fact, isn't it, that you held that  
17 belief because you relied on the reactor coolant pumps  
18 being able to continue pumping throughout the  
19 transient? Isn't that right?

20 MS. WAGNER: Objection to the form.

21 A I don't believe your statement regarding  
22 what I testified to this morning was correct.

23 Q In what way was it not right?

24 A I think the last -- you didn't clarify of  
25 tripping the pumps at what time. At the times assumed

1  
2 in the analysis, which was a loss of off-site power  
3 at reactor trip.

4 Q You assumed the premises in 1978, you  
5 believed that it was safer to leave the pumps running  
6 throughout a small break loss of coolant accident than  
7 to trip the pumps at the start of a small break loss  
8 of coolant accident?

9 A That's correct.

10 Q Your December 1978 conclusion as to which  
11 was a safer situation for the plant was based on your  
12 reliance that the reactor coolant pumps would be able  
13 to function successfully throughout a small break  
14 transient, isn't that right?

15 MS. WAGNER: Objection to the form.

16 A Yes.

17 Q There is a range of small break loss of  
18 coolant accidents in which the loss of coolant exceeds  
19 the capacity of the high pressure injection pumps, is  
20 that right?

21 MS. WAGNER: Objection. Could I have that  
22 reread?

23 (Record was read back.)

24 MS. WAGNER: I take it, Mr. Seltzer, you  
25 are assuming normal HPI in your question?

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MR. SELTZER: Full flow, full throttle

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HPI.

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A That's a very general statement. It would be much better if you clarified it to be at a given pressure, number of HPI pumps, but in general that is a true statement, there would be some break size for which the HPI could not keep up with it.

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Q Could not keep up with the loss of fluid?

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A For a given pressure and given inlet condition at the break for a given break size, they are all interrelated and for some breaks you may not be able to keep up with it immediately but you may be able to keep up with it two hours later, so it is a very vague statement but in general it is true for certain instances.

Q When you were in ECCS analysis and doing analysis of small break loss of coolant accidents, you studied certain break sizes and time periods during which you had to deal with accomplishing effective core cooling even though the loss of fluid for that size break and time and other conditions exceeded the capacity of the high pressure injection pumps; isn't that right?

A That's correct.

1  
2 Q For such breaks and for a certain period  
3 of time during that transient as the transient progressed,  
4 the inventory of water in the reactor coolant system  
5 decreased, right?

6 MS. WAGNER: Objection to the form.

7 A It can decrease over certain time periods,  
8 yes.

9 Q As the water inventory decreased, the void  
10 fraction in the reactor coolant system increased, right?

11 A In general, yes.

12 Q That means there was more steam and less  
13 water in the reactor coolant system?

14 A Essentially, yes.

15 Q In December 1978, what information did you  
16 have about the ability of the reactor coolant pumps to  
17 continue operating with increasing void fractions in  
18 the reactor coolant system?

19 A I don't remember what specific information,  
20 if any, I had at that time. Given we were under the  
21 general evaluation of given that the pumps could run,  
22 we were assessing what the impact was.

23 Q What did you rely on for an assumption that  
24 the pumps could continue to run during a small break loss  
25 of coolant accident?



1  
2 MS. WAGNER: Objection to the form.

3 A At that time I was conversing with ECCS who  
4 were looking at the pumps running and I really didn't  
5 question their bases for assuming that they could run.

6 Q Who in ECCS told you that they were assuming  
7 as a basis that the reactor coolant pumps could continue  
8 to run?

9 A I had discussions at that time with Mr. Jones  
10 and Bert Dunn. Whether we talked specifically about  
11 the pumps' ability, I do not remember.

12 Q Do you remember talking to anybody in  
13 that time period about the ability of the pumps to  
14 continue running?

15 A I don't recall any specific conversations,  
16 no.

17 Q Based on what Jones and Dunn told you about  
18 their assumption that the reactor coolant pumps could  
19 continue to operate during a small break loss of  
20 coolant accident, did you feel there was no basis for  
21 any safety concern being flagged under the B&W  
22 preliminary safety concern procedures?

23 MS. WAGNER: I object to the form of the  
24 question and, Mr. Seltzer, I think you have  
25 mischaracterized the witness' testimony. He

1  
2 didn't say, I don't believe, that either of  
3 those people told him anything about the ability  
4 of the pumps to run.

5 MR. SELTZER: Let's clear that one up.

6 Q Didn't either Dunn or Jones tell you that  
7 they were assuming that the pumps could continue to run  
8 during a small break loss of coolant accident?

9 A They were basically making an assessment  
10 of the impact on the system of the pumps on or the  
11 pumps off. I do not remember having specific  
12 conversations regarding the specific function of --  
13 capability of the RC pumps at that time, either  
14 two-phase conditions.

15 Q It would have invalidated the conclusions  
16 that you were getting from ECCS analysis about the  
17 pumps running case if the reactor coolant pumps were  
18 incapable of successfully functioning throughout  
19 small break loss of coolant accidents, wouldn't it?

20 MS. WAGNER: Objection to the form.

21 A If we found that the pumps did not perform  
22 as our models predicted them to perform, yes, our  
23 conclusion would have been wrong.

24 Q In 1978, who, if anyone, in B&W's ECCS  
25 analysis unit did you consider to be particularly

1  
2 knowledgeable regarding the operating characteristics  
3 of reactor coolant pumps?

4 MS. WAGNER: I object to the form.

5 You may answer if you thought anybody was  
6 particularly knowledgeable.

7 MR. SELTZER: Ms. Wagner, my question began  
8 who, if anyone.

9 MS. WAGNER: I apologize, I didn't hear that.

10 A At that time the ECCS unit was composed of  
11 analysts. There were probably several individuals there  
12 that were very familiar with the analytical models that  
13 used actual pump characteristics to model the  
14 performance of the pumps and their computer codes.  
15 There were, in my opinion--they were not hardware  
16 experts-- there were several that were knowledgeable  
17 of the capabilities of their models.

18 Q You worked with those models when you were  
19 in the ECCS analysis unit, right?

20 A When I was there, we had very simple models  
21 and they were upgraded as a part of 10 CFR 50.46.  
22 Upgrades in our analytical capabilities I did interface,  
23 a limited amount. I was in no way an expert.

24 Q You did the interface after you joined  
25 plant integration, right?

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A Plant integration interfacing was something entirely different.

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Q What was the interfacing that you were referring to in your last answer?

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A At the time that those new models were developed, I was a supervisor and did not actually run the computer codes and therefore did not develop any of the inputs and therefore did not become intimately familiar with those particular models.

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MS. WAGNER: I think Mr. Seltzer just wants to know which department you were in at that time.

12

13

Is that right, Mr. Seltzer?

14

MR. SELTZER: Yes.

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MS. WAGNER: What department were you in at the time you were just talking about, ECCS or integration?

18

THE WITNESS: I have lost the time frame.

19

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MS. WAGNER: At the time when these models were being upgraded.

21

THE WITNESS: I was in ECCS.

22

23

MS. WAGNER: Is that what you wanted, Mr. Seltzer?

24

MR. SELTZER: Yes.

25

Q You said you didn't know of anyone in the

1  
2 ECCS unit that worked particularly with hardware as  
3 opposed to computer models, is that right?

4 MS. WAGNER: This is of RC pumps?

5 MR. SELTZER: Right.

6 A In general, yes.

7 Q Just because an ECCS model assumes that  
8 there are void fractions in the reactor coolant system  
9 following a small break loss of coolant accident doesn't  
10 mean that the equipment that is operating with that  
11 reactor coolant system is able to handle increasing  
12 void fractions, does it?

13 MS. WAGNER: Are you asking for his  
14 current understanding or his understanding at  
15 the time?

16 MR. SELTZER: His understanding at the  
17 time he was working with these models.

18 A In general, the models are as closely  
19 geared to reality as possible. I can't rule out the  
20 possibility that any and all models may not cover all  
21 situations.

22 Q Well, up until 1978 for purposes of  
23 compliance with 10 CFR 50.46 and Appendix K, B&W had  
24 assumed the reactor coolant pumps were tripped at the  
25 start of a loss of coolant accident, correct?

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A That's correct.

3

Q So for all of the modeling that was done,

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B&W's ECCS analysis unit had never had to consider

5

before 1978 whether the reactor coolant pumps could

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continue functioning during a loss of coolant accident,

7

isn't that right?

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MS. WAGNER: Objection to the form.

9

A I believe you showed me a memo or a letter

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yesterday where that had been considered for a large

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break, which probably was considered for large break

12

analyses for the 205 Appendix K application. It was

13

not considered for small breaks, to the best of my

14

knowledge.

15

Q Have you ever heard that anyone in ECCS

16

analysis did anything to check in 1978 to determine

17

whether in fact the reactor coolant pumps could continue

18

to function successfully during a small break loss of

19

coolant accident?

20

A They may or may not have checked. I am not

21

aware if any checking was done.

22

Q Did you ever ask anybody in ECCS analysis

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whether there was any basis for the assumption that

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the reactor coolant pumps could continue to operate

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successfully during a small break loss of coolant

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accident?

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MS. WAGNER: Are you asking this at the time period when the assumption was made, I take it, if ever?

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MR. SELTZER: Let's take it right up to today.

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Q Have you ever asked anybody in the ECCS analysis unit if they ever had anything which they based their assumption on that the reactor coolant pumps could continue to operate during a small break loss of coolant accident?

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MS. WAGNER: Maybe I have missed something here but I am not aware that the witness has ever testified that that assumption was made.

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MR. SELTZER: He has and it is implicit. He was talking to Dunn and Jones about a pumps running case during a small break loss of coolant accident.

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Q If you are not assuming that the pumps are going to run, then you don't have a pumps running case at all. If you are not going to assume that the pumps are running during a small break loss of coolant accident, then you haven't got a pumps running case at all. Isn't that right?



2           A       A pumps running case, you make the assumption  
3 that the pumps run.

4           Q       Now, let's go on to the next question.  
5 Did you ever hear anything which indicated to you that  
6 anyone in the ECCS analysis unit had ever done anything  
7 to verify that in fact the pumps had the capability to  
8 continue operating during a small break loss of coolant  
9 accident?

10          A       If my memory serves me correctly, that has  
11 been evaluated at one time or another. I don't  
12 remember the specific circumstances or the exact  
13 document where I read that. I myself do not remember  
14 specifically asking a direct question of that nature.

15          Q       Do you have any recollection what the answer  
16 to that question was?

17               MS. WAGNER: The answer whether the pumps  
18 could --

19          Q       The answer to whether ECCS ever specifically  
20 looked into the physical ability of the pumps to  
21 continue running during a loss of coolant accident?

22          A       Again, I just finished stating I vaguely  
23 remember reading something to that effect, that they had  
24 considered that and examined that. I don't know where  
25 I read that specifically, though.

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Q Do you know when you read it?

3

A No.

4

Q Do you know when the document was written?

5

A No.

6

Q Do you know who wrote the document?

7

A No.

8

Q In 1978 B&W had a pumps unit, didn't it?

9

MS. WAGNER: A unit that has something to do

10

with pumps?

11

A We had people who were responsible for

12

coordinating the procurement and implementation of

13

the pumps on the contract, yes.

14

Q Did you have people who were involved in

15

design specification for reactor coolant pumps?

16

A Yes.

17

Q In 1978 or early 1979, did you ever check

18

with anybody in B&W's pumps unit to see if the assumption

19

made by ECCS analysis was correct, namely, that the

20

reactor coolant pumps could continue to function during

21

a small break loss of coolant accident?

22

A No, I don't remember making any check of

23

that nature.

24

Q In other words, without any evidence from

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Dunn's unit and without any checking with B&W's pumps

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unit, you just accepted the assumption that the reactor coolant pumps could continue to operate during a small break loss of coolant accident?

MS. WAGNER: Objection to the form.

THE WITNESS: Would you repeat that?

(Record was read back.)

A I at that time had no reason to question that assumption. I did not do any checking.

Q At the time that you wrote GPU Exhibit 122, you were responsible for monitoring or supervising the engineering interface on this pumps running issue, weren't you?

MS. WAGNER: Objection to the form.

THE WITNESS: Would you repeat that?

Q At the time that you wrote GPU Exhibit 122, your assignment in plant integration was to perform an engineering interface function on the issue of reactor coolant pumps running during a small break loss of coolant accident?

A No, my exact job at that time was to, in integration, was to assist the analysis groups in preparing responses to direct Davis-Besse questions that had resulted out of general issues regarding pressurizer level indication.

1  
2 Q The analysis was being done principally in  
3 ECCS analysis on this question of pumps running, right?

4 MS. WAGNER: Objection.

5 A They were -- the ECCS analysis was  
6 responsible for all issues regarding LOCA analysis.

7 Q Weren't you on behalf of plant integration  
8 providing an interface function?

9 A I was providing a function of here's the  
10 questions, how much resources requirements do you need?  
11 I will secure them for you. I also served the function  
12 of inquiring as to their status as to certain periods  
13 of time and I wrote status memos as a means to minimize  
14 man-hours required for people to report on their  
15 various status of their individual jobs.

16 Q Did any of the recipients of GPU 122 tell  
17 you after they got your memo that they thought you  
18 were wrong to recommend not advising the NRC about  
19 possible deficiencies in B&W topical reports previously  
20 submitted?

21 MS. WAGNER: I object to the form of the  
22 question and direct the witness not to answer.  
23 You have misstated what is in the memo and what  
24 his prior testimony is.

25 Q Did anybody from B&W tell you after they got

1  
2 your memo that they thought the statement that you made  
3 about what B&W should or should not tell the NRC was  
4 wrong?

5 MS. WAGNER: I object to the question.

6 Could I hear the question again, please?

7 (Record was read back.)

8 MS. WAGNER: Mr. Seltzer, perhaps you could  
9 refer the witness to what it is that discusses  
10 statements to the NRC about which you would like  
11 to ask a question.

12 MR. SELTZER: I am referring to the second  
13 and third sentences in item 6 on page 2.

14 A Those particular sentences did not make any  
15 recommendations of what to tell the NRC one way or the  
16 other.

17 Q Weren't you saying that if the NRC were to  
18 ask a question about the B&W small break topical reports  
19 that they must be in a position to tell the NRC that the  
20 topicals have already considered the worst possible  
21 condition?

22 A At this point in time, we were specifically  
23 pushing to secure some funding to do that analysis and  
24 to document that basic assumption and in the event that  
25 that topic ever came up again, we would have a clear

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analysis by which to back up our engineering assessment.

3

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Q You didn't have those analyses available at the time you wrote this memo, did you?

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A That is correct.

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Q Did anybody ever communicate with you after getting this memo and say that it was wrong for you to have indicated, "The customer should not be informed of the ECCS analysis efforts to examine the pumps running case"?

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A As I testified yesterday, I believe those were poor choices of words. My intent there was we should have our schedules defined and work scopes defined and resources secured and at that time would be the best time to notify the customer. I also testified that the customer was well aware of the bases for his LOCA analysis and what analyses existed with the pumps running.

19

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MR. SELTZER: I move to strike that as nonresponsive.

21

22

23

Q Did anybody tell you after they got your memo that it was wrong for you to indicate that the customers should not be informed?

24

MS. WAGNER: Objection.

25

A After writing this memo, I went on vacation



1  
2 for approximately three weeks. Upon returning, I don't  
3 remember receiving any comments at that time regarding  
4 it.

5 Q And no comments had arrived in the form of  
6 memos while you were gone?

7 A I don't remember receiving any memos  
8 providing comments on this memo.

9 (Recess taken.)

10 BY MR. SELTZER:

11 Q Let me show you what was produced to us  
12 late in the night two nights ago after 6:30 just before  
13 your deposition commenced. It is a pile of documents  
14 labeled "L. R. Cartin Control File 1978."

15 Can you describe what type of material you  
16 placed in this file and how this file was maintained?

17 A This file was maintained by a secretary.  
18 Normally when she did typing for me, she would stick  
19 the original in this file and I would get a copy and  
20 from that original, the distribution would be made.

21 Q Who put the C's in the upper right-hand  
22 corner of the document in the file?

23 A I don't know specifically who. The secretary  
24 sometimes puts things on it to tell her something but  
25 I don't know exactly who put that C on there or what it



1  
2 means.

3 Q So all the documents in here are documents  
4 which you wrote and the secretary was keeping a  
5 chronological copy for you?

6 A In general those would be my documents.  
7 On occasion I have asked her to put something that I  
8 didn't actually write in there just so that I could find  
9 it because it related to something I had written.

10 Q Take a look at the document that is stamped  
11 21765. After you have had a chance to read that, could  
12 you tell me what it is.

13 (Three-page document entitled "Supplemental  
14 Information for Figure 15E.6.2" marked GPU  
15 Exhibit No. 495 for identification, as of this  
16 date.)

17 MS. WAGNER: The question I think, Mr. Cartin,  
18 is what is this document?

19 A During this time period I prepared some  
20 sequence diagrams that showed the various safety  
21 functions for Chapter 15 events. It was done for the  
22 PASNY contract and the consumer's contract. This looks  
23 like some information I had prepared for one of those  
24 particular diagrams. I can't tell which plant it was  
25 appropriate to from the information here.

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Q How would your preparation of this which we have marked as GPU Exhibit 495 relate to sequence diagrams?

A We generally provided some additional discussions that were supplemental to the sequence diagram.

Q What is a sequence diagram?

A A sequence diagram is a graphic -- well, it is not graphic. It is an illustration of a transient that attempts to show what safety systems must work or have been assumed to work in the analysis. It gives the NRC a picture of why you assume HPI to work in your analysis.

Q GPU 495 is a written description that you prepared to go along with the graphic or diagrammatic description of system operation, is that right?

A Yes, but I am not aware that this is the final form of a particular document that I released.

Q From its location in your chronological file, can you state approximately when you prepared GPU 495?

MS. WAGNER: I guess it should be noted for the record that there doesn't appear to be a date on the document.

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A Based purely on the fact that there is a memo, unrelated memo of date June 23, 1978 before it and an unrelated memo of June 26, 1978 after it, that may indicate it was written around June of 1978.

Q What did you refer to in preparing the information that is on the first page of GPU 495?

A I don't remember the exact information I had at my disposal at the time I prepared this document. It was prepared to supplement an FSAR.

Q Did you believe that the instructions which you gave in the third paragraph beginning with the words "This condition" were the proper instructions for the operation of high pressure injection?

MS. WAGNER: I object to the form.

A The intent of this information was not to provide guidelines or instructions on how to control anything. It was primarily to identify those areas that may require some action on the part of the operator.

Q Did you believe that the operator action which you described in this paragraph was the correct operator action to be taken for a small break loss of coolant accident of the type described in this exhibit?

MS. WAGNER: I object to the form. I don't believe the exhibit describes such an accident.

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Q Isn't it a fact that the document does describe a small break loss of coolant accident?

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A The document is in reference to an instrument line break.

5

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Q Instrument line from the primary system, right?

7

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A That's correct.

9

Q The primary system holds reactor coolant?

10

A Yes.

11

Q And a break in that line would be a loss of coolant accident of the small break size, right?

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A If the break is in the right location, yes.

14

Q Now, would you answer the question that I posed before, did you believe that the statements that you made in the third full paragraph about operation of the high pressure injection system described a correct method for operation of the high pressure injection system during a small break loss of coolant accident?

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MS. WAGNER: I object to the form.

22

A The statements here were intended to say that the operator will be required to control HPI following this particular accident since once it is actuated, it more than matches the leak rate thereby

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1  
2 terminating the accident as far as 10 CFR 50.46 goes.

3 Q Did you believe at the time you wrote this  
4 that the descriptions of when and how the operators  
5 should regulate high pressure injection were accurate?

6 A Again, this was not meant to be specific  
7 guidance given to the operators.

8 Q I didn't say that it was.

9 A It was generally to indicate that the  
10 operator would be required to control HPI once he had  
11 a normal pressurizer level for this particular break.

12 Q You said that this was to indicate that  
13 the operator would be required to control high pressure  
14 injection. Do you believe that the descriptions in  
15 this paragraph of when he would be required to control  
16 HPI and how he would be required to control HPI were  
17 accurate?

18 MS. WAGNER: Mr. Seltzer, I think for the  
19 record it would be appropriate to demonstrate  
20 what in this paragraph you think tells you when  
21 you should control HPI, and as I read it, the  
22 paragraph --

23 MR. SELTZER: Fine, let me do the examining.

24 Q Do you see the third sentence that says,  
25 "That is, the operator must control pressurizer level to

1  
2 prevent the HPI pumps from filling the pressurizer and  
3 increasing the system pressure"? It goes on and says,  
4 "This is accomplished by securing the HPI pumps."

5 Do you see that?

6 A Yes.

7 Q Did you believe that the descriptions in  
8 this paragraph of when and how the operator was to  
9 control the high pressure injection pumps was accurate?

10 MS. WAGNER: Mr. Seltzer, again I must  
11 object to your question. You haven't pointed  
12 to anything here which says when you must do it.

13 I wouldn't continue with my objection  
14 unless you have a problem in understanding it.  
15 Don't answer the question until Mr. Seltzer  
16 responds.

17 Q Isn't it a fact that this says the  
18 operator must regulate high pressure injection in order  
19 to control pressurizer level?

20 A For this particular event that would be a  
21 reasonable action, yes.

22 Q And he must throttle high pressure injection  
23 when it is necessary to do so to prevent the pressurizer  
24 from filling and system pressure from increasing, right?

25 MS. WAGNER: I object to the form.



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A From the standpoint of identifying operator actions for a safety function of this particular event, he would, could throttle HPI to prevent the system from going water solid. This is a very, very small break, one that is immediately matched by high pressure injection when actuated.

Q Did you understand at the time you wrote this that B&W believed it was desirable to prevent the reactor coolant system from going water solid?

MS. WAGNER: Are you asking him in this case or in general?

MR. SELTZER: In general. In general, but I want to limit it to small break loss of coolant accidents.

MS. WAGNER: Do you understand what the full question is now?

Q Did you understand at the time you wrote GPU 495 that B&W's engineering department believe that it was desirable to avoid letting the reactor coolant system going water solid during a small break loss of coolant accident?

MS. WAGNER: I object to the form.

A Per definition, this break is at the point that it is generally not defined as a small break loss



1  
2 of coolant accident, a small leak which is very  
3 close to normal operation as far as the system is  
4 concerned, so in general it is not generally viewed a  
5 small break LOCA. It is a small -- it is a size range  
6 that is categorized as a small leak which is used to  
7 size your high pressure injection.

8 Q It is a fact, isn't it, Mr. Cartin that  
9 this is a break of sufficient size to require the  
10 actuation of the high pressure injection system?

11 A That is correct but it is immediately  
12 matched by the flow introduced by that system.

13 Q For breaks in the reactor coolant system  
14 that could be matched by flow from the high pressure  
15 injection system, did you understand in 1978 that B&W  
16 intended that the reactor coolant system should not  
17 become water solid?

18 MS. WAGNER: Objection to the form.

19 A Preventing water solid conditions would be  
20 advisable actions provided those actions do not put the  
21 plant in an unsafe condition. The operator has to  
22 review all the plant parameters and take actions as  
23 appropriate.

24 Q Do you see the sentence which is the next  
25 to the last sentence in your third paragraph, "The HPI

pumps can then be stopped manually once a normal pressurizer level is established"?

A Yes.

Q At the time you wrote that sentence, did you believe that was an accurate statement?

MS. WAGNER: Objection.

A For this accident as described in the FSAR and as this information related to the sequence diagram prepared to supplement that, that would be a correct statement of what the operator could do because the system would be highly subcooled.

Q Based on your understanding of the operation of the B&W plant and the analyses that you were familiar with for small break loss of coolant accidents, did you believe that that statement about high pressure injection pumps being stopped manually once normal pressurizer level is established was a correct statement for small break loss of coolant accidents within the capacity of the high pressure injection pumps?

MS. WAGNER: Objection to the form.

A This particular information was prepared specifically for one accident. This one in a given FSAR. I prepared this information to supplement that

1  
2 particular accident specifically.

3 Q Now I am asking you a slightly different  
4 question. I am telling you it is a slightly different  
5 question. I am not limiting this question now to breaks  
6 in instrument line or lines from the primary system.  
7 Do you understand that?

8 A You are not limiting it to that?

9 Q That's right. Now I am expanding it to a  
10 class of small break loss of coolant accidents including  
11 this particular small break loss of coolant accident  
12 that is within the capacity of the high pressure  
13 injection pumps to overcome the loss of coolant.

14 Are you familiar with breaks of that size  
15 range?

16 A Yes.

17 MS. WAGNER: Mr. Seltzer, I have to object  
18 to one thing. He has testified this is not a  
19 small break loss of coolant accident. You are  
20 welcome to ask him about small break loss of  
21 coolant accidents within the capacity of HPI.

22 MR. SELTZER: I think his testimony is what  
23 it is. He did say earlier that this is a small  
24 break loss of coolant accident.

25 MS. WAGNER: I don't think he did but anyway,

1  
2 regardless of what he said, go ahead.

3 Q For small break loss of coolant accidents  
4 within the capacity of the makeup pumps, isn't it a  
5 fact that it was your understanding in 1978 that for  
6 those breaks the high pressure injection pumps can be  
7 stopped manually once a normal pressurizer level is  
8 established?

9 A That statement is made in direct reference  
10 to a specific break assumed to be at a specific location  
11 within the FSAR. For that particular instance, that  
12 statement was an indication or was intended to be an  
13 indication that the operator would have to take control  
14 would be -- the operator would not have to, but the  
15 operator would be advised to take control actions once  
16 a normal pressurizer level was obtained.

17 Q Based on your knowledge in 1978, are you  
18 aware of any reason why that would not be the correct  
19 operator response to any other small break loss of  
20 coolant accident within the capacity of the high  
21 pressure injection pumps?

22 A At that --

23 MS. McDONALD: Can I have that read back?

24 (Record was read back.)

25 A Could you define for me what "correct

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2 response" is?

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Q The response which B&W thought was the appropriate response, just as B&W thought that stopping the pumps manually once normal pressurizer level was established for this particular response described in GPU 495 --

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A Pressurizer level is not the only indication which an operator would use to control HPI flow. This information was not to be a verbose discussion of the why's and wherefore's of operator action. It was to supplement a diagram that said the operator would take manual action to control HPI flow and that was its intended intent.

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Q It is a fact, isn't it, that there are instrument lines that are in the steam space at the top of the pressurizer?

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A That is correct.

19

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Q When you wrote this, you were writing descriptions that would apply to a break in those instrument lines, is that right?

22

23

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A If my memory serves me correct, the break in this particular instance was assumed to be within the primary loops.

25

Q Does that include the pressurizer?

A No, the break was within the water space of the primary loops, the cold legs or hot legs.

Q Is there anything in GPU 495 that that?

A Is that question directed to me?

Q Yes.

A Not specifically, no.

Q There is no reference in your description on high pressure injection control to a subcooling margin, is there?

A No, there is not.

Q There is no reference in your description of high pressure injection control to saturation conditions, is there?

A No, there is not.

MS. WAGNER: I think, Mr. Seltzer, that the record would be more complete if it were noted that the paragraph from which you have been reading refers to actions to be taken "with the reactor temperature and pressure below the normal 'hot' shutdown condition."

Q You were involved in late 1978 and early 1979 in meetings with Toledo Edison and with the NRC regarding problems of pressurizer level indication,

Re: GPU 82  
PP. 158-78



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2 isn't that right?

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A That is correct.

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Q What was your responsibility in connection with that issue of pressurizer level indication?

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A Yes.

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Q And you attended a meeting two days earlier among B&amp;W and Toledo Edison Company personnel?



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A Yes.

3

Q On page 1 in the first paragraph, do you

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see the sentence beginning, "This meeting"?

5

A Yes.

6

Q It says, "This meeting was required to

7

identify and resolve present problems associated with

8

establishing steam generator level control set points

9

which would maintain indicated pressurizer level

10

during normal reactor trip events." E

11

What is your understanding as to why it

12

was thought to be important to maintain indicated

13

pressurizer level during normal reactor trip events?

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MS. WAGNER: I object to the question. I

15

don't think the memo indicates that it is

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important but the witness can answer the question.

17

A The pressurizer level issue was essentially

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viewed as an operational inconvenience. It is desirable

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that under normal reactor trip events design condition

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would be that pressurizer level indication would remain

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on scale. Several of the plants were experiencing

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problems, TECO being one, that indicated level would

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go off scale momentarily and therefore the operator

24

had no pressurizer level indication.

25

Q Why, if you know, was it deemed advisable

1  
2 for the operator to maintain a pressurizer level  
3 indication?

4 A Would you repeat that?

5 Q Why, if you know, was it deemed advisable  
6 for the operator to maintain a pressurizer level?

7 A The pressurizer level issue here was being  
8 raised as a result of questions received by TECO from  
9 the NRC. We were trying to assist them in preparing  
10 a response to specific NRC questions.

11 Pressurizer level, although desirable, was  
12 not an indication that was required to maintain plant  
13 safety for the conditions of question here.

14 (Continued on the following page.)  
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Q Take a look at page 3 of your notes.

Do you see Section 3 entitled "Criteria for Pressurizer Sizing"?

A Yes.

Q Your first sentence under that states, "The need to maintain pressurizer level during normal accident conditions was discussed at length."

Who was it who was discussing at length the need to maintain pressurizer level?

A This general meeting was primarily chaired by Eric Swanson, although I don't remember specifically most everyone in attendance. It was an open discussion-type meeting.

I in general tried to give a fair record of what went on.

Q Did anybody at the meeting discuss problems associated with losing pressurizer level indication going on the high side; in other words, the water level rising above a level at which the operators can read pressurizer level in the control room?

A Without -- my only basis for memory would be to review this document in detail. Right now

1  
2 I don't remember that being an item of discussion,  
3 although it could have been.

4 Q Do you remember any discussion at this  
5 meeting about the operators having been confused by  
6 rising pressurizer level indication during a transient  
7 that had occurred at Davis-Besse?

8 A I don't remember that being an item of  
9 discussion.

10 Q Did Bert Dunn say anything at the meeting  
11 about incorrect operator action in terminating  
12 high pressure injection in response to a rising  
13 pressurizer water level?

14 A I don't remember Mr. Dunn making any  
15 statements to that effect.

16 Q You refer in this same paragraph on page  
17 3 to a table attached to your minutes, Table 2.

18 Did you review Table 2 before including it  
19 in your memorandum, GPU 82?

20 A I believe I prepared Table 2 to be  
21 consistent with the information written on a  
22 blackboard and the open discussion at that meeting.

23 Q Who had put the information on the  
24 blackboard during the meeting?

25 A Some of the information in part was put up

1  
2 by Eric Swanson. There may have been others.

3 Q In Table 2 do you see the column at the  
4 far right-hand side headed "LOCAs"?

5 MS. WAGNER: I think we should state for  
6 the record that it is kind of hard to read this.

7 MR. SELTZER: Let me see if we can give  
8 you a better copy. That's the copy from  
9 your chronological file.

10 A Yes, I see it.

11 Q What was the purpose of the entries on  
12 that column.

13 A May I review the table for a few minutes  
14 and see if I can put it in the right frame?

15 Q Certainly.

16 THE WITNESS: Would you repeat the  
17 question.

18 Q What were the entries in the last column  
19 under loss of coolant accidents intended to  
20 indicate?

21 A The table in general were trying to write  
22 down some general items regarding pressurizer level  
23 during various accident conditions and normal operation,  
24 trying to list what we knew at that time to be the  
25 steam generator level control set points assumed in

the analysis of those accidents or normal operating conditions, and we wrote down some general things that were possible following items to be investigated after this meeting.

Q What is the entry under "Small Break" loss of coolant accidents?

MS. WAGNER: At any point on the chart or all of them? The first entry?

A Loss of pressurizer level is a natural consequence of the accident.

Q Did that mean loss of level low?

A I would interpret that to be the intent of that statement.

Q When is the first time that you learned that during a small break loss of coolant accident it was possible for pressurizer level to go off scale high as a natural consequence of the accident?

MS. WAGNER: Objection to the form.

A I think when you look at LOCAs, you have to be very specific as to where their location is for a break outside of the pressurizer is generally a natural consequence to the level to go low.

For a break at the top of the pressurizer, it would be a general consequence of the level to go



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up. Everybody knew that. It was a natural consequence. It wasn't an expected condition.

Q I am not asking you to testify to what people in China know, to what people in Africa know. I don't want you to tell me what everyone knows because I don't think you know what everyone knows, do you?

MS. WAGNER: I don't think you need to yell at the witness. The witness is trying to respond to your questions and if you want to ask him in a polite tone of voice, he may answer the question.

Q You don't know what everyone knows, do you?

A That is correct.

Q When is the first time that you learned as part of your active understanding of the operation of a B&W reactor coolant system that pressurizer level could go up as a natural consequence of a small break loss of coolant accident?

MS. WAGNER: Mr. Seltzer, could I inquire what you mean by "active understanding" as opposed to regular understanding?

MR. SELTZER: I mean not when does



1  
2 Mr. Cartin now believe it would have been  
3 implicit in his knowledge.

4 I want to know when he explicitly knew  
5 as a fact that pressurizer water level would  
6 rise in response to certain small break loss  
7 of coolant accidents.

8 A In general, an analyst, when he --

9 Q Not in general an analyst. I want to know  
10 when you learned for the first time.

11 A I do not know the exact time I gained  
12 that knowledge. One of my first jobs as an analyst  
13 at B&W was to analyze a break at the top of the  
14 pressurizer in regard to an accident. It was an  
15 expected condition then the pressurizer level would  
16 rise.

17 Q Who expected it?

18 A In general before an analyst attempts to  
19 make an analysis, he has some expectation of what  
20 he expects to see. It's good engineering practice  
21 to say this is what I anticipated to find, and if your  
22 detail calculations confirm that, that's the normal  
23 way that at least I would go about running an analysis.

24 Q Did you have detailed calculations that  
25 confirmed that pressurizer water level would rise

1  
2 in response to a break in the steam space?

3 A The calculations that I performed indicated  
4 that.

5 Q Where are those calculations?

6 A I have no knowledge of their whereabouts  
7 today.

8 Q Be as specific as you can.

9 What writings do you recall existed at  
10 the time that you are describing which would  
11 describe a rise in pressurizer water level in  
12 response to a break in the steam space at the top  
13 of the pressurizer?

14 MS. WAGNER: Are you including in that  
15 question what, for instance, computer runs you  
16 could draw that inference from or are you asking  
17 for a sentence that level will go up if there  
18 is a break at the top of the steam space?

19 MR. SELTZER: I believe that Mr. Cartin  
20 testified that he saw something in writing that  
21 described a rise in pressurizer water level in  
22 response to a break in the steam space at the  
23 top of the pressurizer.

24 THE WITNESS: That is incorrect.

25 Q You do not recall seeing anything in

1  
2 writing that described a rise in pressurizer water  
3 level in response to a break in the steam space at  
4 the top of the pressurizer?

5 A At or about the time I was doing those  
6 particular analyses, no. Pressurizer level  
7 wasn't exactly pertinent to showing acceptance as to the  
8 criteria that we were trying to demonstrate.

9 Q So you did not create and you don't  
10 recall anything in writing that described a rise in  
11 pressurizer water level in response to a small break  
12 loss of coolant accident, is that right?

13 A I do not remember preparing a document  
14 of that nature.

15 Q And you don't remember seeing a document  
16 of that nature, is that right?

17 MS. WAGNER: Again, just to clarify the  
18 question, because I am not sure that it is  
19 clear on the record, you are talking about  
20 something which says in the English language,  
21 this is what you see. You are not talking  
22 about numbers from which one could draw that  
23 conclusion; is that correct?

24 MR. SELTZER: Well, let's take first a  
25 description in words that describes a rise in

pressurizer water level in response to a break at the top of the pressurizer.

Q Is it a fact that you never saw such a description?

MS. WAGNER: At or about the time that he is talking about, obviously.

A At or about the time in 1972 or '71?

Q Whenever you were doing the ATWS analysis.

A No, I never saw a description of that nature.

Q Did you see any mathematical representation of the response of pressurizer water level to a break in the steam space at the top of the pressurizer?

A The run I was examining was a break equivalent in size to I believe a pressurizer safety valve under ATWS conditions.

The code would have indicated a rise in liquid volume within the control volume simulating the pressurizer during the early parts of a transient.

Q You say it would have?

A Yes.

Q When is the last time you saw those calculations?

A I don't ever remember re-looking at those

calculations since that analysis was completed.

Q So more than a decade ago you are talking about?

A It's been at least approximately ten years.

Q You said that it's your belief that the calculations would have shown that.

Do you have any specific recollection of noticing that the calculations did in fact show that?

A I don't remember my exact review process at that time.

In general, my general practice in conducting an analysis would be to examine plots of what the system performance was and asking myself whether they were reasonable and what I expected.

Q Let me be very clear. I don't want you to speculate on what you would have done.

I am asking you do you recall today, ten or 11 years later, that you actually looked at this mathematical data and noticed that it showed a rise in pressurizer water level for a break at the top of the pressurizer?

A I do not remember making that exact

1 observation, but I may have.

2 Q Did you ever tell anybody after the  
3 Three Mile Island accident that you had some ten  
4 years earlier reviewed data that showed a rise in  
5 pressurizer water level in response to a small  
6 break at the top of the pressurizer?  
7

8 MS. WAGNER: I object to the form.

9 A No, I saw no reason to.

10 Q Since the Three Mile Island accident,  
1 have you ever discussed with anyone other than  
2 counsel the fact that you think you saw data more  
3 than ten years ago that predicted there would be a  
4 rise in pressurizer water level in response to a small  
5 break at the top of the pressurizer?  
6

7 A I don't remember any specific  
8 conversations, no.

9 Q At the November 27, 1978 meeting among  
10 Toledo Edison and B&W personnel to discuss problems  
1 with maintaining pressurizer level, did you point  
2 out to the attendees that in addition to the  
3 possibility of losing pressurizer level indication low  
4 in response to a small break loss of coolant accident,  
5 you knew that pressurizer level indication could  
6 also go high in response to a small break loss of  
7

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82

ON

1  
2 coolant accident?

3 MS. WAGNER: Mr. Seltzer, I think you are  
4 drawing an unfair assumption from the witness'  
5 testimony.

6 MR. SELTZER: Do you have an objection  
7 to the testimony? Why don't you state it  
8 instead of making a speech?

9 MS. WAGNER: I object to the fact that  
10 you are eliminating from your question an element  
11 of the witness' testimony, i.e., the analysis  
12 that he did was under ATWS conditions.

13 You may answer the question.

14 A No, I do not remember making statements  
15 of that nature. I think they wouldn't have been  
16 appropriate.

17 Q Why wouldn't they have been appropriate?

18 A We were looking at a loss of pressurizer  
19 level in the opposite direction.

20 Q Do you have any recollection of discussing  
21 with anyone prior to the Three Mile Island accident  
22 the anticipated fact that pressurizer water level  
23 could rise in response to certain small break loss  
24 of coolant accidents?

25 (Continued on the following page.)



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MS. WAGNER: Objection to the form.

A As a result of the ATWS analysis that I conducted, I did prepare some presentations on the outcome of that analysis. I don't remember the exact contents, and I do not remember whether I made specific statements regarding the calculated response of water volume or other parameters that would relate to a pressurizer level.

Q So you are not sure that even in relation to the anticipated transient without scram studies that you did in or about 1972 whether you mentioned this unusual response of pressurizer level rising following a small break loss of coolant accident, is that right?

MS. WAGNER: I object to the form.

A I would not say it was an unusual response for that particular accident. It was the expected response.

Q You don't recall studying that response even with regard to that ATWS study, right?

A I do not recall any specific instances where I did, but I may have.

Q And you don't recall discussing it in any context other than that ATWS study, do you?

2 A Not at that time period, no.

3 Q What about any time period prior to the  
4 Three Mile Island accident?

5 A No, not that I remember.

6 Q You said you took issue with my calling  
7 the rise in pressurizer water level an unusual  
8 response.

9 Isn't it a fact that for all loss of  
10 coolant accidents except a break in the steam  
11 space at the top of the pressurizer, the normal  
12 response of pressurizer water level is to drop?

13 MS. WAGNER: Objection.

14 THE WITNESS: Would you repeat that,  
15 please?

16 (Record read back.)

17 A It was not an unusual response for the  
18 break that I analyzed.

19 I will agree with you for breaks outside  
20 of the pressurizer, the initial response during the  
21 LOCA would be a drop in pressurizer level.

22 Q Were you aware before the Three Mile  
23 Island accident that for system transients other than  
24 a small break at the top of the pressurizer reactor  
25 coolant system pressure and pressurizer level moved

2 in the same direction?

3 MS. WAGNER: Could you read that back?

4 (Record read back.)

5 MS. WAGNER: Did you intend that to be  
6 limited to LOCAs or any transients?

7 MR. SELTZER: Any transients.

8 A I don't believe I ever thought of that  
9 particular relationship in that context. I was  
10 aware that I could give you an estimation for a  
11 given transient as far as what pressurizer level  
12 and pressurizer pressure would do.

13 I don't think I ever thought about that  
14 particular concept insofar as direction.

15 Q Are you aware of any other transients  
16 besides a small break at the top of the pressurizer  
17 which produces movement of pressurizer water level  
18 that is in a direction opposite reactor coolant  
19 system pressure?

20 MS. WAGNER: Are you asking for his  
21 current understanding?

22 MR. SELTZER: No, his knowledge before  
23 the Three Mile Island accident.

24 A Again, I had never thought of the concept  
25 of pressure and pressurizer level moving in the same

2 direction.

3 I prefer not to answer that unless I was  
4 given adequate time to think about it and evaluate  
5 it since it's a new concept to me.

6 MS. WAGNER: I don't think Mr. Seltzer  
7 wants you to evaluate something now. He wants  
8 your recollection of whether, some time before  
9 March 1979, you thought about that.

10 A I had not thought about that concept in  
11 particular.

12 Q Since the Three Mile Island accident,  
13 have you ever discovered any transient that causes  
14 pressure and pressurizer level to go in opposite  
15 directions other than a small break loss of coolant  
16 occurring at the top of the pressurizer?

17 MS. WAGNER: Just before we go on, so  
18 the record is clear, I take it you understand  
19 what Mr. Seltzer now means by "pressurizer level  
20 and pressure going in opposite or the same  
21 directions," is that correct?

22 THE WITNESS: Yes.

23 MS. WAGNER: Now, why don't you answer his  
24 question.

25 A I really haven't thought about it.

1  
2 MR. SELTZER: Let me mark as GPU Exhibit  
3 82-A a clearer version of what has previously  
4 been marked as GPU Exhibit 82.

5 This is a memo from Cartin to Karrasch  
6 dated November 29, 1978, subject: "TECo - B&W  
7 Meeting Minutes." It's stamped with the  
8 identification No. T21883 on the first page.

9 (Clearer copy of GPU Exhibit No. 82  
10 marked GPU Exhibit No. 82-A for identification  
11 as of this date.) -

12 Q Did you ever discuss with anybody after  
13 the Three Mile Island accident how many people in  
14 Eric Swanson's group knew before the Three Mile  
15 Island accident that a break at the top of the  
16 pressurizer would produce a rise in pressurizer water  
17 level?

18 MS. WAGNER: Objection to the form.

19 A Would you repeat that?

20 Q After the Three Mile Island accident,  
21 did you ever have a discussion among the people in  
22 Eric Swanson's group to see how many of them  
23 actually knew before the Three Mile Island accident  
24 that a break at the top of the pressurizer would  
25 cause pressurizer water level to rise?

1

2

A No.

3

MS. WAGNER: Objection to the form.

4

Q Did you ever have any discussion with

5

Bert Dunn after the Three Mile Island accident to

6

ask him what his understanding was prior to the

7

Davis-Besse event about whether a break at the top

8

of the pressurizer would cause a rise in pressure

9

water level?

10

A No. I don't remember a conversation

11

of that nature.

12

Q Did you ever have such a conversation

13

with Bruce Karrasch?

14

A I don't remember talking about that

15

subject to Bruce Karrasch.

16

Q Did you ever talk with anybody about

17

when they first knew that a break in the steam

18

space at the top of the pressurizer would produce

19

a rise in pressurizer water level?

20

MS. WAGNER: Objection to the form.

21

A I believe I would guess I had talked

22

about that after the accident. I believe I also

23

addressed that particular subject in the preparation

24

of ATOG guidelines.

25

Q You are missing my point.



1  
2 The question is did you ever discuss  
3 with anybody after the accident when, prior to the  
4 accident, they gained actual knowledge that a break  
5 in the steam space at the top of the pressurizer would  
6 produce a rise in pressurizer water level?

7 A No.

8 Q After the Three Mile Island accident,  
9 do you remember working with D. G. Newton on  
10 developing operating instructions for a stuck open  
11 pilot operated relief valve?

12 A I worked on that area briefly, yes.

13 Q Who was D. G. Newton?

14 A He was another engineer within our group.

15 Q He was Eric Swanson's group?

16 A Yes.

17 Q I would like to show you GPU Exhibit 297  
18 and ask you if this is a copy of a memorandum which  
19 you and Newton prepared and circulated on or about  
20 April 8, 1979.

21 A This must be the predecessor of a memo  
22 that possibly was released, but I didn't actually sign  
23 the memo. It does have my name on it.

24 Q Newton had prepared an earlier draft of  
25 this, hadn't he?

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A I don't remember the exact circumstances under which these guidelines were prepared. Both he and I worked on various parts of them. I don't know who prepared the actual drafts.

Q Take a look at the second page of the exhibit.

Do you see the item numbered 3 at the bottom, "Symptoms of a Stuck Open PORV"?

A Yes.

Q Under 1 you have, "Decreasing reactor coolant pressure," with "A, Pressurizer level increasing or indicated high; B, stable or increasing reactor coolant temperature."

How did you know that a symptom of a stuck open pilot operated relief valve would be pressurizer level increasing or indicated high?

MS. WAGNER: Object to the form.

A I don't remember the exact bases for developing this symptom other than intuition.

Q Let me show you what D. G. Newton had drafted earlier that same day and I will mark it as GPU Exhibit 496. It's a memo from Newton to Womack, subject: "Operating Instructions for Stuck Open PORV" dated April 8, 1979, 12:57 a.m.

(Memo from Newton to Womack, subject:  
"Operating Instructions for Stuck Open PORV"  
dated April 8, 1979, 12:57 a.m., marked  
GPU Exhibit No. 496 for identification as of  
this date.)

Q What I want to call your attention to is  
page 3, item 4, "Symptoms of a Stuck Open PORV."

Mr. Newton has identified the symptoms  
of a stuck open PORV as "Decreasing RC pressure  
or pressurizer level with no decrease in RC temperature  
or increase in let down flow."

Do you see that?

A Yes.

Q In preparing GPU 297, did you notice  
that Mr. Newton had been in error in what he had  
described as the symptoms of a stuck open PORV in the  
draft he had prepared earlier that day?

MS. WAGNER: I object to the form.

I don't believe the witness has testified that  
he did prepare GPU 297, although he may have;  
nor do I think it was established that he ever  
saw GPU 496 prior to any later memo.

A I don't remember specifically this memo.

MS. WAGNER: Referring to 496 from

1  
2 Mr. Newton to Mr. Womack.

3 Mr. Cartin, I will advise you now not  
4 to interpret these documents. Mr. Seltzer  
5 wants to know about the preparation of these  
6 documents.

7 If you have a recollection, give it to  
8 him, but if you don't, don't interpret these  
9 documents.

10 A I did assist in the preparation of this  
11 memo, or one that was changed subsequently to it,  
12 but not to my recollection this memo.

13 MS. WAGNER: The witness identified  
14 GPU 297 as the one he worked on but not GPU  
15 496.

16 Q Did you ever tell Newton that he was  
17 wrong in thinking that the symptoms of a stuck  
18 open pilot operated relief valve included decreasing  
19 pressurizer level?

20 MS. WAGNER: Objection to the form.

21 A I believe Mr. Newton and I were in agreement  
22 as to the symptoms we indicated in the memo that he and  
23 I -- the memo, GPU 297.

24 Q In other words, to the extent that the  
25 symptoms in GPU 297 are different from those in GPU

1  
2 496, Newton's views had changed?

3 MS. WAGNER: Objection to the form.

4 The witness has not identified having  
5 knowledge of 496. I don't think he can answer  
6 a question about Newton's views based on two  
7 memos, and I direct him not to answer.

8 Q You made a statement earlier that everyone  
9 knows something about what happens to pressurizer  
10 level in response to a break at the top of the  
11 pressurizer.

12 When you made that statement, you didn't  
13 have in mind what Newton's thinking had been in  
14 April 1979, did you?

15 MS. WAGNER: Objection to the form.

16 A I was not particularly thinking of Mr.  
17 Newton at the time when I made that statement.  
18 The statement was one, of an issue that was at least  
19 obvious to me.

20 MR. SELTZER: I don't think we have any  
21 further questions.

22 Do you want to cross-examine later?

23 MS. WAGNER: I do.

24 (Whereupon, at 12:50 o'clock p.m., a lunch  
25 recess was taken.)

## AFTERNOON SESSION

(4:40 p.m.)

L U C I U S       R O S C O E       C A R T I N ,

resumed.

EXAMINATION BY MS. WAGNER:

Q       Mr. Cartin, you have been asked questions during this deposition about GPU 330, which is a memorandum written by Mr. Jones to you on December 11, 1978.

Did you have an understanding at or about that time of whether or not Mr. Jones had a position with respect to the issue of pumps running about which you have testified during this deposition?

A       It was my understanding at that time that Mr. Jones' position was that tripping the pumps early in the event as assumed in the past analyses bound the consequences that would occur if the RC pumps were assumed to operate continuously.

Q       Did you know at or about that time whether he had any position with respect to whether an analysis, a further analysis was needed?

A       At that time he agreed with my previous recommendation that it was -- it would be very helpful to document and make this issue clear,



1  
2 obviously clear that tripping the pumps early was  
3 a worst case should this issue be raised in the  
4 future.

5 Q What was the basis for your understanding  
6 just testified to about Mr. Jones' position?

7 A Both this memo and discussions I had  
8 with him after this memo was issued.

9 Q What was the subject of the conversations  
10 after the memo was issued?

11 MR. SELTZER: I object. For you to be  
12 introducing this through cross-examination of  
13 your own witness when it's clearly hearsay I  
14 think is improper.

15 MS. WAGNER: You think it is hearsay for  
16 this witness to testify about the subject  
17 of his conversation with Mr. Jones?

18 MR. SELTZER: Yes. If you are asking  
19 him to testify about the substance of what  
20 Jones told him, that's the heart of hearsay.

21 MS. WAGNER: I am asking him to testify  
22 about what his understanding was based on  
23 what Jones told him.

24 MR. SELTZER: I object; that's clearly  
25 hearsay.

1  
2 Q You may answer the question, Mr. Cartin.

3 A During those discussions we talked  
4 briefly about the items identified in his memo and  
5 specifically about the resource requirements that  
6 I had specifically requested of him.

7 Q After this conversation was an analysis  
8 performed?

9 A Yes, it was, and it was started in January  
10 of the next year.

11 Q In that analysis, what assumption, if  
12 any, was made about reactor coolant pumps?

13 A Reactor coolant pumps were assumed to  
14 operate continuously during the small break analyzed.

15 Q Do you recall that you testified earlier  
16 that you did not at that time have a basis for  
17 assuming one way or another whether the pumps  
18 physically could run under those circumstances?

19 A Yes.

20 Q Was it any purpose of the analysis  
21 that was performed, to the best to your knowledge,  
22 to determine whether or not the pumps physically  
23 could run in the circumstances assumed in that analysis?

24 A No. The exact purpose was to evaluate  
25 what the system response would be assuming the pumps

operated continuously.

Q Was any assumption made in that analysis about a change in the pump status?

A No, for that particular analysis the pumps were assumed to operate continuously.

Q At or about this time were you aware of any analysis in which any assumption was made with respect to the pump status other than the one you have just testified to or which you previously testified to the pumps tripped status?

A No. At that time the only assumptions under consideration was assuming a pump trip due to a loss of off-site power at reactor trip and the second situation was continuous RC pump operation.

Q Did there ever come a time when a pump status other than what you have just described was considered?

A Following the TMI 2 event, the status of the RC pumps was further evaluated for loss of coolant accidents under a set of assumptions not previously considered, PSC was issued that identified that a pump trip during the course of a LOCA could result in more severe consequences than previously predicted.

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2 Q Was any analysis done to your knowledge  
3 with respect to the issue you have just described?

4 A Yes, a detailed analysis was done.

5 Q What was the conclusion of that analysis?

6 A That analysis generally showed that there  
7 is a break, a range of small break sizes approximately  
8 .02 to .2 square foot in area for which or during  
9 which a pump trip at certain times in the event  
10 could lead to more severe consequences.

11 Q Do you know what the size of the opening  
12 was in the opening of the TMI-2 PORV?

13 A It's approximately .007 square feet.

14 Q Was a break of that size addressed by  
15 the conclusions reached in the analysis of the pump  
16 trip at some time other than the reactor trip?

17 A That analysis would indicate that the pump  
18 status would have no bearing on the overall  
19 acceptability of the failed open PORV under standard  
20 LOCA assumptions.

21 Q ... this analysis that you have just  
22 described, was any assumption made with respect  
23 to the status of high pressure injection?

24 A To the best of my knowledge, that analysis  
25 included at least the minimum flow from at least one

1  
2 train of HPI.

3 Q Do you know if that assumption was also  
4 made in the analysis of pumps running that you have  
5 described was done in January of '79?

6 A Not specifically, but that would be the  
7 standard LOCA assumption for small break analyses.

8 Q Mr. Cartin, do you recall yesterday,  
9 I believe, testifying about an interview you had with  
10 an I&E inspector?

11 A Yes.

12 Q Was that interview in any way recorded?

13 A No.

14 Q Was it tape recorded?

15 A No.

16 Q Was it recorded by a stenographer?

17 A No.

18 Q Were you ever asked by anyone to review  
19 any summary of that conversation for accuracy?

20 A No.

21 Q Mr. Cartin, Mr. Seltzer asked you some  
22 questions about what was marked this morning as GPU  
23 Exhibit 82-A for identification. He was asking you  
24 questions about Table 2, I believe, about the column  
25 entitled "LOCAs."

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I would like to ask you some questions about the column entitled "Condition 2 Events."

What are condition 2 events?

A Condition 2 events are generally events of moderate frequency. That is, they are expected to occur on the order of at least one per year.

Typical examples that we considered here was the loss of off-site power, stuck open secondary side relief valve and loss of main feedwater.

Q What would be included in a definition of a stuck open secondary side relief valve?

A That may include the opening either partial or full open of a relief valve, a secondary safety valve, or even a turbine bypass valve.

Q When you refer to a relief valve, you are referring to a relief valve on the secondary side?

A That is correct.

MS. WAGNER: I have no further questions.

BY MR. SELTZER:

Q You have referred in your testimony to the analysis of the pumps running case that was done in January 1979.

Who did that analysis?

A It was conducted by the ECCS unit.



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Q Were you aware before the Three Mile Island accident that they were doing that analysis?

A Yes.

Q What was your involvement with that analysis?

A At the time the analysis was conducted, I had no involvement.

Q How did you know the analysis was being performed?

A I had been involved in the recommendation leading up to the analysis.

Q Did you stay in contact with the ECCS analysis unit personnel who were performing that analysis?

A I talked to them on occasions.

Q Did they let you know how the analysis was coming along?

A I do not remember any specific occasions where I inquired specifically.

Q Did they let you know at least that their analysis in January was supporting the conclusions which Jones had described to you in December of the previous year?

A I had knowledge of their results at the

2 time the analysis was conducted. I do not remember  
3 how I actually came to acquiring that knowledge.

4 Q So you knew that their analysis showed  
5 that even though there were increasing void fractions  
6 for certain break sizes, the pumps running case  
7 turned out to be a safer situation than pumps off at  
8 the time of transient initiation?

9 MS. WAGNER: I object to the form.

10 A Their analysis showed that most limiting  
11 consequences occurred with the pump tripped at the  
12 beginning of the accident.

13 Q And it showed that even though with the  
14 pumps on for certain cases very high void fractions  
15 were produced, is that correct?

16 MS. WAGNER: I object to the form.

17 A I did not review in detail the calculations  
18 performed. I only had knowledge of the basic conclusions  
19 reached.

20 Q Were you aware that when they did that  
21 analysis, they found that increasingly high void  
22 fractions resulted for certain void sizes with the  
23 pumps running?

24 MS. WAGNER: Objection.

25 A To the best of my knowledge, they only

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analyzed one break. I was not generally aware of what void fractions were calculated.

Q Take a look at GPU 282, please, which is the PSC report for the pumps running case.

Do you see the paragraph that begins just below the single-spaced entry?

A Yes.

Q It begins with the words "Examining this case."

A Yes.

Q Do you see in the second sentence where it says that the case that was run also shows that the reactor vessel would contain only approximately 550 cubic feet of water in ten minutes after the break?

A Yes, I see that.

Q Are you aware that that means that less than 20 percent of the total inventory of water in the reactor coolant system would be left in the reactor coolant system?

MS. WAGNER: I object to the form.

Now, Mr. Cartin, he is not asking you to analyze it. He is asking you if you are aware of that.

MR. SELTZER: I am asking for a little bit

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2 of analysis. If he knows what the total  
3 inventory in the reactor system is and knows  
4 that 550 feet constitutes less than 20 percent,  
5 then he knows the answer.

6 MS. WAGNER: I will state my objection,  
7 but I will allow the witness to answer.

8 A The total inventory of the RCS is about  
9 10,000 cubic feet or more. I don't know off the  
10 top of my head what percentage 550 would be, but if  
11 simple mathematics was done, it could be easily  
12 determined.

13 Q Were you familiar before the Three Mile  
14 Island accident with the concept of cavitation in  
15 a water pump?

16 A Not in detail. I had heard the term, yes.

17 Q You knew what it meant?

18 A Only vaguely.

19 Q Were you familiar with something known  
20 as a net positive suction head?

21 A In general I had considered it. Today  
22 I probably couldn't give you an accurate definition.

23 Q But before the Three Mile Island accident,  
24 you were familiar with the concept of net positive  
25 suction head as applied to a reactor coolant pump?

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A I don't ever remember examining that in detail.

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I have heard of the term "net positive suction head" both at B&W and previously in college.

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Q Were you aware that B&W issued net positive suction head curves that governed the range of operatability of reactor coolant pumps?

9

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A No, I am not specifically aware of that, no.

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Q Did it ever occur to you before the Three Mile Island accident that operating the reactor coolant pumps in a highly voided environment would cause destructive cavitation?

15

MS. WAGNER: Objection to the form.

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A No, I had never thought specifically of that.

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21

Q Did you know before the Three Mile Island accident that operating reactor coolant pumps in a highly voided system could result in increased vibration?

22

A Not specifically, no.

23

24

25

Q Did you know that B&W in its limits and precautions precluded operation of reactor coolant pumps with vibration exceeding certain

1

2 specified limits?

3 A No, I did not.

4 Q Did it ever occur to you that continuing  
5 to operate the reactor coolant pumps under the  
6 conditions specified in the pumps running case would  
7 violate B&W operating instructions?

8 MS. WAGNER: I object to the form.

9 A Prior to TMI-2, no.

10 Q After TMI-2, did that occur to you?

11 A I had heard that raised as a reason, as  
12 a supposed reason why they cut the pumps off at  
13 TMI-2.

14 Q Did you ever verify whether what  
15 you had heard was correct?

16 A No, I did not.

17 Q You never made any attempt to find out  
18 whether B&W had limits on net positive suction head  
19 or on vibration?

20 A No, I did not.

21 Q Did you know that cavitation is caused  
22 by steam in a water pump?

23 A In concept, yes.

24 Q You knew that before the Three Mile  
25 Island accident, right?



1

2

A Yes.

3

Q You knew that steam could cause

4

pitting on the veins of the pump, didn't you?

5

A No, sir.

6

MS. WAGNER: Objection to the form.

7

Q You knew that cavitation was an undesirable

8

feature of pump operation, didn't you?

9

A I was not a pump expert and really did not

10

understand in detail the impact of cavitation on

11

pump performance.

12

Q You knew that cavitation worsened the

13

performance of a pump as opposed to making it better?

14

A In general, that's correct.

15

Q And you knew that the performance steam

16

that was introduced into a liquid pump, the more

17

cavitation would occur, didn't you?

18

A No, not specifically, no.

19

Q You had never heard that before the

20

Three Mile Island accident?

21

A I would not say I could stand up and

22

defend that based on my knowledge.

23

Q Did you ever ask anybody when you heard

24

about the study of the pumps running case, did you

25

ever ask anybody whether running the pumps in a voided

1  
2 environment would cause excessive cavitation?

3 A No, I did not.

4 Q Do you know whether anybody else was  
5 raising a question about that?

6 A I was unaware of that at that time.

7 Q Do you understand that one of the items  
8 for which B&W was fined by the NRC was the failure  
9 to report to the NRC the item 6 in your memorandum,  
10 GPU 122?

11 MS. WAGNER: Objection to the form.

12 A No, I do not know that for a fact.

13 Q Let me show you your copy of GPU 122  
14 taken from your files which we will mark as GPU 122-A.

15 (Copy of GPU Exhibit 122 taken from  
16 Mr. Cartin's files marked GPU Exhibit No. 122-A  
17 for identification as of this date.)

18 Q That's your handwriting in the right-hand  
19 margin of GPU 122-A, is that correct?

20 A Yes.

21 Q Read what you wrote in the margin,  
22 please.

23 A The first comment to the right-hand  
24 margin of item 6 is "Condition believed to be safe.  
25 Need documentation."

1

2 Q What is the next comment in the margin?

3 A "B&W to define schedule and document  
4 position. No need for additional schedule pressure."

5 Q Do you see the 3s that you wrote in the  
6 left-hand margin?

7 A I did not write those 3s.

8 Q Do you know who did?

9 A No, I don't.

10 Q When is the first time you noticed that  
11 those 3s were there?

12 A I don't remember putting any bearing on  
13 their being there one way or the other.

14 Q Let me show you a copy of the citation  
15 which B&W received from the NRC, April 10, 1980,  
16 fining B&W a lot of money for violating NRC rules  
17 and regulations.

18 MS. WAGNER: I object to the form.

19 We will mark this as GPU Exhibit 497.

20 (Letter to The Babcock & Wilcox  
21 Company from United States Nuclear Regulatory  
22 Commission dated April 10, 1980 marked GPU  
23 Exhibit No. 497 for identification as of  
24 this date.)

25 Q This is a copy of the NRC's citation of

1  
2 B&W resulting from the TMI-2 accident which was  
3 produced from your files in this litigation.

4 MS. WAGNER: I object to the form of that  
5 comment.

6 Q Would you turn to the appendix page 2,  
7 please.

8 Do you recognize your handwriting in the  
9 left-hand margin?

10 A Yes.

11 Q What did you write next to item 3?

12 A I wrote that "me" and "me."

13 Q Those are your comments next to item 2  
14 and item 3, right?

15 A That is correct.

16 Q And it's a fact, isn't it, that you  
17 wrote "me" next to each of those because you recognized  
18 that those two items referred to actions which were  
19 allegedly taken by you, isn't that right?

20 MS. WAGNER: Objection to the form.

21 A I wrote that because the topics here were  
22 items that I had worked on or I had been associated  
23 with to some extent.

24 Q Item 3 you say referred to a topic that  
25 you had worked on. Specifically, that is the same

1  
2 topic that's in item 6 in your report, GPU 122, isn't  
3 that right?

4 A I would like to read this item if that's  
5 acceptable.

6 Item 3 of the NRC letter, GPU 497, and  
7 item 6 of GPU 122-A do address a common subject.  
8 That is an analysis with the RC pumps running.

9 Q So this does now refresh your recollection  
10 that B&W was fined and cited by the NRC for acts  
11 relating to matters that you were responsible for?

12 MS. WAGNER: I object to the form of the  
13 question.

14 You may answer it.

15 A I have no exact knowledge of the final  
16 reasons why fines were levied or paid.

17 Q But you know that the NRC citation that  
18 was issued to B&W cited B&W for acts that you were  
19 dealing with with regard to the pumps running analysis,  
20 isn't that right?

21 MS. WAGNER: I object to the form. The  
22 document does not indicate acts taken by  
23 Mr. Cartin were the subject of a fine.

24 A I acknowledged that several topics that  
25 I worked on were discussed in the NRC letter.

1  
2 Q Now, the NRC said in item 3 of GPU 497  
3 that, "a small break LOCA analysis with reactor  
4 coolant pumps running had not been performed for  
5 Babcock & Wilcox plants."

6 Do you see that in the first sentence of  
7 item 3?

8 MS. WAGNER: I believe, Mr. Seltzer, it  
9 indicates a time frame, "as early as November  
10 1978."

11 MR. SELTZER: Fine.

12 A Yes, I see that.

13 Q It says, in fact, that "senior engineers  
14 at Babcock & Wilcox were aware as early as November  
15 1978," that such an analysis with pumps running had  
16 not been performed.

17 It's correct, isn't it, that as of  
18 December 1978 you specifically were aware that  
19 there was no documented analysis of the pumps running  
20 case for small break loss of coolant accidents,  
21 isn't that right?

22 MS. WAGNER: Mr. Seltzer, this has been  
23 asked and answered a number of times.

24 A At that time I was not aware of any  
25 documented analysis, that is, computer calculations



1  
2 and calculational files in support of those for RC  
3 pumps running during a small break.

4 Q You testified yesterday that you knew  
5 that you had to have a documented analysis in order  
6 to comply with 10 CFR 50.46.

7 Did you ever discuss with anybody other  
8 than counsel whether the lack of a documented analysis  
9 of the pumps running case for small break loss of  
10 coolant accidents constituted a defect under part 21  
11 of the NRC rules?

12 MS. WAGNER: Mr. Seltzer, I object to your  
13 comments made prior to your question which  
14 I believe misstate the witnesses testimony.

15 Could you repeat the question?

16 MR. SELTZER: I was only trying to avoid  
17 what you said. I am asking the same questions  
18 I asked yesterday.

19 Let me ask the same question again.

20 Q Isn't it a fact that in order to  
21 demonstrate compliance with 50.46 B&W has to have  
22 documented analysis?

23 MS. WAGNER: Object to the form.

24 A We perform analyses and submit that  
25 analysis to show compliance to 10 CFR 50.46. Some

1  
2 of our assumptions are based on engineering  
3 assessments and engineering judgments.

4 Q But the analysis to demonstrate compliance  
5 with 50.46 has to be documented and available for NRC  
6 review and it has to be in writing, doesn't it?

7 MS. WAGNER: Objection.

8 A Analyses conducted are generally documented  
9 per the requirements of our internal procedures.  
10 I don't think 10 CFR 50.46 lays out internal  
11 documentation requirements.

12 Q Well, in fact, you had to submit topical  
13 reports in writing to the NRC to demonstrate compliance  
14 with 50.46, didn't you?

15 A That is correct.

16 Q Those weren't oral reports, were they?

17 A No.

18 Q You didn't have any written report for  
19 the pumps running case in the end over 1978, did you?

20 A That is correct.

21 Q So you couldn't have demonstrated  
22 compliance with 50.46 with any written presentation as  
23 of the end of 1978, could B&W?

24 MS. WAGNER: Objection to the form.

25 I believe there are documents introduced

1  
2 during this deposition which bear on that  
3 issue..

4 A At that time our engineering assessment  
5 was that a pump trip due to a loss of off-site power  
6 at reactor trip was a worst case assumption, and based  
7 on that, the topical report submitted to the NRC  
8 with that assumption demonstrated compliance to  
9 10 CFR 50.46.

10 Q Did you ever discuss with anybody at B&W  
11 outside of counsel whether the lack of any written  
12 analysis demonstrating the pumps running was not the  
13 worst case constituted a defect in B&W's work that  
14 should have been reported to the NRC under part 21?

15 MS. WAGNER: Mr. Seltzer, are you using  
16 the term "defect" in its normal English usage?

17 MR. SELTZER: I am using it in the sense  
18 in which it is used in the sentence which has  
19 the word "me" written next to it by Mr. Cartin.

20 MS. WAGNER: I will object insofar as  
21 your question calls for Mr. Cartin to  
22 draw a conclusion with respect to the analysis  
23 of a regulation.

24 Mr. Cartin can certainly testify to his  
25 understanding of the practice in B&W.

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Q Mr. Cartin, all I am asking you is, did you ever discuss this with anybody, not a lawyer?

A I do not remember discussing that, no.

Q After you got a copy of GPU 497, didn't you discuss item 3 with people who weren't lawyers?

A Only with my immediate supervisor I had a conversation.

Q That's Eric?

A I had a conversation with Eric Swanson. He may not have been my immediate supervisor at that time.

Q Did you also have a conversation with whomever was your immediate supervisor at that time?

A No.

Q Did you and Swanson discuss whether the lack of a documented analysis of the pumps running case in 1978 constituted a reportable defect, in other words, something that should have been reported to the NRC?

A I don't remember a discussion to that effect.

Q Did you ever discuss with Eric whether the absence of a pumps running analysis should have been reported to the NRC?

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2

3

A I don't remember discussing that with Mr. Swanson.

4

5

Q Did you ever discuss that with anybody at any time?

6

MS. WAGNER: Other than counsel.

7

A No, I don't remember discussing that.

8

9

Q Did you ever discuss with anyone whether you or any other engineer should have reported to James Taylor the fact that there had been no documented pumps running analysis done by B&W prior to the end of 1978?

12

13

14

A No, I don't remember discussions to that effect.

15

16

17

18

Q Until the analysis was done of a pumps running case, didn't it occur to you that it was at least an open question whether pumps off was a worst case?

19

20

21

22

23

24

25

A No, we were of the opinion, both ECCS and I agreed with their assessment that the assumptions made in the previous analysis were indeed worst case and appropriate for use. I at no time considered the pumps running to be more severe. I did recommend that we do analyses so we can have it documented, and it was done very quickly.

1  
2 Q You knew that the NRC would expect  
3 you to have documented analyses of the pumps running  
4 case, didn't you?

5 MS. WAGNER: Objection to the form.

6 A I knew that it was -- it would be very  
7 good that if this issue was raised, that we would have  
8 documented analyses.

9 Q It was your view that if this issue  
10 were raised with the NRC, the NRC would insist on  
11 documented analyses, isn't that right?

12 MS. WAGNER: Objection to the form.

13 A Not necessarily.

14 Q Wasn't it your view that if you were not  
15 able to satisfy the NRC with documented analyses,  
16 that there was a serious danger that the NRC would  
17 derate or shut down all B&W operating plants?

18 MS. WAGNER: Objection to the form.

19 A My view was if that issue were raised and  
20 the NRC did not accept our engineering judgments,  
21 they could request an analysis and the worst thing  
22 that could happen is that they could take some interim  
23 action of some nature, possibly derating a plant.  
24 They could take an interim action until that analysis  
25 was completed.



1  
2 Q And you anticipated that they could take  
3 that action because they might consider the lack  
4 of a documented analysis a serious safety concern,  
5 isn't that right?

6 MS. WAGNER: Objection to the form of  
7 the question. There is nothing like that in  
8 any testimony or document.

9 You may answer.

10 A In our opinion we did not consider it a  
11 serious safety concern; only a matter of lack of  
12 detailed documentation.

13 MR. SELTZER: I move to strike that as  
14 not responsive.

15 MS. WAGNER: It's perfectly responsive.  
16 You asked him if he thought it was a safety  
17 problem and he said he didn't think so.

18 MR. SELTZER: Why are you arguing with me?  
19 This isn't the time for arguing the motion.

20 Would you repeat the question.

21 (Record read back.)

22 Q In other words, I am not asking you whether  
23 you considered it a serious safety concern. I am  
24 saying, isn't it a fact that when you anticipated  
25 that the NRC might derate or shut down all B&W



1  
2 operating plants, you were thinking that the NRC  
3 would consider this a very serious safety concern?

4 MS. WAGNER: Objection.

5 A I was trying to put the actions, the  
6 potential actions of the staff in the worst type of  
7 atmosphere to support funding availability for  
8 the analysis. I was not trying to say this is what  
9 I expect them to do. Only that can never be ruled  
10 out as a possible action by the staff for whatever  
11 reasons they deem appropriate.

12 Q Isn't it a fact that you were anticipating  
13 that the NRC might shut down all B&W plants because  
14 the NRC staff perceived the lack of a pumps running  
15 analysis as a significant safety issue?

16 MS. WAGNER: I object to the question.

17 It's been asked and answered, but you may answer  
18 it again.

19 A I was fairly confident that our engineering  
20 assessment would be directly accepted by the staff.  
21 I was only trying to use the argument of potential  
22 staff actions as a means to convince people that that  
23 analysis ought to be done and funded.

24 Q It's a fact, isn't it, that you believed  
25 B&W should not report the lack of a pumps running

analysis to the NRC. because you were afraid that B&W would have all of its operating plants shut down?

MS. WAGNER: I object to the form.

A That's totally not true.

Q Isn't it a fact that you also believed that B&W shouldn't even disclose this problem to its customers because they would be required to report the matter to the NRC and the NRC might shut the B&W plants down?

MS. WAGNER: Objection.

A That is not true.

MR. SELTZER: I have no further questions.

MS. WAGNER: We will take a two-minute break.

(Recess taken.)

MS. WAGNER: We have no further questions.

(Time noted: 5:30 p.m.)

LUCIUS ROSCOE CARTIN

Subscribed and sworn to  
before me this day  
of , 1982.

CERTIFICATE

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

I, NANCY A. RUDOLPH, a Notary  
Public of the State of New York, do hereby  
certify that the continued deposition of  
LUCIUS ROSCOE CARTIN was taken before  
me on April 14, 1982 consisting  
of pages 114 through 213;

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 24<sup>th</sup> day of April, 1982.

Nancy A. Rudolph  
NANCY A. RUDOLPH

## I N D E X

## WITNESS

## PAGE

Lucius Roscoe Cartin

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## E X H I B I T S

## GPU

## FOR IDENT.

82-A	Clear copy of GPU Exhibit No. 82	178
122-A	Copy of GPU Exhibit 122 taken from Mr. Cartin's files	199
495	Three-page document entitled "Supplemental Information for Figure 15E.6.2"	146
496	Memo from Newton to Womack, subject: "Operating Instructions for Stuck Open PORV" dated April 8, 1979, 12:57 a.m.	182
497	Letter to The Babcock & Wilcox Company from United States Nuclear Regulatory Commission, dated April 10, 1980	200

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