

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

dg

- - - - - x

GENERAL PUBLIC UTILITIES CORPORATION, :
JERSEY CENTRAL POWER & LIGHT COMPANY, :
METROPOLITAN EDISON COMPANY and :
PENNSYLVANIA ELECTRIC COMPANY, : 80 CIV. 1683
 : (R.O.)
Plaintiffs, :

-against-

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

- - - - - x

Continued deposition of Defendant The
Babcock & Wilcox Company, by BRUCE ADOLPH
KARRASCH, taken by Plaintiffs pursuant to
adjournment, at the offices of Kaye, Scholer,
Fierman, Hays & Handler, Esqs., 425 Park
Avenue, New York, New York, on Tuesday,
September 29, 1981, commencing at 10:00
o'clock in the forenoon, before Joseph R.
Danyo, a Shorthand Reporter and Notary Public
within and for the State of New York.



8306290990 810929
PDR ADOCK 05000289
T PDR

WALTER SHAPIRO, C.S.R.
CHARLES SHAPIRO, C.S.R.

DOYLE REPORTING, INC.
CERTIFIED STENOGRAPHIC REPORTERS
369 LEXINGTON AVENUE
NEW YORK, N.Y. 10017
TELEPHONE 212 - 867-8220

1

2

A p p e a r a n c e s :

3

4

KAYE, SCHOLER, FIERMAN, HAYS & HANDLER, ESQS.
Attorneys for Plaintiffs
425 Park Avenue
New York, New York

5

6

By: RICHARD C. SELTZER, ESQ.,

7

of Counsel

8

9

10

DAVIS POLK & WARDWELL, ESQS.
Attorneys for Defendants
One Chase Manhattan Plaza
New York, New York

11

12

By: PATRICIA VAUGHN, ESQ.

13

-and-

ROBERT F. WISE, ESQ.,

14

of Counsel

15

16

Also Present:

17

DAVID TAYLOR

18

-o0o-

19

20

21

22

23

24

25

BRUCE ADOLPH KARRASCH ,

having been previously duly sworn, resumed and
testified further as follows:

EXAMINATION (continued)

BY MR. SELTZER:

Q This is a continuation of the deposition
which you began giving in this lawsuit in June 1981.
Are you aware of that?

A Yes, I am.

Q Are you also aware that just as your
testimony then was testimony being given under oath to
tell the truth, your testimony today is similarly under
oath?

A Yes.

Q Within the Plant Integration unit, when you
were in charge of it, did you have a group called the
NSSS Design Group?

A Yes.

Q Am I correct that you prepared a description
of the scope of responsibilities of the NSSS Design
Group?

A I don't recall.

MR. SELTZER: Let me mark for identification
as GPU Exhibit 377 a document from Mr. Karrasch's

1
2 files entitled "NSSS Design Group."

3 (Document above described so marked as
4 Plaintiffs' Exhibit GPU 377 for identification,
5 as of this date.)

6 Q Do you recognize GPU Exhibit 377 as a
7 description of the responsibilities of the NSS Design
8 Group which was prepared by or for you while you were
9 head of Plant Integration?

10 A I vaguely recall a document like this being in
11 place when I was manager of Integration. I do not recall
12 who prepared it, nor whether or not I even approved it.

13 Q Was the NSSS Design Group responsible for
14 the preparation and issue of overall plant level
15 requirements for the nuclear steam supply system?

16 A Yes.

17 Q Was the NSSS Design Group responsible for
18 plant balance of plant criteria and secondary system
19 requirements?

20 A Yes.

21 Q Could you explain what plant balance of
22 plant criteria were in 1978 and 1979?

23 A The balance of plant criteria were documents
24 prepared by B & W which informed our utility customers
25 what design requirements they should comply with in the

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

design of the remainder of the plant.

Q Am I correct that B & W had an interest in that because the balance of plant components and systems have a direct interface and operational influence on the overall nuclear steam supply system? Do you see where I am reading from?

A No, I was not following where you were reading.

(Record read.)

A Yes, I think that is correct.

Q Is the main feedwater system a balance of plant component as viewed by Babcock & Wilcox?

A Yes, it is, to the best of my knowledge.

Q Is the auxiliary feedwater system a balance of plant component?

A Yes, it is.

Q Is the condensate polisher system a balance of plant component?

A Yes, it is.

Q Do the main feedwater system, auxiliary feedwater system, and condensate polisher system all have a direct interface and operational influence on the B & W nuclear steam supply system?

A Yes, I believe that is accurate.

Q Prior to the Three Mile Island accident,

1

2

what, if any review or analysis was done in plant

3

integration to develop requirements for the condensate

4

polisher system?

5

A The only requirements that I am aware of that

6

could possibly have an effect on the condensate polisher

7

system are those with respect to maintaining proper

8

feedwater chemistry.

9

Q To what extent, if any, did B & W review

10

the design of the condensate polisher system in plants

11

that were under design and construction? I am referring

12

to the period when you were the head of Plant

13

Integration.

14

A During the time I was manager of Plant Integration,

15

I cannot recall any review of a condensate polisher

16

system being conducted.

17

Q Do you know whether there was any group

18

outside of Plant Integration that was reviewing the

19

design of condensate polisher systems prior to the

20

Three Mile Island accident?

21

MS. VAUGHN: For the time he was manager of

22

Plant Integration?

23

MR. SELTZER: No, any time prior to the

24

Three Mile Island accident.

25

MR. WISE: Going all the way back to the

1960s?

MR. SELTZER: Yes. As far back as Mr.

Karrasch has a recollection.

A I am not aware of any such B & W review of the condensate polisher systems on any plant.

Q Is there any one unit or group outside of Plant Integration that would have had any responsibility for review of the condensate polisher system prior to the Three Mile Island accident?

MS. VAUGHN: We are talking of that whole period of time?

MR. SELTZER: Yes.

A The Control Analysis Group did have responsibility for review of plant secondary systems. I don't know if that review ever included the condensate polishing system.

Q Within what larger part of the B & W organization was the Control Analysis Section?

A The Control Analysis Unit was a part of the Plant Design Section.

Q Who was head of Control Analysis at the time you were head of Integration? R. B. Davis?

A I recall that Ron Davis was manager of Control Analysis for at least some portion of the time that I was manager of Plant Integration.

1

2

Q Is Davis still at B & W?

3

A No, he is not.

4

Q Where is he?

5

A I don't know.

6

Q Do you know where he went after he left

7

B & W?

8

A I vaguely recall that he took a position with another engineering firm in Lynchburg, Virginia.

10

Q Was it part of the assignment of the NSS

11

Design Group to provide generic policy and coordination

12

for policy resolution affecting the broad aspects of

13

the overall plant design?

14

MS. VAUGHN: You are talking about still

15

when Mr. Karrasch was manager?

16

MR. SELTZER: Exactly.

17

A Yes, that was part of the responsibility of the

18

NSS Design Group.

19

Q The NSS Design Group was headed by Eric

20

Swanson while you were the unit manager right?

21

A Yes.

22

Q And Joe Kelly was one of the engineers

23

within the group?

24

A Yes.

25

Q And Lou Cartin was also in that group?

1
2 A Joe Kelly and Lou Cartin were in that group for
3 some portion of the time that I was manager of Plant
4 Integration. I don't recall exactly how long.

5 Q What does it mean to provide generic policy
6 and coordination? You said that was part of the
7 assignment of the NSS Design Group.

8 A The NSS Design Group had cognizance over the plant
9 level analysis which was performed in the other units
10 in the Plant Design Section. At times, problems would
11 come up wherein it was discovered that the analysis
12 needed to be changed for some reason or another. Mr.
13 Swanson's group was sometimes asked to take the lead in
14 resolving that problem and assuring that any re-analysis
15 that had to be performed was still consistent with the
16 overall design of the plant.

17 Q When you say that they were to provide
18 generic policy, does that mean that the policy
19 guidance given by the NSS Design Group would be
20 applicable to more than one plant?

21 A That is my understanding of the word "generic,"
22 yes.

23 Q Looking at the second page of GPU Exhibit
24 377, is it correct that part of the overall responsibility
25 of the NSS Design Group was to conduct interface reviews

1
2 among the NSS and secondary side balance of plant
3 systems in order to assure compatibility of interfacing
4 system designs and hardware?

5 A Yes, that was part of the NSS Design Group's
6 responsibility.

7 Q What is your understanding about why B & W
8 felt that a group within B & W should have that
9 responsibility?

10 A The analysis design work performed by B & W
11 engineering on a nuclear steam supply system uses
12 various parameters which are important in the design
13 of the secondary systems and balance of plant. The
14 balance of plant criteria documents and the interface
15 reviews which were performed were conducted to
16 communicate to our utility customers the fact that
17 certain aspects of their balance of plant design were
18 important to our NSS design, so it was a communication
19 channel between the NSS vendor and the utility customer.

20 Q Was it part of the overall responsibility
21 of the NSS Design Group as set forth in item 5 on page 2
22 of this exhibit to review and approve selected test
23 specifications and draft operating procedures for systems
24 and equipment in the NSS and secondary side balance of
25 plant?

1
2 MS. VAUGHN: While Mr. Karrasch was manager?

3 MR. SELTZER: I think we can avoid even
4 probably having to have that clarification, because
5 the unit was created and Mr. Karrasch became its
6 first manager, and the unit was reorganized and
7 disbanded about the time you ceased being its
8 manager.

9 Q Isn't that right?

10 A That's correct. However, the duties and
11 responsibilities which are outlined in this document
12 were carried out by another unit which became part of
13 Plant Integration when the Plant Integration Unit was
14 organized in 1976. This function had been part of our
15 responsibility for I would guess seven or eight years.

16 MS. VAUGHN: Also, he said he didn't know
17 who prepared this or when it was in existence, and
18 I don't want him testifying if it is not within
19 the time he was manager of it, because he didn't
20 prepare it.

21 Q You said that for six or seven years B & W
22 had been performing this function. Are you referring
23 to the function that is set forth in item 5 on page 2
24 of GPU 377?

25 A Yes.

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Q When you said six or seven years, was that for six or seven years prior to the creation of the Plant Integration Unit?

A No, I meant six or seven years prior to today.

Q What was the procedure by which B & W was, to your knowledge, reviewing draft operating procedures for the six or seven years that you say that was being done?

A During this time period, I believe the Nuclear Service Department had the responsibility to prepare selected test specifications and draft operating procedures. The Nuclear Service Department would at times request various units within the Engineering Department to review those specifications and procedures. The responsibility outlined in item No. 5 of this document identifies that the NSS Design Group might be asked to review and approve test specifications and draft operating procedures for systems and equipment in the secondary system and balance of plant.

Q Have you taken any steps to determine whether the NSS Design Group or any predecessor of it reviewed any draft procedures for the Three Mile Island Unit 2 plant?

A No, I have not.

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Q So you don't know one way or the other whether the NSS Design Group or predecessor of it reviewed any draft procedures for Three Mile Island Unit 2; is that right?

A That is correct.

Q Do you know, one way or the other, whether any other group in the Engineering Department reviewed any of the draft procedures prepared by B & W for Three Mile Island Unit 2?

A No, I am not aware of a B & W review of draft operating procedures for Three Mile Island Unit 2.

Q You see item 8 on page 2 of GPU Exhibit 377?

A Yes, I do.

Q While you were head of Integration, was it part of the overall responsibility of the NSS Design Group to participate in the solutions for generic risk problems for the nuclear steam system and for the secondary side systems or for systems which have direct interfaces or operational influence on the plant design?

A Yes, that was part of the responsibility of the NSS Design Group.

Q What are generic risk problems?

A Generic risk problems are problems which were identified on B & W backlog plants under construction

1

2

which had an effect on more than one plant.

3

4

5

Q Is a plant as you have used the term under construction up until the point when an operating license is issued or until it goes commercial or when?

6

7

8

A I believe the point in time that I am referring to as under construction is that time prior to the plant going into commercial operation.

9

10

11

Q So the period of construction includes a period of operational testing and generation of power, right?

12

13

A Yes, I believe that is correct. To the best of my knowledge.

14

15

16

17

18

19

Q You testified in June about a request that you got from Allen Womack shortly after he became the head of the Plant Design Section, and it was a request that you put together a group of people to brainstorm the SMUD light bulb event. Do you recall that request from Allen Womack?

20

A Yes.

21

22

23

Q Was that a request for analysis and development of a solution for a generic risk problem of the type described in item 8?

24

25

A No, I don't believe Allen was asking me to solve the generic risk problem.

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Q How is what he was asking you to work on different from a generic risk problem?

A The majority of the generic risk problems which I am aware of were the result of inconsistencies between the analysis that was performed on the plant and the hardware which B & W had yet to provide on that plant. The problem solution usually required either re-analysis or change to the hardware. The nature of Allen's request to me on the SMUD light bulb incident was more along the lines of please provide a review of the lesson we learned at SMUD to determine if there are improvements that could be made to the plants which we were still designing. I wouldn't include Allen's request in the category of a generic problem to be solved.

Q You said that you understood part of the assignment from Allen Womack was to see if there were improvements that could be made in the plants. Did you understand that those improvements could include improvements in the hardware?

A Yes.

Q And did you understand that those improvements could also include improvements in recommended operating procedures or emergency procedures?

A I don't at this time recall the exact words in

1
2 Allen's request to me. I do recall focusing my attention
3 only on the design features of the plant.

4 Q Are you aware of analysis that was done at
5 B & W during the time that you were head of the Plant
6 Integration Section concerning a break in the pump
7 discharge line? Do you know what I am referring to?

8 A I am not specifically aware of what you are
9 referring to.

10 Q Do you recall that in 1978 B & W notified
11 the NRC that it had previously failed to analyze small
12 break loss of coolant accident occurring in the discharge
13 line between the reactor coolant pumps and the reactor
14 vessel?

15 A Yes, I am vaguely aware that there was such a
16 problem.

17 Q You do recall that there was work done at
18 B & W on analyzing such a break in the pump discharge
19 line?

20 A I recall that there was a problem related to pump
21 discharge line break. I am not at all aware of the
22 analysis that was performed or the details of the way
23 it was resolved.

24 Q I show you GPU 378, Mr. Karrasch's monthly
25 report to Don Roy dated May 2, 1978, subject: April

1

2

Activities Report.

3

4

5

(Document above referred to so marked as
Plaintiffs' Exhibit GPU 378 for identification,
as of this date.)

6

Q I call your attention to item D on page 3.

7

8

Is GPU 378 a copy of an activities report
which you prepared for April 1978?

9

A Yes, it is.

10

11

12

13

14

Q Was it the purpose of your activities report
to describe to the manager of Plant Design and to the
others whom you sent copies what Plant Integration was
working on and what Integration had accomplished in the
past month?

15

16

17

A The intent of the activity report was to report
significant accomplishments and status of problems which
we were working on which were significant.

18

19

Q Have you read all of the text for the item
which you lettered "D" on page 3 of GPU 378?

20

A Yes, I just read it.

21

22

23

Q Does that refresh your recollection as to
some of the details of B & W's work on the pump
discharge line break?

24

A Yes, it does.

25

Q What was Plant Integration's involvement in

1
2 the work in 1978 on the pump discharge line break? What
3 I am really asking is since I assume your monthly report
4 is not meant to be an NPGD newsletter talling what all
5 of NPGD is working on, I assume there is some part of
6 the work on pump discharge line break which was
7 specifically being performed in Plant Integration and
8 that is what I wanted to ask you to focus on.

9 A I very vaguely recall that either Lou Cartin or
10 Eric Swanson were asked by Don Roy to coordinate the
11 resolution of this problem. The majority of the work
12 was performed in Bert Dunn's ECCS Analysis Unit, and
13 the only role that I recall Plant Integration played
14 was that of scheduling work and monitoring it to insure
15 that it got completed in a timely manner.

16 Q Did your group managers submit monthly
17 activities reports to you?

18 A Yes, they did.

19 Q Did you as a general rule prepare your
20 monthly report based on, in large part, the monthly
21 reports which your group managers had submitted to you?

22 A Yes, that's correct.

23 Q So what appears in item D is something that
24 would have been prepared from a monthly report submitted
25 by Swanson?

1
2 A I don't know for sure who prepared the words in
3 item D.

4 Q In item D (1), do you see where you have
5 described the operator action that has to be taken?

6 A I see the words in item D (1), yes.

7 Q Do you recall that part of the solution to
8 the pump discharge line break problem was for B & W to
9 recommend a new procedure for the operation of the high
10 pressure injection system?

11 A No, I really don't recall the procedure for
12 performance of high pressure injection system.

13 Q Do the words that you wrote in D (1) indicate
14 that part of the solution to the pump discharge line
15 break problem was to change the procedures for operation
16 of high pressure injection?

17 A I don't recall writing these words.

18 Q That is your signature at the bottom, isn't
19 it?

20 A Yes.

21 Q I am just asking you what your understanding
22 is. If you don't recall writing them but you do have a
23 recollection of what the words mean, I would like that.
24 If you don't have a recollection from 1978 of what those
25 words mean, since you wrote this, I would like to ask

1
2 you what you would understand your own words mean as you
3 read them today.

4 A I think the words in front of me speak for
5 themselves.

6 Q You mean you think it is pretty clear what
7 that means?

8 A It means no more to me than the words themselves,
9 if I were to read them back to you.

10 Q As the author, do you understand that those
11 words that you wrote in D (1) mean in response to B & W's
12 analysis of the pump discharge line break each of the
13 affected B & W customers established or adopted a
14 revised procedure for the operation of the high pressure
15 injection system?

16 MS. VAUGHN: I think I am going to object
17 to the form of that. I am not sure those words
18 say that at all.

19 MR. SELTZER: I am asking him. That is my
20 question.

21 Q Is that what those words mean?

22 A I am not familiar enough with the background of
23 this item D (1) to interpret any meaning beyond exactly
24 what the words themselves state. I can read it back to
25 you, if you would like.

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Q No. I think I can read also, although I appreciate the offer to read it to me.

Are you saying that your words do not convey any meaning to you one way or the other about whether the customers were adopting a new procedure for operation of high pressure injection? Are you saying you can't tell from reading your own words whether the customers were adopting a new procedure for the operation of HPI?

Let me phrase it positively. Looking at your words, can you tell me whether the customers were establishing a new or a modified procedure for the operation of high pressure injection?

A I don't recall any of the background leading up to item D (1) in this report. The words do state that each of the affected customers has established a procedure to perform some action within the first ten minutes following ESFAS actuation.

Q And your words are not sufficiently -- I hear you are saying what the words say explicitly. I am just asking you, yes or no, can you tell me whether your words tell you today that the operators were adopting a new procedure?

MS. VAUGHN: I think he already answered it.

MR. SELTZER: What is the answer?

1

2

MS. VAUGHN: He says he doesn't remember.

3

He doesn't remember enough one way or the other.

4

MR. SELTZER: Now I want present understanding.

5

MS. VAUGHN: Of what?

6

MR. SELTZER: Whether those two sentences

7

that he wrote indicate to him that the operators

8

were adopting a new or revised procedure for HPI

9

operation.

10

MS. VAUGHN: I think he answered that the

11

words say just what they say and he can't answer

12

anything beyond that.

13

MR. SELTZER: It is a simple yes or no.

14

Q Do the words indicate or don't they indicate

15

that the operators were adopting a new or revised

16

HPI procedure?

17

MS. VAUGHN: Can you answer that?

18

Q If you want to say you can't tell, just say

19

that.

20

A I can't tell from this.

21

Q That is an answer. I am not pressing --

22

MR. WISE: Let's not get into that sort of

23

conduct.

24

MR. SELTZER: Fine, but I don't want him to

25

anguish over it. I don't want him to think I am

1
2 putting him through a wringer here. If he can't
3 tell, that is a good answer.

4 Q I show you GPU Exhibit 92, which is a copy
5 of a letter from your manager of Licensing, Jim Taylor,
6 to the NRC dated May 1, 1978, with a blind copy marked
7 to you, Mr. Karrasch.

8 Is GPU 92 a copy of a letter and a report
9 which you received in or about early May 1978?

10 A I don't recall ever receiving or reading this.

11 Q Take a look at the operation action section
12 on page 5 and continuing onto page 6. If you could
13 read that and then tell me whether that refreshes your
14 recollection that you knew in 1978 that part of B & W's
15 solution to the pump discharge line break problem was
16 to recommend a change in the procedure for operation of
17 high pressure injection.

18 MS. VAUGHN: Do you understand the question?

19 THE WITNESS: Please read the question back.

20 (Question read.)

21 A I don't recall reading this in 1978.

22 Q It does not refresh your recollection?

23 A Therefore, it does not refresh my recollection
24 of what I knew in 1978.

25 Q I show you GPU Exhibit 90, which is the

report of the preliminary safety concern for this pump discharge line break problem. As the manager of Plant Integration, you had a specific role in the preliminary safety concern procedure; is that right?

A Yes, I did.

Q Part of that role was evaluation of the safety concern, right?

A My understanding of the procedure in 1978 was that Licensing had the lead responsibility for evaluating the safety concern. Plant Integration provided a review function of the safety concern to assure that all interfaces among the various analysis and hardware units had been addressed and to review any corrective action to assure that it was indeed the proper corrective action to take.

Q Was that procedure in effect in the spring of 1978?

A To the best of my knowledge, yes.

Q Did you have a procedure in the spring of 1978 for assigning the Plant Integration review functions on preliminary safety concerns to anyone within your unit?

A I don't recall a formal procedure. My practice was normally to delegate the review of the preliminary

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

safety concerns to the most capable person in the unit to perform the review.

Q Was there any one particular person whom you were relying upon for that review in the spring of 1978?

MS. VAUGHN: For the review of this or for the review of any PSC?

MR. SELTZER: For the review of any PSC.

A No, there was not one particular person designated for the review of any PSC.

Q Do you recall assigning anyone to perform any review function in connection with the pump discharge line break PSC?

A I don't know exactly who I delegated this preliminary safety concern to.

Q Is there a small group of people among whom you believe the individual is to whom you assigned this?

A I didn't understand the question.

Q What I am trying to find out is analogous to the situation where you think you sent Hallman's request to either Swanson or McBride, but you are not sure which, is there a similar group of people, one of whom you believe you gave this preliminary safety concern to?

A I don't know for sure. I do note that Lou Cartin's

1
2 name is on the distribution list for the May 1st, 1978
3 letter from Taylor to the NRC. Lou Cartin did work in
4 Plant Integration.

5 Q Are you saying that it is possible that Lou
6 Cartin is the person whom you assigned to work on this
7 PSC?

8 A That is possible.

9 Q When B & W developed corrective action to
10 respond to a PSC, did you make it a practice to review
11 the proposed corrective action?

12 A Yes, I believe that we did.

13 Q If one of your engineers reviewed the
14 proposed corrective action, was it your practice to take
15 a look at that proposed corrective action before it was
16 communicated to customers?

17 A Yes, I would say so.

18 Q I show you GPU Exhibit 91, which is a letter
19 from Jim Taylor to the NRC dated April 14, 1978
20 concerning the pump discharge line break. The third
21 page from the back is headed "Corrective Action." Do
22 you see that?

23 A Yes, I have that page in front of me.

24 Q Before B & W would notify the NRC of
25 proposed corrective action, pursuant to Part 21, was it

1
2 your practice to review that proposed corrective action?

3 A I recall that Integration was required to sign the
4 evaluation report prepared by Licensing. On most
5 occasions, I delegated the review of that evaluation
6 report to appropriate members of my staff. They would
7 then recommend to me that it be either signed or
8 modified. On the majority of the evaluation reports
9 which I was asked to sign, I did read them. I do not
10 recall this specific one.

11 Q The Rancho Seco light bulb event took place
12 sometime early in 1978, to the best of your recollection;
13 is that right?

14 A Yes, to the best of my knowledge.

15 Q In January 1979 the Rancho Seco plant had
16 a second overcooling incident similar to the one that
17 had taken place in early 1978; is that right?

18 A Yes, to the best of my knowledge.

19 Q Prior to that second overcooling event at
20 Rancho Seco, had you done anything to put together the
21 team of engineers to evaluate the first Rancho Seco
22 overcooling event as you had been requested to do by
23 Allen Womack?

24 A I don't recall if any action was taken in response
25 to Dr. Womack's request to form a task force to review

the SMUD light bulb incident.

Q As of January 1979, to your knowledge, had B & W produced any effective recommendations or follow-through on corrective action for the underlying causes of the overcooling transient at Rancho Seco?

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

Q I am just asking for your knowledge.

A As a result of the SMUD light bulb incident, I recall preparing a memorandum which I sent to Nuclear Service which suggested action that our customers could take as a result of the incident. I really don't recall today what happened to that memorandum.

Q That was your March 1978 memo.

A Yes, I have in front of me GPU Exhibit 306, and that is the memorandum to which I referred.

Q What is the date of it?

A The date is March 29, 1978.

Q Do you know whether any of these recommendations were followed through to the point of sending any of them out to customers?

A I vaguely recall that some follow-up action was taken to send this to some of our customers. I don't know the specific time nor the specific customers.

1
2 Q After the second overcooling transient at
3 Rancho Seco in January 1979, did Dr. Womack speak to you
4 about his August 1978 request that more work be done
5 to analyze the Rancho Seco rapid cooldown transient in
6 order to reduce the likelihood of such an event in the
7 future?

8 A I don't recall.

9 Q After Rancho Seco's second overcooling
10 transient, did anybody speak to you about the need to
11 do further work on generic problems in order to prevent
12 their recurrence?

13 A Again, I don't recall.

14 (Recess taken.)

15 BY MR. SELTZER:

16 Q I would like to show you GPU Exhibit 151,
17 which is a memorandum by Joe Kelly dated October 24,
18 1977, subject: Report on Depressurization Event,
19 Section 1, a report on the Davis-Besse event.

20 Is GPU Exhibit 151 a copy of a memorandum
21 which you received from Joe Kelly in your unit in or
22 about late October 1977?

23 A I don't recall receiving this memorandum.

24 Q You see that you are marked for a copy?

25 A Yes, I do.

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Q Would you read the fourth paragraph on the second page of the exhibit, the page that is headed "Sequence of Events."

Before getting this description of the Davis-Besse event, you attended a presentation in Training Room B at which Joe Kelly had described the principal events of the Davis-Besse transient; is that right?

MS. VAUGHN: I don't think he testified that he got this.

Q Before the time that GPU Exhibit 151 was written, you attended, I think you already testified, a meeting at which Joe Kelly described to you and to many other B & W managers the basic facts about the Davis-Besse transient; isn't that right?

A I recall attending such a meeting. I don't know what date in time the meeting was held.

Q Do you recall hearing Kelly describe what he had learned about the Davis-Besse transient at that meeting?

A I recall both Joe Kelly and Fred Faist making a presentation on the event that had occurred at Toledo Edison, yes.

Q I would like to show you GPU Exhibit 133,

1
2 which is the site problem report for the Davis-Besse
3 event transmitted on October 11, 1977, with a copy
4 marked to you.

5 You regularly received site problem reports,
6 right, during the period that you were head of Plant
7 Integration?

8 A Yes, that's correct.

9 Q Is GPU Exhibit 133 a copy of a site problem
10 report which you received?

11 A I don't recall receiving this site problem report.

12 Q I would like to show you GPU Exhibit 152,
13 which is a site problem report for the Davis-Besse
14 event transmitted on November 9, 1977.

15 Is GPU Exhibit 152 a copy of a site problem
16 report which you received?

17 A I don't recall receiving a copy of GPU Exhibit 152.

18 Q The site problem report for the Davis-Besse
19 September 24, 1977 event had several incarnations.

20 Without asking you whether you recall which specific
21 issue of the site problem report you received, is it
22 your recollection that you did receive one version at
23 least of a site problem report for the Davis-Besse
24 September 24, 1977 event?

25 A I don't recall receiving either one of these site

1
2 problem reports.

3 Q In other words, even though it was your
4 practice to receive a copy of each site problem report
5 as it was issued during the period you were Plant
6 Integration manager, you have no specific recollection
7 of receiving an SPR for the Davis-Besse transient; is
8 that right?

9 A I believe that is correct, yes.

10 Q Turning to page 3 of 85 in GPU Exhibit 133,
11 would you read the second full paragraph?

12 MS. VAUGHN: The paragraph beginning at 2134?

13 MR. SELTZER: Right.

14 Q Would you look at Exhibit 152, please, page
15 23 of 51. Do you see that the sequence of events that
16 appears beginning on that page is the same as the
17 sequence of events that was in Kelly's GPU 151?

18 MS. VAUGHN: Do you want him to go line by
19 line?

20 MR. SELTZER: No, I think Joe Kelly said
21 they are the same. I am just asking Mr. Karrasch
22 if he notices if they appear to be the same.

23 A They appear to be the same.

24 Q You already read the fourth paragraph in
25 the sequence of events, right?

1

2

A Yes.

3

4

5

6

Q In the fall of 1978, you knew, did you not, that the Davis-Besse pilot operated relief valve had cycled several times and had failed open during the September 24 transient, correct?

7

A No, I don't believe I did.

8

9

10

Q You are saying you don't think you learned during the fall of 1978 that the pilot operated relief valve had failed at the Davis-Besse transient?

11

MR. WISE: That is not what he said.

12

MR. SELTZER: I am asking him that.

13

14

Q If it helps you to have your counsel say that, please reconsider.

15

A Would you please restate the question?

16

17

18

19

20

Q The question is: Did you know in the fall of 1978 that a pilot operated or power operated relief valve in the Davis-Besse plant had failed to close during a transient at that plant, which transient had taken place in September 1977?

21

22

Maybe I am getting the years wrong. I will start over again.

23

24

25

Did you know in the fall of 1977 that a pilot operated relief valve or electromagnetic relief valve had failed to close at the Davis-Besse plant

1

2

sometime during September 1977?

3

MS. VAUGHN: You are fixing on the fall of

4

1977?

5

MR. SELTZER: Yes. At the time that Kelly

6

gave the presentation to 30 or 50 managers, at

7

the time that Kelly wrote and marked you for a

8

copy on GPU Exhibit 151, at the time you were

9

marked for a copy on at least two site problem

10

reports of the Davis-Besse transient.

11

A The only thing I recall knowing in the fall of

12

1977 was that a loss of feed water event had occurred

13

at Davis-Besse, that Joe Kelly was dispatched to go to

14

Davis-Besse to evaluate the transient and that both he

15

and Fred Faist made a presentation to describe the

16

results of that evaluation.

17

I do not recall any details of what had

18

happened during the transient or what the cause of the

19

transient was. I did attend the meeting where Joe and

20

Fred made the presentation. That is all I recall.

21

Q Whatever Joe and Fred said at that meeting

22

you heard them say; is that right?

23

A I was listening to what they said, yes.

24

Q Do any of the documents that I have placed

25

in front of you relating to the Davis-Besse September 24,

1
2 1977 transient refresh your recollection that you knew in
3 the fall of 1977 that the pilot operated relief valve
4 had failed to close at the Davis-Besse plant?

5 A No.

6 Q Do they refresh your recollection that you
7 were advised in the fall of 1977 that as a result of
8 this transient the pressurizer water level rose?

9 A No, They do not.

10 Q Do they refresh your recollection that you
11 knew in the fall of 1977 that the operators had
12 terminated high pressure injection in response to rising
13 pressurizer water level even though the pilot operated
14 relief valve was still open?

15 A No, they do not.

16 Q Do you recall that in the fall of 1977 you
17 knew that boiling or saturation had occurred in the
18 reactor coolant system of the Davis-Besse plant?

19 A I vaguely recall hearing that fact in the
20 presentation which Joe Kelly and Fred Faist made.

21 Q Do you recall any other transient at a B & W
22 plant occurring prior to Three Mile Island where
23 saturation occurred in the reactor coolant system?

24 A I vaguely recall hearing about such an incident at
25 Three Mile Island sometime after the Three Mile Island

1

2

accident occurred.

3

4

5

6

Q Prior to the Three Mile Island accident, were you aware of saturation occurring at a B & W plant during a transient other than during the Davis-Besse transient of September 24, 1977?

7

A No.

8

9

10

Q In the fall of 1977, did you learn or do you recall learning that during the Davis-Besse event the reactor coolant drain tank rupture disk was ruptured?

11

12

A I do not specifically recall hearing that in the meeting that I attended.

13

14

15

16

Q You say that you do recall hearing that saturation had occurred in the reactor coolant system during the Davis-Besse transient. What was your understanding as to the mechanism that led to saturation?

17

A I don't recall the details of the mechanism.

18

19

Q What did you understand saturation had occurred meant?

20

MS. VAUGHN: Back in 1977?

21

MR. SELTZER: Right.

22

23

A That there was some amount of steam in the reactor coolant system piping.

24

25

Q That is steam outside of the top of the pressurizer, right?

1

2

A That's correct.

3

4

5

6

7

8

A Yes, I think I understood that in 1977.

9

10

11

12

Q So you understood in the fall of '77 that during the Davis-Besse transient there had either been a temperature excursion going up or a sudden depressurization, right?

13

A Yes.

14

15

16

17

18

19

Q Does anything that you have seen this morning or that you have just been testifying to refresh your recollection that you knew that the chain of events leading to saturation at Davis-Besse included depressurization through an open pilot operated relief valve?

20

A No, they do not.

21

22

23

24

Q Since the Three Mile Island accident, have you ever discussed with Joe Kelly what it was that he said to the 30 to 50 B & W managers in his presentation with Fred Faist shortly after the Davis-Besse event?

25

A No, I don't believe I have discussed that event

1
2 with Joe Kelly since the Three Mile Island accident.

3 Q Since the Three Mile Island accident, have
4 you discussed with Joe Kelly any of the reasons why he
5 wrote his November 1, 1977 memorandum regarding operator
6 termination of high pressure injection?

7 A I don't recall any discussions with Joe Kelly on
8 his November 1st, 1977 memorandum.

9 Q Are you aware of any incident prior to the
10 Three Mile Island accident in which a pilot operated
11 relief valve at a B & W plant failed to close?

12 What I am asking is do you recall knowing
13 before the Three Mile Island accident about any B & W
14 plant at which a pilot-operated relief valve failed to
15 close?

16 A I really cannot remember any at this time.

17 Q Before the Three Mile Island case, were you
18 aware of any B & W plant at which the reactor coolant
19 drain tank rupture disk had broken?

20 A I recall such an occurrence at the Oconee nuclear
21 station a very long time ago, and the thing I recall
22 about it is the fact that insulation had been broken
23 off of the lower part of the steam generator. I don't
24 recall when.

25 Q That was an event that occurred in or about

1

2

1975, is that right, or around there?

3

A I don't know. I am quite sure it was prior to
3 Mile Island, too.

4

5

Q What was your understanding before the Three
6 Mile Island accident regarding what had popped the
7 rupture disk at Oconee?

8

I will withdraw that.

9

10

Did you understand before the Three Mile
Island accident that the reactor coolant drain tank at
11 B & W-designed plants receives steam vented from the
12 pressurizer?

12

13

A Yes, I did know that.

14

15

Q Was it your understanding that the cause of
the rupture disk blowing at the Oconee plant was a
16 release of steam from the Oconee pressurizer?

16

17

A To the best of my knowledge, I recall that being
18 the reason, yes.

18

19

20

Q Did you know which valve on the top
of the pressurizer at Oconee had released the steam
21 which then pushed open the rupture disk?

21

22

A No, I did not.

23

24

Q Is it your understanding before the Three
Mile Island accident that the Oconee pressurizer had
25 on the top of it two code safety valves and a

25

1
2 pilot operated relief valve?

3 A Yes, to the best of my knowledge.

4 Q Was it also your understanding that the
5 pilot operated relief valve at the Oconee plant was
6 set to open at a lower pressure than the code safety
7 valves?

8 A Yes, I was aware of that.

9 Q Do you recall that at the end of 1978 and
10 into 1979 work was done to analyze what is known as the
11 pumps running case?

12 A I am afraid you will have to be more specific. I
13 don't know what "pumps running case" means.

14 Q It means leaving the reactor cooling pumps
15 on during a loss of coolant accident.

16 A I recall being aware of such an evaluation after
17 the Three Mile Island accident. I don't recall any
18 activity on that prior to Three Mile Island.

19 Q I take it you haven't looked at your
20 December 1978 progress report recently. Let me mark
21 that as GPU Exhibit 379. It is a Karrasch to Womack
22 piece dated January 3, 1979.

23 (Document above described so marked as
24 Plaintiffs' Exhibit GPU 379 for identification,
25 as of this date.)

1

2

Q Do you see the last paragraph on page 3?

3

A Yes, I see it.

4

5

6

Q Is that part of a progress report which you prepared and sent to your boss covering the month of December 1978?

7

A Yes, it is.

8

9

10

11

Q Does that refresh your recollection that there was work being done in December 1978 to evaluate primary coolant pumps running during a loss of coolant accident?

12

13

14

A Yes, it refreshes my memory that such work was under way. I don't recall being directly involved in that work.

15

16

17

Q In other words, it refreshes your recollection that work was being done on that problem before the Three Mile Island accident, right?

18

19

20

21

A The words in this progress report demonstrate that work was under way. My memory doesn't recall any such work or any direct participation on my part in such work.

22

23

24

25

Q I would like to show you GPU Exhibit 122, which is a memo from Lou Cartin in your section, subject: TECO status report, December 19, 1978, with a copy marked for you.

1
2 Is GPU Exhibit 122 a copy of a memo which
3 Eric Swanson on behalf of Lou Cartin sent to you?

4 A I don't recall seeing or reading this memorandum
5 in December 1978.

6 Q Do you recall seeing or receiving it ever
7 before today?

8 A No, I do not recall ever seeing this memorandum
9 before today.

10 Q Cartin was in Swanson's group at the time that
11 this memorandum was written; is that right?

12 A To the best of my knowledge, yes.

13 Q Were you aware in late 1978 that Cartin was
14 working on supporting Toledo Edison Company in its
15 attempts to resolve NRC concerns relating to the
16 Davis-Besse plant?

17 A I don't recall that that was one of his specific
18 work assignments.

19 Q Take a look at item 6 on page 2.

20 Have you read that item?

21 A Yes, I just read it.

22 Q The second sentence in that item says, "If
23 questioned by the NRC, however, B & W must be in a
24 position to state that the small break topicals have
25 considered the worst possible conditions (i.e., loss of

1
2 off-site power). Our inability to respond conclusively
3 to such an inquiry could result in the NRC derating or
4 shutting down all of B & W's 177 FA operating plants
5 except SMUD until the issue is resolved."

6 Did Cartin or Swanson ever discuss with you
7 any proposal that the NRC not be responded to
8 conclusively because a response to the NRC could result
9 in derating or shutting down all B & W 177 plants?

10 A I do not recall any such discussions.

11 Q At any time after mid-December, 1978, did
12 you ever tell Swanson or Cartin that they or B & W
13 should not shrink back from disclosing things to the NRC
14 because it could result in derating or shutting down of
15 B & W plants?

16 A I do not believe that I did.

17 Q Do you recall that prior to December 1978
18 B & W had assumed that pumps off during a loss of
19 coolant accident was a worse case than attempting to
20 leave the pumps running during a loss of coolant
21 accident?

22 A I don't recall ever making such a distinction for
23 B & W small break loss of coolant accident analysis.

24 Q You knew for small break loss of coolant
25 accidents B & W's analysis had always assumed a loss of

1
2 off-site power, didn't you?

3 MS. VAUGHN: Prior to December '78?

4 MR. SELTZER: Right.

5 A I do recall that loss of off-site power was an
6 assumption made for the safety analysis work performed
7 in Danny LaBelle's group. I don't recall being aware
8 that that was always the situation in the ECCS analysis
9 performed in Bert Dunn's group.

10 Q Does GPU Exhibit 379, which is your December
11 monthly report, refresh your recollection on that subject?
12 Take a look at the second sentence in your last paragraph
13 on page 3.

14 A I still do not recall being aware of or personally
15 involved in this situation in December 1978.

16 Q Do the words that you have written in your
17 December 1978 progress report indicate to you that the
18 assumption being made in B & W's small break LOCA
19 analysis prior to December 1978 was that the reactor
20 coolant pumps would be shut off?

21 A The words in this exhibit state that small LOCA
22 has been evaluated assuming a loss of off-site power.
23 That assumption would result in a loss of reactor
24 coolant pumps.

25 Q Do you see the third sentence that you wrote

1
2 in that paragraph?

3 A I don't recall writing these words.

4 Q I just asked if you see them.

5 MR. WISE: No, you asked a different
6 question.

7 Q I said, do you see the words in your third
8 sentence in that last paragraph?

9 A Yes, I see the words.

10 Q You wrote those words, right?

11 MR. WISE: He just testified that he didn't.

12 MR. SELTZER: No, he didn't testify that.

13 Q You wrote this report, didn't you, GPU 379?

14 A I do not recall writing the words in item III A
15 in this report.

16 Q Do you believe that those words were written
17 by anyone else other than Bruce Karrasch?

18 A I just don't know who wrote the words.

19 Q Do you have any reason to believe that
20 somebody other than you wrote those words?

21 A I really don't know.

22 Q You don't know of any reason to believe that
23 somebody else wrote those words? Is that what you are
24 saying?

25 A My normal process in preparing monthly progress

1
2 reports was to take input from my staff and use it to
3 put together what I consider significant items to report
4 to Dr. Womack. I really don't know who wrote those
5 words.

6 Q You put this report together for Dr. Womack,
7 right, GPU 379?

8 A That was my normal practice. I don't recall for
9 sure if I put this specific report together.

10 Q Is that your handwriting at the bottom of
11 page 3?

12 A Yes, I believe I did initial this report.

13 Q To the best of your recollection, did you
14 write or assemble what now appears within GPU Exhibit
15 379?

16 A I don't recall.

17 Q Looking at the last paragraph above your
18 signature, you have the sentence, the third sentence in
19 that paragraph, "The validity of the assumption to
20 produce the most limiting LOCA consequences (small break)
21 is now being evaluated."

22 What does the phrase "the most limiting LOCA
23 consequences" mean to you?

24 MS. VAUGHN: Mean to him now?

25 MR. SELTZER: Yes.

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

A It would mean to me that it is that the most conservative analysis had been performed in accordance with the regulations and requirements to perform such an analysis.

Q Does the phrase "the most limiting LOCA consequences" refer to consequences which produce a worst case?

A I am not sure I understand what you mean by the words "a worst case." My understanding of the LOCA analysis is that certain basic assumptions are used to prepare an analysis, which then yields results which are compared to some established acceptance criteria. The most limiting LOCA consequences implies to me that that analysis is conservative.

Q What do you mean, that it is conservative?

Let me try to help. When you say that it is conservative, do you mean that the analysis bounds all other breaks that are possible to occur?

A I am not familiar with the details of the requirements for conducting small break LOCA analysis. I do know that there are a set of rules which we follow which are used to assure that the analysis is conservative and does cover a spectrum of break sizes.

I see the words "limiting LOCA consequences."

1
2 It implies to me that the analysis is performed in
3 accordance with the conservative assumptions that we
4 must use.

5 Q Let me switch back to GPU Exhibit 122, which
6 is a copy of Cartin's memo which he indicates he was
7 sending to you. In item 6, the sentence 2, Cartin and
8 Swanson, who signed this, say, "If questioned by the
9 NRC, B & W must be in a position to state that the small
10 break topicals have considered the worst possible
11 conditions."

12 Was is your understanding that in order to
13 comply with NRC criteria, B & W had to be in a position
14 to state that its analyses had considered the worst
15 possible conditions?

16 A No. I don't think that the words "worst possible
17 conditions" reflect the analysis we tried to perform.

18 Q Do you have to reflect as you understood it
19 in 1978 the worst possible credible conditions?

20 A Again, I am not familiar at all with the
21 requirements on what conditions we must consider, but I
22 do believe that there is a well defined set of analysis
23 methods, analysis inputs, and acceptance criteria for
24 results in LOCA analysis which we must use to show an
25 acceptable and safe plant.

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Q Did you know in 1978 that you had to have studied the maximum credible accident?

A Yes.

Q What does that mean, the maximum credible accident?

A Again, I am not exactly sure of the details, but my understanding is that the maximum credible accident has historically been the large break loss of coolant accident.

Q Did you also understand that for small break loss of coolant accidents B & W had an obligation to study the worst possible conditions that could result from small breaks?

A I really can't attach any meaning to the words "worst possible conditions." I don't know what they mean.

Q You don't understand what my question means when I said did you know that B & W had to study the worst possible conditions that could result from a small break LOCA?

A I don't know what the words "worst possible conditions" mean.

Q You testified a moment ago that you understood that B & W had an obligation to analyze the largest

1

2

credible break that could occur in the reactor coolant system. Did you also understand that B & W had an obligation to examine the consequences of break sizes that were less than the largest possible break in the reactor coolant system?

7

A Yes.

8

Q Did you understand that B & W had to determine what were the consequences of breaks that were less than the largest break that could occur in the reactor coolant system?

11

12

A Yes, to the best of my knowledge.

13

Q Did you understand that that included determining what were the worst consequences that could happen from a break that was smaller than the maximum break that could occur in the reactor coolant system?

16

17

A I am really having trouble with your words "worst conditions."

18

19

Q Was it your understanding in 1978 that B & W just had to come up with some of the consequences of a small break, but if you missed the worst consequences, that didn't matter?

22

23

MR. WISE: Mr. Seltzer, I really think that you are badgering this witness unnecessarily.

24

25

MR. SELTZER: I am trying to use a very

1
2 docile voice. I am trying to be very calm about
3 this. I don't understand, and I think if I
4 approach it differently, maybe the witness will
5 understand it.

6 Q I can't conceive how you could do a LOCA
7 analysis of break sizes that would not anticipate the
8 worst consequences and I think that you had told the NRC
9 everything that you should about a certain size break.

10 MS. VAUGHN: Mr. Karrasch has testified
11 that he is not familiar with the details of how
12 it was done, but that it was only his understanding.
13 Within the confines of a general understanding,
14 he may not be able to answer your question.

15 MR. SELTZER: If he can't answer it, that is
16 O.K., because if the head of Plant Integration
17 doesn't know that a vendor is supposed to study
18 the worst possible consequences, that is probably
19 not a bad result for us.

20 MR. WISE: I think part of the problem is
21 the question of assumptions. If you want him to
22 assume that a utility trains its operators poorly,
23 so they do something they are not supposed to do,
24 the way you phrase the question, the worst
25 possible consequences, I could imagine a number of

1
2 consequences of operator error and utility
3 malfeasance which could result in rather horrible
4 consequences.

5 If you are implying that the NRC required
6 B & W to assume malfeasance by the utility, as an
7 example, it seems to me that you have added a
8 condition to your question that makes it very
9 difficult for this witness to answer.

10 MR. SELTZER: I certainly wasn't adding
11 that condition which you have suggested.

12 MR. WISE: I think the witness testified that
13 there are various criteria which people in the
14 LOCA analysis field would be more aware of than
15 he is as to the conditions under which you must
16 analyze a LOCA, and there are certain assumptions
17 about what will work, what wouldn't work, what
18 you can take credit for, and what you can't take
19 credit for, and he testified he is not familiar
20 with the details on how bad things must get for
21 you to assume that analysis.

22 MR. SELTZER: Let's see if I can ask
23 something different then.

24 BY MR. SELTZER:

25 Q Did you learn sometime after the beginning

1
2 of December 1978 and at any time up to today, that the
3 consequences for a small break loss of coolant accident
4 could be more severe if the reactor coolant pumps were
5 left on following the onset of a transient than if the
6 reactor coolant pumps were shut off at the start of a
7 transient?

8 A I understand the question. Would you please
9 clarify the time frame again for me?

10 Q Any time up to today.

11 A Yes, I was aware that such a question came up
12 sometime after the Three Mile Island accident. I recall
13 such a question coming up.

14 Q And are you aware that B & W's analysis
15 showed that the consequences were worse for certain
16 small break accidents in which the reactor coolant pumps
17 were left on than for the same postulated break size and
18 location if the pumps had been shut off at the start of
19 the transient?

20 A I am vaguely aware that sometime after Three Mile
21 Island 2 that ECCS performed analysis to determine
22 the impact of leaving the reactor coolant pumps running
23 during a small break loss of coolant accident. Again I
24 am unfamiliar with the details of that analysis.

25 Q Are you aware of this result of that analysis,

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

and I am not asking about any other results of the analysis. Are you aware that the analysis done at B & W showed that there were worse consequences that followed leaving reactor coolant pumps on for certain small break LOCA's than would follow from shutting off the reactor coolant pumps at the start of the transient for those same small break LOCA's? In other words, did you ever hear there was a class of small breaks for which it was worse to leave the pumps running than it was to shut them off?

A I don't recall ever understanding that it was worse to leave the reactor coolant pumps running during a small break LOCA.

(Luncheon recess taken at 1:00 o'clock p.m.)

-oOo-

AFTERNOON SESSION

(2:15 p.m.)

BRUCE ADOLPH KARRASCH, having
been previously duly sworn, resumed and testified
further as follows:

EXAMINATION (continued)

BY MR. SELTZER:

Q You are aware, are you not, that your
testimony this afternoon continues to be under oath?

A Yes, I am.

Q After the Three Mile Island accident, B & W
communicated to the NRC revised instructions for whether
the reactor coolant pumps should be on or off after the
start of a transient. Do you recall that?

A Yes, I am aware that that situation was evaluated
and that there were communications with the NRC.

Q Do you recall that there was a point in time
after the Three Mile Island accident when B & W was
recommending that the reactor coolant pumps be left on
during a transient?

A Again, I was not intimately involved in the work
nor the decision-making that went on in this issue. I
do recall that I was aware that there were many
discussions within B & W on how to resolve the issue. I

1
2 am not aware of the details.

3 Q I show you GPU Exhibit 262, which is a
4 preliminary safety concern report for the pumps running
5 problem dated May 31, 1979. You are marked for a copy
6 on this.

7 In the spring of 1979 at or about the time
8 that GPU Exhibit 262 was written, was it still your
9 function as the manager of Plant Integration to review
10 all reports of preliminary safety concern?

11 A Yes, it was.

12 Q Do you recall reviewing or assigning someone
13 to review the safety concern reflected in GPU Exhibit
14 262?

15 A No, I do not recall this safety concern in GPU
16 Exhibit 262.

17 Q Take a look at the last page of the exhibit,
18 which is the second page of a memo written by Bert Dunn
19 to Kane. Bert is reporting on his conversation with a
20 gentleman of the terrific name of Zoltan Rosztoczy.

21 Did you know Dr. Rosztoczy?

22 A No, I don't know him personally.

23 Q Have you ever met him?

24 A I have never met him. I recall attending an NRC
25 meeting at which he was present.

1

2

Q You shared the same room with him?

3

A Yes.

4

5

Q On the second page of Bert's memo, beginning in the first full sentence, do you see where he begins, "As an overriding concern"?

6

7

A Yes, I see it.

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Q The statement continues, "As an overriding concern, I pointed out that there is no intention within the operating guidelines to cause a reactor coolant pump trip during the transient and that this is true regardless of pump performance variables. In other words, I restated our position that at least one pump per loop will run until it dies. I confirmed that my experience with reactor coolant pumps running in high void systems has shown no problems with their performance and that our pump experts indicate no concern in pumping a two-phase fluid."

Was it your understanding in 1979 that the phrase "two-phase fluid" refers to a mixture of steam and liquid water?

MS. VAUGHN: You mean his understanding generally, independent of this particular memo or letter?

MR. SELTZER: Right.

1

2

A Yes, I think that is an accurate description of my understanding.

3

4

Q Were you aware in May of 1979 that there were people at B & W whom you considered pump experts?

5

6

A Yes.

7

8

Q Were you aware in the spring of 1979 that based on B & W's experience and the knowledge of experts at B & W reactor coolant pumps were able to run in high void systems with no problems in their performance?

10

11

A No, I really was not aware of that.

12

13

Q Did you have any knowledge about the ability of reactor coolant pumps to perform in two-phase fluids or with highly voided systems?

14

15

A I was aware in the spring of 1979 that the reactor coolant pumps at TMI-2 had performed and pumped a two-phase fluid at various times during the accident.

17

18

Q Do you know how high the void fraction was during the Three Mile Island accident while the reactor coolant pumps were still on?

20

21

A No, I do not.

22

23

Q So you don't know how highly voided the system was with the RC pumps going?

24

25

A No, I don't recall what the value of the void fraction was at any time during the TMI-2 accident.

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Q At any time up until today have you learned anything about the ability of reactor coolant pumps to perform in a high void system, in other words, a system that has a lot of steam and relatively little liquid water?

A My only exposure to that situation that I can recall is my knowledge of the sequence of events of the Three Mile Island 2 accident.

Q You don't recall anything else; is that what you are saying?

A That's correct.

Q Including you don't recall what Dunn said on the last page of GPU Exhibit 262 for which you are marked for a copy?

A That's correct. I don't recall ever seeing Bert's letter to Ed Kane of May 29, 1979.

Q Do you recall ever receiving GPU Exhibit 262 from Jim Taylor on which he marks you as the second person in the distribution list?

A No, I don't think I recall seeing this exhibit.

Q Based on your knowledge of distribution procedures, do you have any reason to believe that Jim Taylor did not send you a copy of GPU Exhibit 262?

A No, I do not.

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Q Did you know in the spring of 1979 that it was B & W's position that at least one reactor coolant pump per loop should be left on until it dies?

MS. VAUGHN: Are you reading from Bert Dunn's letter now?

MR. SELTZER: That is what I am reading from, but I don't think my question depends on where I am reading from.

MS. VAUGHN: It might be easier for him to follow the question.

MR. SELTZER: Sure.

A No, I was not aware that it was B & W's position that the reactor coolant pump should be left on until it dies.

Q Do you have any recollection of ever hearing that that was B & W's position?

A I don't recall that ever being B & W's position.

Q Did you do any work on the small break operating guidelines that were sent out after the Three Mile Island accident?

A No, I did not work on the small break operating guidelines sent out after the accident.

Q Did you ever review them?

A I recall reading the guidelines several months

1

2 after they were issued.

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Q Do you recall whether those guidelines say that if the reactor coolant pumps are on during a transient, they should be left on?

A No, I don't recall that.

Q Was it your understanding in the spring of 1979 that if the vibration on reactor coolant pumps exceeded B & W's limits and precautions, that the operators were supposed to shut the pumps off?

A I was aware that there were vibration limits for operation of reactor coolant pumps. I was not aware of the action that B & W recommended as a result of high vibration, that being to trip the reactor coolant pumps.

Q Have you subsequently learned that that was B & W's recommendation, to trip the pumps if the vibration exceeded the vibration limits in B & W's limits and precautions?

A I think I am aware of that today, yes.

Q You are aware that that was the B & W instruction that was in effect on the day of the Three Mile Island accident?

A No, I am not aware of that.

Q You said you are aware today of that. Today, you are aware that B & W had a recommendation that the

1
2 pumps should be tripped if vibration exceeded the
3 vibration limits in the limits and precautions issued
4 by B & W, and I am asking you during what period of time
5 did you understand that B & W had such an instruction?

6 A Again, my only exposure to the issue of tripping
7 reactor coolant pumps due to high vibration has been
8 through my review of the actual TMI-2 incident itself.
9 I am not aware of the background or the details or the
10 rationale behind any limits and precautions or
11 recommendations to trip reactor coolant pumps.

12 Q Are you saying you reviewed the procedures
13 in the limits and precautions that applied at the time
14 of the Three Mile Island accident?

15 A No, I am not saying that at all.

16 MR. SELTZER: Could you read back the
17 witness's next to last answer?

18 (Record read.)

19 Q When you reviewed the tripping of the
20 reactor coolant pumps due to high vibration which
21 occurred during the Three Mile Island accident, did you
22 learn that the vibration at TMI had exceeded the B & W
23 limits and precautions?

24 MS. VAUGHN: I am not sure that is exactly
25 what he testified to. I will let him answer.

MR. SELTZER: I hope I am asking something that is a little bit of an extension of what he answered.

A Could you repeat the question?

(Question read.)

A The only thing I recall is reviewing the various write-ups of the sequence of events during the Three Mile Island accident. Several of those write-ups indicated that the reactor coolant pumps were tripped due to high vibration. Again, I am unaware of what the limits are, what their basis is or any of the background beyond the fact that they were tripped due to high vibration.

Q I am not asking you what the limits were or what the background of the limits was. You said now for a couple of times that you learned that the reactor coolant pumps were tripped during the Three Mile Island accident in response to high vibration on those pumps.

Did you learn that the high vibration which was observed on the reactor coolant pumps during the Three Mile Island accident was measured to be in excess of the vibration limits in the B & W limits and precautions?

A No, I was not aware of that.

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Q Were you aware at the time you were doing this study and review that there were vibration limits for reactor coolant pumps in the B & W limits and precautions?

A I really don't know what the source of the vibration limits was.

Q Were you aware that there were B & W announced vibration limits for the reactor coolant pumps at the time of the Three Mile Island accident?

That is a little ambiguous. I mean, did you subsequent to the accident become aware that at the time of the accident there were B & W announced vibration limits for reactor coolant pumps? And please know I am not asking you what the source of those limits was. I am just asking, did you subsequently become aware that there were B & W vibration limits for reactor coolant pumps?

A My review of the TMI accident indicated to me that there were vibration limits for the reactor coolant pumps. I don't know whether they were in the B & W limits and precautions or not. I do not know what the source of them was.

Q Irrespective of whether they were in B & W limits and precautions, you say that there were limits

2 set on the permissible vibration of the reactor coolant
3 pumps at the time of the Three Mile Island accident?

4 A According to the experts that I read on the
5 sequence of events that told me that there were limits.

6 Q In what sense did you understand those were
7 limits? What do you mean, "there were limits"?

8 A Only in the sense that those descriptions of the
9 accident stated that the operators tripped the reactor
10 coolant pumps due to high vibration.

11 Q What does that have to do with limits? You
12 said you understood that there were limits.

13 A Maybe I assume that if the operator tripped them,
14 based on some value, that that value indeed was a limit.
15 Again, I don't know what the source of the limit was.

16 Q Where were you on the morning of March 28,
17 1979?

18 A I reported to work at B & W at my normal time,
19 which was sometime between 7:30 and 8:00 o'clock.

20 Q How did you first learn that there was a
21 transient in progress at Three Mile Island that day?

22 A To the best of my recollection, I was informed by
23 Dr. Womack that a transient had occurred at TMI-2 early
24 that morning and that I should be aware that I may be
25 asked to assist in evaluating that transient. That

1
2 occurred between 8:00 and 9:00 o'clock that morning.

3 Q Was Dr. Womack speaking just to you, or
4 were there other people in attendance at the same time?

5 A There were other people in attendance at the same
6 time.

7 Q Was this a meeting at which Allen Womack
8 was speaking to you?

9 A Yes.

10 MS. VAUGHN: What do you mean by a "meeting"?

11 Q What do you mean by a "meeting" when you
12 said "yes"?

13 A Yes, it was a gathering of a small number of
14 Allen's staff in his office on the morning of March 28,
15 1979.

16 Q When you say it was a gathering of Allen
17 Womack's staff, were these people from his Plant Design
18 Section?

19 A Yes.

20 Q Were most, if not all, of the managers of
21 the units in the Plant Design Section present in his
22 office for this meeting?

23 A I don't recall who else was in the meeting.

24 Q Did you take notes at the meeting?

25 A I don't believe that I did.

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Q Did you have any other meetings with Allen Womack that morning?

A I really don't know for sure whether I did or not.

Q Have you ever seen anyone's notes from the meeting with Allen Womack on the morning of March 28?

A I don't know for sure, but I don't think so.

Q Is there someone whose notes you think it is possible you might have seen based on your recollection?

A I don't recall seeing anybody else's notes from that meeting.

Q What, to the best of your recollection, did Allen Womack say about the Three Mile Island transient?

A As I recall, Allen told us that Three Mile Island had experienced a loss of feedwater at approximately 4:00 a.m. that morning, that the reactor had subsequently tripped and I recall him saying that the reactor coolant pumps were off. He had gathered his staff together to alert us that this situation had occurred and to tell us to offer any support we could if asked by the Nuclear Service Department.

That is all I recall about the brief meeting with Allen that morning.

Q Were you asked to do anything else by Allen

1
2 Womack that morning with respect to the Three Mile
3 Island accident?

4 A No, I don't believe that I was.

5 Q Didn't he ask you to set up an incident
6 team?

7 A I don't remember him asking me to set up an
8 incident team.

9 Q Didn't Allen Womack tell you that the
10 pressurizer had gone solid?

11 A I don't recall hearing that.

12 Q Do you remember that he told you that there
13 was a possible two-phase mixture in the reactor coolant
14 system?

15 A No, I don't remember that.

16 Q The presence of a two-phase mixture in the
17 reactor coolant system would mean that it hit saturation,
18 wouldn't it?

19 A Yes.

20 Q Isn't it a fact that Allen Womack told you
21 at the morning meeting or sometime during the morning
22 of March 28, 1979, that there was increasing
23 radioactivity in the reactor building at Three Mile
24 Island?

25 A I don't recall hearing that during the morning of

1
2 March 28, 1979.

3 Q Had you ever heard of a release of
4 radioactivity into the reactor building of a B & W
5 plant during any other transient prior to March 28, 1979?

6 A No, I don't believe that I had.

7 Q Prior to March 28, 1979, had you ever heard
8 of a pressurizer going solid at any B & W plant?

9 A I vaguely recall that the pressurizer during the
10 SMUD light bulb incident was at a very high water level.
11 I don't know if it went solid or not.

12 Q Where do you remember that from?

13 A I guess I am recalling that during that incident
14 the pressurizer safety valves were weeping a small amount.

15 Q You know now, don't you, that the pressurizer
16 went solid at the Davis-Besse plant during the September
17 24, 1977 event, right?

18 A I don't recall.

19 Q Sitting here right today, you don't recall
20 that the Davis-Besse pressurizer went solid on March 24,
21 1977?

22 A I never studied the Davis-Besse transient in 1977.

23 Q At no point since 1977 has it ever come to
24 your attention and stuck in your mind that the
25 pressurizer went solid during that transient?

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

A That's correct.

Q Are you aware today that the operators at Davis-Besse terminated high pressure injection in response to rising pressurizer level?

A Yes, I am aware of that today.

Q Are you aware that the reactor coolant drain tank rupture disk blew open at Davis-Besse?

MS. VAUGHN: I thought we went over this this morning.

MR. SELTZER: No, we were talking of what he knew in the fall of 1977, and now I am asking what he knows right now.

A I am aware that the quench tank rupture disk ruptured at the Davis-Besse incident.

Q Do you know that the pilot operated relief valve failed in its open position at Davis-Besse in the fall of 1977?

MS. VAUGHN: Does he know that today?

MR. SELTZER: Yes.

A Yes, I know that today.

Q On March 28, 1979, did you know that the pilot operated relief valve at Davis-Besse had failed open in a prior transient?

A No, I was not aware of it at that time.

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Q At any time during the day on March 28, 1979, did you see any similarities between what you were hearing had happened at Three Mile Island and what you had heard or read had happened at Davis-Besse in September 1977?

A No.

Q After the meeting with Allen Womack and his staff, what was your next source of any information about the pending Three Mile Island calamity?

A To the best of my recollection, my next exposure to the Three Mile Island accident occurred sometime after noon of that day in another meeting, whose purpose was to determine if we had any additional data to further make an evaluation of what had happened. The data we had at the morning meeting was basically nonexistent, and we were to meet again early in the afternoon to evaluate any further accumulation of data.

Q At or after your morning meeting with Allen Womack, did you ask any questions?

A I don't recall.

Q Did anybody consult with you during the morning of March 28 about sending Kelly, Winks, and Twilley, or any one of them, up to Three Mile Island?

A I don't recall that either.

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Q After the meeting with Al Womack, did you just go back to your unit and conduct business as usual?

A To the best of my knowledge, yes.

Q Have you ever seen a copy of Wandling's notes prepared on the day of the accident?

A Could I see what you are referring to?

Q Sure.

A Yes, I have seen this before.

Q Other than being shown it by counsel, under what circumstances have you seen Wandling's notes from the day of the accident?

A The only time I saw this set of notes from the accident was in the presence of counsel yesterday.

Q Did seeing it today or reviewing it today, if you would like to take a chance to, refresh your recollection about the fact that sometime during the morning of March 28, 1979 you were assigned to lead or set up a task force or incident team?

A To the best of my recollection, I cannot recall being asked to set up a task force to lead the B & W effort.

Q Do you see where it says "B. Karrasch to lead," just after "approximately 8:10"?

A Yes, I see that.

1

2

Q Do you see the entries after 7:45 a.m.?

3

A On the top of the page?

4

Q Yes.

5

A Yes.

6

Q Do you see the list of plant conditions

7

starting with loss of feedwater followed by high pressure

8

injection initiated, turbine tripped, et cetera?

9

A Yes, I see those.

10

Q Do any of those refresh your recollection

11

that you heard about those conditions existing at the

12

Three Mile Island plant on the morning of March 28?

13

A The ones I recall hearing about on the morning

14

were the loss of feedwater, the reactor trip on high

15

pressure, the turbine trip, and the fact that the reactor

16

coolant pumps were not running.

17

Q You said that you heard that the reactor

18

had tripped. Was that a pressure trip that you heard

19

about?

20

A I don't recall if I heard what caused the trip.

21

Q Did you know in March 1979 that the high

22

pressure trip point for the reactor was above the

23

pilot operated relief valve trip point?

24

A Yes, I did know that.

25

Q Did you know in March 1979 that a solid

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

pressurizer was not the normal operating mode for the
pressurizer?

A Yes, I knew that.

Q Did you know in March 1979 that B & W limits
and precautions said that the pressurizer must not be
filled to solid conditions except under hydrostatic
testing?

A No, I did not know that that was explicitly defined
in the limits and precautions.

Q Did you know anywhere in anything that B & W
had distributed to its customers there was an advisory
against filling the pressurizer solid except under
hydrostatic test conditions?

A No, I do not know of any specific advisory to
our customers.

Q I don't know whether you are meaning to
change my question in your answer or not. I am not
asking about whether there was a specific advisory. I
am asking, did you have any awareness at all that B & W
had advised customers that they should not permit the
pressurizer to fill solid except during pre-operational
testing?

A I was unaware of any specific advisories.

Q Are you aware today from anything that you

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

have read or heard that on March 28, 1979 Three Mile Island had a B & W limit and precaution that said the pressurizer must not be filled to solid conditions except under hydrostatic test conditions?

A I recall in the course of reviewing the TMI-2 accident that such instructions existed just through my review of the sequence of events. Again, I don't know what the specific source was or in what documents they were.

Q Was it your understanding in March 1979 that there were many different types of transients which would lead to opening of the pilot operated relief valve in the B & W 177 plants?

A Yes, I was aware of that in March 1979.

Q Was it your understanding that those anticipated openings of the pilot operated relief valve would lead to blowing open the rupture disk on the quench tank or the reactor coolant drain tank, as it is sometimes often referred to?

A No, it was not.

Q Was it your understanding in March 1979 that if the reactor coolant drain tank rupture disk blew open, that something unexpected had happened?

A Yes.

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Q In other words, something more than just a normal opening of the pilot operated relief valve had happened?

A Yes. The rupture disk on the quench tank was not supposed to rupture except in a very abnormal occurrence.

Q In other words, it would take more than the release of steam from a normal opening of a pilot operated relief valve to blow the rupture disk on the quench tank?

A That would be my understanding, yes.

Q And that was your understanding in March 1979?

A Yes.

Q In March 1979, the only prior occasion on which you then recall a quench tank rupture disk had blown open was the Oconee incident some years earlier?

A Yes, the one that I alluded to this morning.

Q Have you learned at any time up to today that in addition to the Oconee event, the quench tank rupture disk had also been blown open during the Davis-Besse September 1977 transient?

A Yes, I think I recall hearing that the rupture disk had blown at Davis-Besse also.

Q Do you know that the operators at Davis-Besse

1
2 terminated high pressure injection in response to
3 rising pressurizer water level?

4 A Yes.

5 Q When did you learn that?

6 Let me ask you more pointedly. I will
7 withdraw that.

8 At some time between August 3, 1978 and
9 March 15, 1979, when you were reading Don Hallman's
10 memo more than once and contemplating a response to
11 Hallman's memo, did you ever have the understanding that
12 the operators at Davis-Besse had terminated high
13 pressure injection in response to rising pressurizer
14 water level?

15 A No, I don't believe that I did.

16 Q In March 1979, did you understand that there
17 was something wrong happening in the plant if there
18 were 800 rems of radiation measured in the dome of the
19 B & W reactor building?

20 A Yes, that would indicate an abnormal condition to
21 me in March of 1979.

22 Q Why would that indicate an abnormal condition?

23 A That level of radiation is significantly greater
24 than it should normally be in the dome of the reactor
25 building.

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Q Based on your understanding in March 1979, did you have any impression what could create a reading as high as 800 rems?

A No, I really didn't understand what could cause a reading that high. I just knew that it was much higher than normal.

Q In March 1979, were you aware of anything other than failed fuel rods that could produce a reading as high as 800 rems in the dome of the reactor building?

A No.

Q At Allen Womack's morning meeting, did Dr. Womack or anybody else at the meeting say in words or substance that they believed that there had been a loss of coolant accident at the Three Mile Island plant that morning?

A I don't recall hearing that.

Q At any time during the morning of March 28, 1979, did anybody indicate to you that they either thought there had been a loss of coolant accident at Three Mile Island that day or there was a loss of coolant accident in progress at Three Mile Island?

A I don't recall any discussions about loss of coolant accident at Three Mile Island on the morning of March 28, 1979.

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Q After you left Allen Womack's office, did you talk to anybody else about the reported transient at Three Mile Island before lunch?

A I don't recall for sure.

Q Did anybody ever show you Bob Jones' handwritten notes of the meeting in the morning with Allen Womack?

MS. VAUGHN: You mean outside the presence of counsel?

MR. SELTZER: Including yesterday.

A I don't recall seeing any handwritten notes from that meeting.

Q Let me show you Bob Jones' notes and ask you if it refreshes your recollection about some of the things that you heard that morning. His notes have been marked as GPU 96.

A Does that say "Notes of R. C. Jones on 11:00 a.m. staff meeting for Plant Design"?

Q Right. You see at the bottom of page 2 where it says, "Set up incident team - B. Karrasch. Various people will be tapped from each team"?

A Yes, I see that.

Q Does that refresh your recollection that Allen Womack asked you to set up such a team on the

1
2 morning of March 28, 1979?

3 A No, it does not. For the record, I recall the
4 meeting I attended to have been much earlier than 11:00
5 a.m.

6 Q Where were you at 11:00 a.m.?

7 A I don't recall. I am quite sure I was not in a
8 meeting with Allen Womack on the incident at TMI-2.

9 Q Why are you so certain your meeting was
10 8:00 a.m. and not 11:00 a.m.?

11 A That is just the best of my recollection.

12 Q You keep time records?

13 A No.

14 Q Do you have a diary of this day?

15 A No.

16 Q Have you discussed with anybody else what
17 things you did on the morning of March 28, 1979, other
18 than counsel?

19 A I believe I was asked to explain my activities on
20 that morning by either the President's Commission or the
21 Rogovin Commission. I don't recall which.

22 Q Would you turn to the fourth page of
23 Wandling's notes. There is a number 4 at the top of
24 the page. Do you see the entry for noon?

25 A Yes.

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Q Do you recall that at or about noon on March 28, 1979, the Karrasch task force was asked to determine the recommended course of action for cases with and without the reactor coolant pumps running?

A No, I do not recall being asked to determine the recommended course of action for cases with and without reactor coolant pumps.

Q What happened in the afternoon? You said that after lunch was the next time that you got involved in the Three Mile Island fiasco?

A I recall being asked to attend a meeting in a room called the Project Control Center. The purpose of the meeting was to make an evaluation of additional data which had been received during the morning and to determine if there was assistance we could offer Three Mile Island and see if we could find out more about what had happened.

Q How early did you show up for that meeting?

A I believe I was there, to the best of my recollection, by about 1:00 p.m. in the afternoon.

Q When you walked into that meeting, there were other people already present in the room, right?

A I believe there were several people already present, yes.

1
2 Q Was there an organized meeting in progress,
3 or were people just standing around, sitting around,
4 talking in groups?

5 A I don't recall an organized meeting in progress.

6 Q Shortly after you arrived at the afternoon
7 meeting or the afternoon gathering, did anyone inform
8 you that a determination had been made that there had
9 been a loss of coolant accident at Three Mile Island or
10 a loss of coolant accident was in progress at Three
11 Mile Island?

12 A No.

13 Q Did anybody tell you shortly after you
14 arrived at the afternoon gathering that the thinking at
15 B & W was that there had been a very serious accident
16 at Three Mile Island involving possible core uncovering
17 and fuel melting?

18 A No.

19 Q Did anybody advise you that he had personally
20 begun to think that there was a serious possibility of
21 core uncovering or fuel damage at Three Mile Island?

22 A No, I don't believe so.

23 Q Did anybody tell you that he had personally
24 begun to think that there had been a loss of coolant
25 accident at Three Mile Island?

1

2 A No.

3 Q When did you first hear anybody at B & W
4 suggest that there may have been or may be a loss of
5 coolant accident at Three Mile Island?

6 A To the best of my recollection, I don't believe
7 I heard the words "loss of coolant accident" until
8 either very, very late that afternoon or possibly even
9 the next morning.

10 Q When is the first time that you heard
11 anybody suggest that there may be or may have been core
12 uncovering or fuel melting at Three Mile Island?

13 A I recall coming to a belief that there may be
14 possibly core uncovering myself when I heard that there
15 were readings indicating the presence of superheated
16 steam in the reactor coolant loops, and I believe that
17 occurred sometime in the mid-afternoon. Approximately
18 three o'clock.

19 Q You say that was mid-afternoon?

20 A Yes.

21 Q You said that you don't believe you heard
22 anyone suggest that there had been a loss of coolant
23 accident until either very late in the afternoon or early
24 the next day.

25 What time period is "very late in the

1

2 afternoon" or "late in the afternoon," whichever phrase
3 you used?

4

A 5:00 or 6:00 p.m.

5

Q Why did superheat in the loops, which I
6 understand to be the same as the hot and cold legs --
7 is that right?

8

A That's correct.

9

Q Why did superheat in the hot or cold legs
10 indicate to you that there was possible core uncover?
11 Can you explain your thinking on that one.

12

A When I arrived in the meeting at one o'clock,
13 the first data points that I heard that were significant
14 to me were the fact that the reactor coolant pressure
15 was less than a thousand pounds and that there were
16 indications of reactor coolant temperature greater than
17 600 degrees.

18

Q Both of those were measurements in the
19 loops or the hot and cold legs, as you call them?

20

A I don't recall exactly where the measurements
21 were. I do recall that that was the first point at
22 which I personally became alarmed that something was
23 really wrong at Three Mile Island. That condition
24 indicates that there is voiding in the loops.

25

Q Why does that mean that there is voiding in

1
2 the loops? You said you didn't know where those
3 temperatures were measured.

4 A Let me correct myself.

5 Q Or today you don't recall where they were
6 measured?

7 A I don't recall where they were measured, but I
8 recall enough about the steam tables to know that 600
9 degrees is greater than saturation temperature at 1,000
10 pounds per square inch pressure. It was at that point
11 in time that I became alarmed that there was a very
12 abnormal condition at Three Mile Island.

13 Sometime later in the afternoon, possibly
14 an hour or so later, I heard that there were temperatures
15 being indicated by the in-core thermal couples that
16 were also in excess of possibly even 700 degrees. In
17 order for that condition to occur, I thought that that
18 would have to mean that at least the incore thermal
19 couples were not in an environment of water or even a
20 saturated fluid. That would indicate to me that they
21 were in a steam environment. That realization occurred
22 sometime in the mid-afternoon.

23 Q You said that in the middle of the afternoon
24 you heard temperature and pressure conditions measured
25 somewhere in the reactor coolant system that indicated

1
2 there had been saturation or that there was saturation
3 at the time those readings were taken, right?

4 A Yes.

5 Q And saturation in the reactor coolant system
6 meant that there had been voiding in the system, as you
7 understood at that day, right?

8 A That's right.

9 Q And voiding is the same as a two-phase
10 mixture, right?

11 A Right.

12 Q And you said that is a very unusual condition?

13 A Yes.

14 Q In mid-afternoon on March 28, 1979, did you
15 go from the conclusion that there was voiding in
16 saturation to the conclusion that there was core
17 uncovering?

18 A I recall hearing that there were very high
19 readings on the incore thermal couples, readings in
20 excess of saturation temperature, which to me indicates
21 that at least the upper part of the fuel where the
22 incore thermal couples are was in a steam environment.
23 That would indicate core uncovering to me.

24 Q Did you get temperature and pressure
25 readings from the reactor coolant system before you

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

heard what the incore thermal couple readings were?

A I don't recall where the temperature readings were taken from when I first heard that the temperatures were in excess of the saturation temperature. They are two-phase. The RTD's in the upper hot legs and the incore thermal couples.

Excuse me. There is also a third place. There are RTD's in the cold legs also.

Q Are there thermal couples in the pressurizer?

A Yes, I recall there also is a temperature measurement in the pressurizer.

Q Is it an RTD?

A I don't know if it is an RTD or a thermal couple.

Q What is an RTD?

A "RTD" stands for resistance temperature device, a special kind of temperature measuring device.

Q Were you in the room when Bert Dunn and Lou Cartin recommended that B & W call the Island and tell the Island that they should be charging HPI at 400 GPM?

A Yes, I recall being in the room when a whole series of discussions went on about getting HPI on and water back into the system.

Q Was the gist of it that the people in the

room who were proposing that HPI should be on perceived that there was a possibility of core uncover due to inadequate water inventory?

A No. My recollection is that the data we had on reactor coolant temperature and pressure indicated that we were saturated and that we were well below the set point for automatic initiation of high pressure injection and that therefore it should be on.

Q What is the maximum flow rate for high pressure injection on a 177 fuel assembly lowered loop plant?

A I believe on the order of a thousand gallons per minute.

Q When Bert Dunn and Lou Cartin proposed a charging rate of only 400 gallons per minute for high pressure injection, did you suggest that it should be on the maximum, namely, a thousand gallons per minute?

A No, I did not.

Q Did anyone in the room, to your recollection, suggest that the recommendation that B & W make should be to turn high pressure injection on full bore instead of just turning it on half-throttle at about 400 GPM?

A I don't recall.

Q Was this some effort to save water that you

1
2 were only going to turn it on 400 gallons per minute
3 instead of full-blast?

4 MR. WISE: I object to that. There is no
5 need for that sort of thing. I think you know
6 why 400 gallons was chosen instead of some other
7 figure. So ask questions instead of making silly,
8 facetious remarks to the witness.

9 Q Do you know why 400 gallons was chosen
10 instead of a thousand gallons per minute?

11 A No. I don't recall all the facts that went into
12 any such decision to recommend a value for high
13 pressure injection.

14 Q Do you recall anyone recommending any value
15 higher than 400 gallons per minute?

16 A No, I do not recall that.

17 (Recess taken.)

18 BY MR. SELTZER:

19 Q Do you remember preparing comments on the
20 operating guidelines for small breaks?

21 A No, I don't recall doing that.

22 Q Do you recall that B & W issued small break
23 operating guidelines following the Three Mile Island
24 accident?

25 A Yes, I do recall that.

1
2 Q Let me show you a document headed "Plant
3 Integration Comments on 'Operating Guidelines for Small
4 Breaks,'" GPU Exhibit 380.

5 (Document above described so marked as
6 Plaintiffs' Exhibit GPU 380 for identification,
7 as of this date.)

8 Q This is a document produced from your files.
9 Is that your handwriting on the second page?

10 A Yes. They are my handwritten comments.

11 Q Is that your handwriting on the subsequent
12 typed pages?

13 A Yes, it looks like it.

14 Q Does this refresh your recollection that
15 you did prepare comments on the operating guidelines
16 for small breaks?

17 A Yes, it does. It appears that I did provide
18 comments on this document.

19 Q To whom were you giving these comments?

20 A I don't recall.

21 Q Do you see where you wrote on the top of
22 the second page, "Plant Integration comments are called
23 to your attention to assist in discussing with NRC and
24 understanding the complete scope of emergency
25 procedures"?

1

2

A Yes, I see that.

3

4

Q And above that, you have written "ECCS Procedure"?

5

A Yes, I see that.

6

7

Q Does that refresh your recollection as to whom you were supplying these comments?

8

9

A No, it really doesn't. In fact, I am having a very hard time recalling what the situation was when I presumably prepared these comments.

10

11

12

13

14

15

16

17

18

19

Q Take a look at item 13 on the first page of GPU Exhibit 380. You said there, "Add to #7 above - The length of this implies that our 'simple' approach of the past (start and keep high pressure injection on; keep subcooled) is inadequate - if that is the case, our position on Three Mile Island 2 (operator error) is weakened."

Did you discuss that with anyone before you wrote that comment?

20

21

22

23

24

25

MS. VAUGHN: I object just because I am not sure that we have established that he wrote this. We have established that the second page are his handwritten notes and the third page.

Q Is what appears on the typed page at the front a typewritten version of comments which you

2 prepared?

3 A No, I am quite sure that it is not.

4 Q On the second page in the margin, could you
5 read what you have written there, please?

6 MS. VAUGHN: You mean next to point "c"?

7 MR. SELTZER: Right.

8 A Next to point "c" it says, "Weakens our position
9 that TMI-2 operator erred."

10 Q What weakens B & W's position that the
11 Three Mile Island 2 operator erred?

12 A I don't know.

13 Q Do you know who prepared the first page of
14 GPU Exhibit 380?

15 A No, I do not.

16 Q Do you exclude the possibility that you
17 prepared the first page?

18 A I doubt that I prepared the first page, but I
19 don't know for sure. The reason that I doubt that I
20 prepared it is that the level of technical detail goes
21 beyond what my understanding of these operating
22 guidelines were to include.

23 Q In the spring of 1979, who in your unit had
24 the technical expertise and the participation in any
25 work in this area to have drafted this?

1

2 A To the best of my knowledge, Lou Cartin --

3 Q Lou used to be in ECCS, didn't he?

4 A -- was involved in the preparation of the guidelines.

5 Q Lou used to be in the ECCS Analysis Unit,
6 right?

7 A Yes, that's correct.

8 Q Do you recall discussing the guidelines with
9 Lou Cartin?

10 A No, I don't recall discussing the guidelines with
11 Lou.

12 Q I take it you don't have any recollection
13 of discussing the items on page 1 of GPU Exhibit 380
14 with anyone; is that right?

15 A I do not recall discussing page 1 of this exhibit
16 with anyone.

17 Q Do you recall discussing with Lou Cartin

18 (Continued on page 491A.)

19

20

21

22

23

24

25

or anybody else your comment that something in these guidelines weakens B & W's position that the Three Mile Island 2 operator erred during the Three Mile Island accident?

A No, I do not recall discussing that with anybody.

(Time noted: 4:20 o'clock p.m.)

BRUCE ADOLPH KARRASCH

Subscribed and sworn to
before me this day
of , 1981.

CERTIFICATE

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

I, JOSEPH R. DANYO, a Notary Public
of the State of New York, do hereby certify
that the continued deposition of BRUCE ADOLPH
KARRASCH was taken before me on September 29,
1981, consisting of pages 399 through 491A.

I further certify that the witness had been previously duly 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 15 day of October, 1961.

Joseph R. Danyo

I N D E X

WITNESS	PAGE
BRUCE ADOLPH KARRASCH (resumed)	
By Mr. Seltzer (continued)	401

E X H I B I T S

PLAINTIFFS'
FOR IDENTIFICATION

GPU 377	Document entitled "NSSS Design Group"	402
GPU 378	Document dated May 2, 1978, April Activities Report, from B. A. Karrasch to D. H. Roy	415
GPU 379	Document dated January 3, 1979, December, 1978 Progress Report, from B. A. Karrasch to E. A. Womack	438
GPU 380	Document headed "Plant Integration Comments on 'Operating Guidelines for Small Breaks'"	488