UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

ORIGINAL

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GENERAL PUBLIC UTILITIES CORPORATION, :
JERSEY CENTRAL POWER & LIGHT COMPANY,
METROPOLITAN EDISON COMPANY and :
PENNSYLVANIA ELECTRIC COMPANY,
:
Plaintiffs, CIVIL ACTIO
: NO. 80 CIV.
-against- 1683 (R.O.)
:
THE BABCOCK & WILCOX COMPANY and
J. RAY McDERMOTT & CO., INC., :
:
Defendants. :

- -x

Continued deposition of THE BABCOCK & WILCOX COMPANY, by BERT M. DUNN, 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, April 7, 1981, at 9:20 a.m., before Joseph R. Danyo, a Shorthand Reporter and Notary Public of the State of New York.

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ALSO PRESENT:

DAVID TAYLOR

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B E R T M . D U N N , having been previously duly sworn, resumed and testified further as follow:

EXAMINATION (Continued)

BY MR. SELTZER:

Q Your testimony today continues to be under oath. Do you understand that?

A Yes.

MR. SELTZER: I would like to mark as GPU Exhibit 110 a letter from D. R. Patterson, Chief of the Mechanical Engineering Branch of Tennessee Valley Authority, to Mr. McFarland at B&W, April 27, 1978, subject "Emergency Core Cooling System - Small Break LOCA Analysis N4M-2-14(AR)," with a copy indicated to Mr. Dunn.

(Letter from D. R. Patterson to Mr. McFarland dated April 27, 1978, marked GPU Exhibit 110 for identification, as of this date.)

BY MR. SELTZER:

Q Is GPU Exhibit 110 a copy of a letter which you received in the regular course of business in or about May 1978?

A I don't recall receiving it.

Q Have you had a chance to look through it to refresh your recollection?

A Yes, I believe I am familiar with this memo or letter.

Q When you say you are familiar with it, what do you mean?

A I have seen it before.

Q In what connection have you seen it?

A At the first time that I actually read the Michelson Report. This was a cover letter to a body report which followed, and I have seen the two of them together most of the time. I don't believe I have seen them separately, except in this deposition.

Q Have you met with Mr. Patterson, the author of GPU Exhibit 110?

A Not since the issuance of this memo.

Q Have you discussed the contents of GPU Exhibit 110 with Mr. Patterson or others from TVA?

A I recall one telephone conversation in which we were discussing the contents of this memo and the contents of the Michelson report

with TVA. I am not sure who was the TVA representative on the phone call.

Q Have you discussed the Michelson report with Carlyle Michelson?

A I don't believe so.

Q Have you discussed any subjects relating to emergency core cooling with Michelson?

A Sometime after Three Mile Island, Michelson was appointed as an adviser to the ACRS. We have had presentations before ACRS during that time frame in which he was an advisory member. Those presentations dealt with the emergency core cooling, loss of coolant accident predictions.

Q Have you had any meetings with Carlyle Michelson since he has assumed his new post in the NRC?

A No.

Q Do you know what his new post is?

A It is my understanding, it is something dealing with equipment, but that could even be wrong. No, I don't know.

Q You don't know that he is in charge of an office that deals with analysis of operating

experience of nuclear plants?

A No, I did not.

Q When you saw him after the Three Mile Island accident, did you tell him you thought he had done a nice job on his report?

MR. FISKE: Which report?

MR. SELTZER: The report that Mr. Dunn has referred to as the Michelson report.

MR. FISKE: I object to the form of that question. Ask him whether he had a conversation about the report.

BY MR. SELTZER:

Q Did you say anything to him about the report?

A I don't believe so. I believe we talked about what happened that day.

Q Is it your best recollection that you have never talked to Carlyle Michelson about the Michelson report?

A Yes.

Q Is it correct that for certain small break loss of coolant accidents, the steam generators are relied upon to remove a portion

of the decay heat?

A In terms of the licensing evaluations, yes.

Q In GPU Exhibit 110, TVA says at the beginning of the third paragraph on the first page, that for small break LOCA's up to five-hundredths of a square foot, steam generators must remove a significant portion of decay heat.

Is that statement accurate?

A No, I think the sentence is reasonable. I don't think the way you paraphrased it and cut it short was accurate.

Q You think the steam generators must remove a significant portion of the decay heat during the initial phase of the loss of coolant accident? Is that right?

A You should complete the sentence.

Q Adding what?

A "Otherwise reactor coolant system repressurization occurs since the break is too small to remove all of the decay heat."

Q Do you agree with the next sentence which says, "Repressurization or even prolonged high pressure operation could seriously limit high pressure injection makeup during blowdown

and thereby adversely influence the peak clad temperature for those cases wherein the core uncovers during the blowdown"?

MR. FISKE: I object to that unless it is couched in terms of what Mr. Dunn thought at the time he saw the memorandum.

Q What did you think when you saw the memorandum about the validity of that statement?

A That it was in essence wrong drawing from combining two different accidents that cannot physically combine.

Q What two accidents?

A One of the larger small breaks which has an opportunity for uncovering the core and the smaller breaks which do not.

Q You said that for licensing, you do rely on the steam generators for removal of a significant portion of decay heat, is that right?

A Yes.

Q Is it correct that in order to take licensing credit for decay heat removal through the steam generators, you have to assume in certain instances continuation of natural

circulation?

A No.

Q If there is not operation of the reactor coolant pumps, do you have to assume natural circulation?

A Not by the definition that most people use for natural circulation.

Q What definition is that?

A Solid water.

Q What do you mean? I know what solid water means. Getting back to your answer, not by the definition most people use.

A My definition of natural circulation is an unforced process of mass transport from the reactor core to some cooling mechanism, typically the steam generator, during which energy is also carried. That can occur in a reactor by three mechanisms. The latter two are thought by most people not to be included in the term "natural circulation," although they are natural and they are in fact unforced.

Q What are the latter two?

A A bubbly two-phase froth mixture in the hot leg that enhances the density difference between

the colder regions of the system, the hotter regions of the system, which transports both liquid and steam to the steam generators, and a mode of operation termed boiler condenser today, and at one time after Three Mile Island inappropriately termed reflection boiling.

Q How does boiler condenser circulation or convection work?

A The circulation mechanism is by boiling steam in the reactor core passing the steam through whatever suspended mixture may be above the reactor core out in the hot legs where it would separate from the mixture region of the system, be transported as steam up the hot leg over the top of the candy cane down into the steam generator and condense on the secondary liquid surface.

Q Does the NRC for licensing purposes accept that as a method of natural circulation?

A The NRC accepts that as a method of providing energy transport during small break loss of coolant accidents.

Q Does B&W take credit for that as a means for heat dissipation in loss of

coolant accidents for licensing purposes?

A Yes.

Q Has the NRC accepted it?

A Yes.

Q On page 2 of GPU Exhibit 110, would you look at the point that is numbered 3.

Do you see the second sentence in point 3 that begins with the words "Decay heat removal"?

A Yes.

Q It says, "Decay heat removal by condensation will cease when the water level inside the steam generator tubes exceeds the secondary side water level."

At the time you received this document and read it, did you believe that was an accurate statement?

A It is accurate, and I am talking about a state of knowledge at the time, but it does tend to infer a necessity that a necessity remains for heat transfer to the generator and in that fashion, it intones something that is slightly inaccurate.

I would like to put on the record, too,

that the time at which I first read these and formed the conclusions I have been giving you is after Three Mile Island.

You said at the time I received this. I want to make it clear that I did not recall receiving this at the time it was issued.

Q When you saw this after the Three Mile Island accident, is that the first time you believe you got a copy of GPU Exhibit 110?

A I believe that is true.

Q It says in the last paragraph on page 2, the seventh line down, the sentence beginning "Also associated." It states, "Also associated with operation in each of the above conditions is a concern that the pressurizer level is not a correct indicator of water level over the reactor core. Because of the loop seal on the pressurizer, it may be possible to have a full pressurizer while the core is partially uncovered."

At the time you read GPU Exhibit 110 for the first time, did you believe that those sentences made statements which you found accurate?

A The intonation about the loop seal being of importance, I would not find accurate. The concern about the possibility of the pressurizer being full while the primary system is partially voiding or as they have expressed it that the pressurizer level is not a correct indicator of the water over the reactor core, I would find true. I did find true.

Q You still find it true, right?

A Yes.

Q That fact that you could have a full pressurizer while the core is partially uncovered is one of the things you took some time to explain to others at B&W on the afternoon of the Three Mile Island accident, is that right?

MR. FISKE: I don't remember Mr. Dunn giving any testimony about pressurizer water level in relation to the afternoon of the accident.

MR. SELTZER: We have introduced his notes in which he had written that he had explained that. GPU Exhibit 97.

MR. FISKE: He can answer the question.

A The answer to the question is that we took some time to explain the consistency of a pressurizer containing water while low levels of coolant existed in the reactor coolant system.

Your statement related to a partially uncovered core, and I am not exactly sure that we treated it as a partially uncovered core in those discussions. We were talking about the need for high pressure injection.

(Continued on following page.)

Q Let me show you again GPU Exhibit 97 and specifically Page 2 of your notes in 97, where you say -- I'm sorry, it starts on Page 1. "We asked for a charge rate of around 400 gallons per minute and started explaining to management how an uncovered core was consistent with full pressurizer level."

Are those your notes?

A Yes.

Q Does that refresh your recollection that you had written that at your meeting on the afternoon of the day of the Three Mile Island accident, you explained to management how an uncovered core was consistent with full pressurizer level?

A Not really. The way I remember it is explaining a need for high pressure injection with the possibility that the water levels in the core were not guaranteed; and that is pretty much how I remember it today. I don't deny I wrote those notes.

Q When you wrote those notes, were you attempting to put your best recollection of the day of the Three Mile Island?

A Yes.

Q And your recollection was fresher when you were writing these notes than your recollection is today; is that right?

A Yes.

Q Would you turn to the last page of GPU Exhibit 110.

The TVA author states there: "We assume that the situations and concerns which have been identified above and in the attached draft study have been considered in your own in-house loss of coolant analysis and analysis work."

As of the date that this is written, which is April 1978, had the situations and concerns which are discussed by TVA already been considered in B&W's loss of coolant analysis work?

MR. FISKE: I think that is a pretty broad question, if you are really intending to ask him separately about each one of the items that was covered in this letter and in the report.

MR. SELTZER: If he would like to take it item by item and tell me which ones

had been considered and which ones hadn't, that's fine. I didn't mean to lump them together unfairly.

MR. FISKE: I just want to know whether you have any particular situation or concern that you are interested in which might save us some time.

MR. SELTZERL Let's take the three numbered concerns on Page 2.

A You want me to just answer?

Q Yes.

A The first issue was considered in determining the nature of the spectrum to be utilized for licensing purposes. The accidents which would have a potential to cause this effect are not severe and did not involve core uncovery and thus did not challenge the emergency core cooling system.

Q Had you analyzed whether the formation of a steam bubble at the top of each steam generator could interrupt natural circulation?

A Not specifically. Our analysis of the situation went a little different.

Q So you hadn't analyzed that?

A In terms of computer evaluation or a specific case, no. I remain with my contention that it is in the licensing basis, the point.

Q What do you mean, it is in the licensing basis? It is bounded?

A Yes.

Q You mean bounded the same way you had thought the discharge pipe break was bounded until you studied that specifically, right?

MR. FISKE: I object to the form of the question.

Q You thought that the discharge break was bounded until you studied it, didn't you?

A Yes, we felt we had determined the worst case to be located for the smaller breaks at the pump suction as opposed to pump discharge.

Q It wasn't until you studied pump discharge breaks specifically that you learned that was a worst case, is that right?

A For that particular plant. We had studied discharge breaks for that plant, but in the wrong break size range.

Q Since April 1978, has B&W in ECCS

Analysis specifically analyzed the possibility of a steam bubble forming either at the top of a candy cane or at the top of a steam generator and thereby interfering with natural circulation and decay heat removal?

A Yes.

Q Who did that work?

A ECCS.

Q Was there any particular individual in your unit that was responsible for that?

A The work has been done on several occasions for several reasons. I would say there are about four people, five people, significantly associated with it.

Q Who in ECCS Analysis is most knowledgeable about that work?

A Probably Mr. Bob Jones.

Q Have any formal reports been written on the subject?

A At least one.

Q When was it written?

A May 7, 1979.

Q What is the title of that?

A The blue books.

Q Turning to point 2 on Page 2 of GPU Exhibit 110, had the situation and concerns stated there been analyzed by B&W prior to April 27, 1978?

A I make the same statement on that that I made to No. 1. The condition is bounded within the licensing evaluation. There was no particular analysis in the form of detailed computer work done of such an event.

Q Since April 1978, has analysis been performed specifically on that situation?

A Yes, it would be the same analysis mentioned in response to Item No. 1.

Q Turning to Item 3, had work been done in-house at B&W on Item 3 before April 27, 1978?

A From the standpoint of seeing ourselves that such events did not pose a compromise to core safety, the point had been considered and a certain way evaluated. Repressurizations were not computed in those evaluations; so we were not finding that repressurization would occur.

The majority of this paragraph seems to deal with long-term accident recovery, which was not specifically evaluated by ECCS at that

time.

Q You did work subsequent to this on the level of water that should be maintained in the secondary side of the steam generator following a loss-of-coolant accident, didn't you?

A Yes, we had done such work.

Q In fact, you came up with a prescription to change the level of water that should be maintained on the secondary side, didn't you?

A We have altered the level for the 177 plants. Design work is proceeding on the level for the 205 plants. The work I was talking about was the design work.

Q You altered the level for the 177 plants after the Three Mile Island accident; right?

A Yes.

Q You increased the level from 50 percent to 95 percent?

A That's correct.

Q When was the work done that supported the change from 50 percent to 95 percent?

A Generally, within a few months of Three Mile Island.

Q Before or after Three Mile Island?

A After.

Q What if anything was perceived as the advantage of raising the level to 95 percent instead of leaving it at 50 percent?

MR. BENEDICT: By Mr. Dunn?

MR. SELTZER: Yes.

A A guarantee that whatever condensate was available in the steam generators would have an opportunity to return to the reactor vessel and a better assurance of steam generator heat transfer during post-accident situations.

Q You wanted to increase the decay heat removal, right, in post-accident situations?

A No. I would say we wanted to assure that certain masses, i.e., the condensate in the steam generators, could return to the core. It was more a mass concern than a decay heat removal concern.

The other part refers to keeping the steam generator in a mode in which it can control certain aspects of the primary system such as pressure. Decay heat removal itself I did think

was a main concern.

Q Isn't the principal objective in recovery from a loss of coolant accident keeping the core cooled?

A Probably not at this phase of the accident.

Q What phase are you talking about?

A Post-accident recovery. Probably the principal concern was control of the plant systems.

Q At what point are you in post-accident recovery?

MR. BENEDICT: In what sort of accident are you talking about?

MR. SELTZER: The one that Mr. Dunn has been referring to.

MR. BENEDICT: Do you have a specific accident in mind?

Q Do you, Mr. Dunn?

A I am talking about loss-of-coolant accidents.

Q When does a loss-of-coolant accident go into post-accident recovery phase?

A At such point as the break in the high-pressure injection system can assure core cooling.

Q The present prescription by B&W for response to small break loss-of-coolant accident is to terminate operation of the reactor coolant pumps within the first two minutes of the accident; isn't that right?

A I want to look back at the actual paper work to testify to the value of the two minutes to terminate the reactor coolant pumps early.

Q The mode of core cooling that follows termination of reactor coolant pumps involves natural circulation; right?

A At sometimes.

Q Immediately after the reactor coolant pumps are terminated, doesn't the circulation of water shortly thereafter depend upon natural circulation?

A For certain break sizes, depending on when the reactor coolant pumps specifically are tripped.

Q For those break sizes that depend on natural circulation, when the pumps are tripped shortly after the start of the accident, does the maintenance of a 95 percent level on the secondary side of the steam generators play a role in heat

removal?

A No. We're talking about 177 plants now. It helps.

Q What do you mean, it helps?

A It makes the situation better.

Q Are you saying that you would have effective core cooling in the 177 plants even if the level were down to 50 percent?

A That is what the analysis shows.

Q Do you have a high degree in those analyses?

A Yes.

(Continued on Page 870.)

MR. SELTZER: I would like to mark as GPU Exhibit 111 a memorandum from Mr. Bailey to Mr. Levandowski, subject "Small Break Report," May 25, 1978.

(Memorandum dated May 25, 1978 from Mr. Bailey to Mr. Levandowski on the subject "Small Break Report," was marked GPU Exhibit No. 111.)

BY MR. SELTZER:

Q Who is Mr. H. Bailey?

A Henry Bailey who, at that time, was a member of the Generic Licensing Group. Unit, I guess it is a unit.

Q That was a unit that reported to Taylor, is that right?

A Yes.

Q Who is Mr. F. J. Levandowski?

A It refers to Frank Levandowski. At this time, I am not sure what he was doing.

Q What is "Manager SLU"?

A SLU doesn't mean much to me today.

Q Is Frank Levandowski still at B&W?

A Yes.

Q In GPU Exhibit 110, the last exhibit

that we saw, on the bottom of page 2, the next to the last sentence concluded with the words "...it may be possible to have a full pressurizer while the core is partially uncovered." The paragraph goes on, "This could lead to incorrect operator actions."

In GPU Exhibit 111, which is Bailey's memo to Levandowski of May 25, 1978, he says "A more valid concern may be the subject of operator action and the potential for erroneous pressurizer levels."

Prior to the Three Mile Island accident, were you aware that TVA had raised as a subject of concern the fact that erroneous pressurizer level could lead to incorrect operator actions?

A Yes.

Q How would you become aware of that?

A Mr. Bob Jones had received from our Project Management Team associated with TVA a report on small break phenomena. That report has since been termed the Michelson Report.

In his review, he became aware that TVA was writing statements, this statement here, the other statements that are contained in the

remainder of the report, and he informed me that TVA was concerned on that issue.

Q At the bottom of page 1 of GPU Exhibit 111 --

MR. BENEDICT: Are you going to ask Mr. Dunn whether he has ever seen this before?

MR. SELTZER: I wasn't planning to.

MR. BENEDICT: I am not sure we should ask questions about it. Why are you asking him a question about a document that you have not identified yet?

MR. SELTZER: I have identified it for the record.

MR. BENEDICT: You have noted it for the record, but you have not identified it as being something that he knows something about.

BY MR. SELTZER:

Q At the bottom of page 1, it says: "No addition communication with TVA has occurred on this matter and ECCS analysis has taken no action on this report. Bert Dunn plans to start looking at the report next week to see what's there and to

consider what action or investigation should be pursued (if any)."

Had you talked with Bailey in or about May 1978 regarding the Michelson Report?

A I do not recall doing so.

Q Had you told anybody in or about May 1978 that you planned to start looking at the Michelson Report to consider what action or investigations should be pursued as a result of the contents of the report?

A By that you mean personally look at it?

Q No, I give you a more royal presence. You or your unit.

MR. BENEDICT: Could you read back the question?

(Record read)

A I am not sure of the timing. Bob Jones had read this report at some time. We had decided there was not anything critical on it and to handle it as the remainder of the work load within the unit allowed. That is pretty close to my total recollection.

Q Did there come a point when the work load of the unit allowed time to do further analysis

of the Michelson Report?

A The first responses to TVA were, I believe, around Christmas, either before or shortly after, 1978.

Q Were those responses in writing?

A Yes.

Q Was there anything in the response about the pressurizer level not being a correct indication of water level over the reactor core?

A Yes.

Q What did you say?

A We agreed with TVA.

Q Who prepared the written response to TVA that you say was sent out about Christmas 1978?

A Bob Jones.

Q Did you review it before it was sent out?

A I cannot recall reviewing it. I believe it is my understanding that I did sign as a reviewer.

Q What does it mean if you signed saying reviewed and approved for conclusions drawn?

A Then I probably reviewed it. I did review

it.

Q And approved it?

A Yes. I think I would like to, if we can, produce that.

Q Sure.

Did it occur to you prior to sending TVA the response that Bob Jones drafted that you could send them the substance of your February 1978 memorandum on operator response to pressurizer level?

A Can I have it back again?

Q I will restate it.

In February 1978, you had written to Jim Taylor that the operators at Toledo Edison had inappropriately terminated high pressure injection in response to rise in pressurizer level, right?

A Yes.

Q When you heard of TVA's concerns over operators acting incorrectly in response to pressurizer level, you made an association, I think you already testified, between what they were writing about and what you had previously written to Taylor about, isn't that right?

A That's correct.

Q After you became aware of TVA's concerns, did you say to anybody "Why don't we send them the substance of what I have already written to Jim Taylor in February 1978"?

A No.

Q Did you say to anybody, "Maybe we should check and make sure that Customer Service has sent out the instructions that I drafted in February 1978"?

A No.

Q Did you write to anybody and suggest that they check to see if your February 1978 instructions had been sent out to customers?

A No.

Q Did anybody tell you in the course of discussing TVA's concerns, "Don't worry about that, we already sent out Bert Dunn's February 1978 instructions"?

A No.

MR. SELTZER: I would like to mark as GPU Exhibit 112 Jones to Lightle, signed by Mr. Dunn, subject "Response to TVA Letter K-5020," January 19, 1979.

(Memo dated January 19, 1979 from R. C. Jones to R. E. Lightle re "Response to TVA Letter K-5020" was marked GPU Exhibit No. 112 for identification as of this date.)

BY MR. SELTZER:

Q Is GPU Exhibit 112 a copy of the response prepared by Jones that you were referring to in your testimony several minutes ago?

A Yes.

Q You reviewed and approved this response, right?

A Yes.

Q Do you know whether your employer ever sent this response to TVA?

A Yes.

Q Did they?

A Yes.

Q Did they send it in exactly the form that appears here, to the best of your knowledge?

A I don't know.

Q If you don't know whether they sent it in this form, how do you know they sent it?

A We had telephone conversations with TVA after this, in which the subject matter of a transmittal

was discussed.

Q Did you discuss the response with Jim Taylor?

A I don't recall.

Q Did you discuss it with Bailey?

A I don't recall.

Q Would you turn to the last page of GPU Exhibit 112.

In the next to last paragraph, you and Jones have stated: "As far as the appropriateness of the operator using pressurizer level indication to trip the HPI pumps, B&W agrees that the level indication is not a reliable indication of the state of the RCS. However, use of the pressurizer level indication, along with system temperature and pressure measurements to ensure that the system is still in a substantially subcooled state, will provide sufficient guidance for operator action."

That statement about insuring that the system is still in a substantially subcooled state is not nearly as extensive as the instructions that you had drafted on February 16th and sent to Jim Taylor, are they?

MR. FISKE: I think I am going to object to the form of the question.

A It is not as explicit.

Q Did you ever consider when you were reviewing GPU Exhibit 112 or any earlier draft of it, did you ever consider inserting explicitly and in full text instructions that you sent to Taylor on February 16, 1978?

A No.

Q You didn't even consider it?

A No.

Q Did you discuss with Jones sending him those instructions?

A I don't believe so.

(Recess)

MR. SELTZER: I would like to mark GPU Exhibit 113, a memorandum from J. D. Carlton to Alan Womack, subject "Small Break LOCA Auxiliary Feedwater Requirements," May 17, 1979.

(Memorandum dated May 17, 1979 from J. D. Carlton to E. A. Womack re "Small Break LOCA Auxiliary Feedwater Requirements," was marked GPU Exhibit No. 113 for identification as of this date.)

Q Is GPU Exhibit 113 a copy of a memorandum from Carlton to Womack attached to which is a description of auxiliary feedwater flow required which you and Carlton prepared?

A It is a copy of a memo on auxiliary feedwater from J. D. Carlton to E. A. Womack; and on the final page where the table is shown, my initials are contained on the bottom.

Q Did you and Carlton prepare the last three pages of GPU Exhibit 113, which is what Carlton says in his cover memo to Womack?

A I remember working with Jim in this area in this approximate time frame, so I will say probably.

Q In the first page of the attachment which you probably worked on, would you look at paragraph 3. It talks there about how auxiliary feedwater flow is controlled to a specific level on the secondary side of the steam generators.

Is that a correct description of how auxiliary feedwater is automatically controlled?

A For the 177 plants, yes.

(continued on next page)

Q As a result of this automatic control of auxiliary feedwater, if the level of primary water were the same or greater than the level of the secondary water, would that result in automatic shutoff of the auxiliary feedwater?

A No.

Q Would it end up reducing the demand for auxiliary feedwater?

A In some cases.

Q In what cases?

A In the case where that level had already been reached.

Q What level?

A The shutoff level for auxiliary feedwater.

Q What is the level that shuts off auxiliary feedwater, and how does it relate to the level of primary?

A It does not relate to the level of primary at all. The level is presently 25 feet. Excuse me. Ninety five percent on the operate range.

Q Before you changed the operate range to 95 percent, what was the level at which auxiliary feedwater was cut off?

A Fifty percent on the operate range.

MR. SELTZER: I would like to mark for identification as GPU Exhibit 114 a memo from Mr. Dunn to Mr. Duerson, subject: CPR Work on RELOAD Contracts, January 18, 1978.

(Memo from Mr. Dunn to Mr. Duerson, subject: CPR Work on RELOAD Contracts, dated January 18, 1978, was marked GPU Exhibit 114 for identification, as of this date.)

Q Is GPU Exhibit 114 a copy of a memo that you sent to Duerson on or about January 18, 1978?

A Today I cannot recall sending this. That is my signature. I have no reason to believe that it is not.

Q In fact, you have some pretty good reasons to believe that it is, right?

A .

Q What was Duerson's role and specifically why were you writing this particular memorandum to him?

A Not recalling generating it at this time,

I would have to speculate and let the memo stand for itself.

Q You called Duerson a name here. You said he was the Generic Project Manager. What does that mean?

A Generic Projects is the name for the organization of project management which we have referred to previously in the deposition as a risk group.

Mr. Duerson was a Project Manager within that organization responsible for arranging for the evaluation of certain types of product concerns.

Q When you say "arranging for the evaluation," you mean securing funding within B&W?

A Yes.

Q Were you writing to him in GPU Exhibit 114 to seek funding for further evaluation of pump discharge breaks?

A It is not clear from the memo. Again I have to speculate.

Q As you reread this memo, do you understand that you were asking Duerson to reconsider finding funding for small break in

the pump discharge line to be analyzed?

MR. FISKE: This is something we have been through before. Mr. Dunn can testify as to what his understanding of it was at the time he wrote it. I have no objection to that. But he doesn't recall it now.

I don't think it is proper to ask him to try to read it now and guess or surmise what his purpose was.

MR. SELTZER: Would it help if I told you your partner, Bob Wise, has been asking a GPU witness within the last couple of weeks what documents mean today?

MR. FISKE: I don't know whether it helps or not. I don't think it changes what I am saying to you.

MR. SELTZER: You think it is improper for Bob Wise to ask our witnesses for their present understanding?

MR. FISKE: You know you are not going to get me into a discussion of whether questions Mr. Wise is asking, which I don't know the contents of, are improper or

proper. All these things have to be based on the individual questions.

I am just telling you what my position is with respect to this memo.

MR. SELTZER: I thought you were enunciating a more generic position.

MR. FISKE: I am simply stating the same thing I stated the last time this came up with Mr. Dunn.

MR. SELTZER: But you are espousing it as a generic proposal, that it is not right to ask him what a document is today, if they don't have a recollection of what it meant when they first saw it or wrote it.

MR. FISKE: I said it in the context of two particular documents that you have shown to Mr. Dunn. Whether that has a broader application or not, I don't know. I just take them one document at a time.

MR. SELTZER: I think this document is not of sufficient interest to me to press the point, but I want you to be on notice that you are creating a precedent which we may apply.

I daresay I vehemently disagree with the principle you are espousing. I think it is phooey.

MR. FISKE: You can call it anything you want. Maybe some day some judge will decide whether you are right.

MR. SELTZER: A lot of judges have decided I am right on that particular point. I think after you exhaust the witness' recollection about what something meant at the time he wrote it, you can advance to what does it mean today.

MR. FISKE: We obviously disagree.

MR. SELTZER: You instruct the witness not to answer that question?

MR. FISKE: Yes. I think that is what I did the last time.

MR. SELTZER: I wanted to make sure we joined the issue.

BY MR. SELTZER:

Q The small break in the pump discharge line that you are referring to in GPU Exhibit 114 is the same break that you had sought funding for through the risk group in April 1977, is that

right? I show you your April activities report, GPU Exhibit 104, if you want to refresh your recollection.

A Yes, I think these are the same.

Q Would you turn to point 3 on the second page of GPU Exhibit 114. In the first sentence you say, "In your decision to ask our customers to pay for the two above analyses, I would like you to consider the following concerns."

"Your decision" refers to a decision made by Duerson or the risk group at B&W, right?

A Again, not recalling the circumstances under which I wrote the memo or writing the memo, I have to say that is an interpretation which could be given.

Q An interpretation which you would give it?

MR. FISKE: I object to that.

MR. SELTZER: He is writing to Duerson. He says "in your decision." I am asking does the "you" refer to Duerson or to Duerson's risk group.

MR. FISKE: Or obviously drawing your

own conclusions from that, which may not be right.

MR. SELTZER: That is why I have a witness here who is sworn to tell the truth. I am asking if that is his conclusion.

MR. FISKE: The whole point of this exercise, if Mr. Dunn doesn't recall the circumstances itself, while he certainly will give you the truth, his truth is no more relevant than your truth as to what that means. I don't think the fact that he has taken an oath has a great deal to do with this.

MR. SELTZER: Let's not descend to a petty level.

Would you let him answer this question?

MR. FISKE: I think we can all read the memo. Why don't you proceed from there.

MR. SELTZER: The question is whether the "your" refers to Duerson or his group.

MR. FISKE: Mr. Dunn has told you he doesn't recall writing it. We can all speculate as to what it means. You can

draw your inference. I can draw mine. I suppose he can draw one, too.

MR. SELTZER: That is what I want. His inference of words that he has written.

MR. FISKE: I am not going to let him answer, not that I think it is particularly crucial with respect to this point. I think in this particular case, I think we would all agree what it means.

MR. SELTZER: You want to have a show of hands.

MR. FISKE: Why don't you go on to the next question.

BY MR. SELTZER:

Q You say "we have been aware of the concern of the pump discharge break for nearly a year. It is possible that NRC would consider our reporting of the concern untimely."

Did B&W eventually report the pump discharge break concern to the NRC?

A Yes.

Q Did you report it to the NRC sometime after January 1978?

MR. FISKE: I think there has been a

lot of testimony about this earlier already. I think Mr. Dunn testified quite thoroughly on that whole subject in one of the earlier days of this deposition.

Q At the time that you communicated the pump discharge concern to the NRC, did you indicate that you had been aware of the concern for nearly a year?

MR. FISKE: I think you are misstating the testimony. Mr. Dunn -- I don't believe Mr. Dunn ever testified that he communicated the concern to the NRC.

MR. SELTZER: I am asking him whether he ever communicated that they had the concern for a year or more.

MR. FISKE: Did he ever communicate that to the NRC?

MR. SELTZER: Yes.

MR. FISKE: You can answer that question.

A I am not absolutely sure, but I don't believe so.

Q Do you believe that anybody else at B&W told the NRC that you had been aware or

anybody at B&W had been aware of a concern over a pump discharge line break for more than a year prior to the reporting to the NRC?

A I don't know.

Q You wrote in January 1978 that "It is possible that NRC would consider our reporting of the concern untimely."

At the time you wrote GPU Exhibit 114, what was your understanding of when the NRC expected you to report concerns such as that?

A I don't know that I have had at that time a clear understanding of when the NRC would have expected us to have reported this type of a concern. The NRC would have expected prompt reporting of the concern once it had been validated or upgraded from its existence at this time, if it remained a concern.

Q You wanted Duerson to consider three concerns, four concerns, that you were raising, right, A, B, C and D?

A Again, that would be a conclusion that could be drawn from the memo.

Q Why did you want him to consider the fact that B&W had been aware of the concern of

the pump discharge break for nearly a year in making up his mind as to whether to ask customers to pay for analysis of that break?

A I think I would have to speculate or interpret to give you an answer.

Q Why don't you interpret?

MR. FISKE: No. This is a question where either he remembers why or he doesn't. If he doesn't, I don't think it is useful to have him speculate at this point.

MR. SELTZER: I don't think it is speculating. He said he could interpret it. I think to get the author to interpret is important.

I also think it is something bordering on a cover-up for you to be putting wraps on this witness at a time when I am trying to explore why for a year B&W would not pay for an analysis of an ECCS concern, and after a year, when this man honestly thinks it might be untimely to let the NRC know about it, B&W saying, let's throw this one onto the customer to let them pay to bring this plant in conformance.

MR. FISKE: You are totally misstating the record. I am compelled to respond to your statement.

MR. SELTZER: Why not let the witness respond to it?

MR. FISKE: I am responding to your comment which is totally inconsistent with the facts. The facts are that this was reported to the NRC. This has nothing to do with the Three Mile Island accident. This is another one of a number of totally extraneous matters that have prolonged this deposition far beyond any reasonable termination point, and one of the reasons we go on day after day is you persist in pursuing these irrelevant areas.

Now we have a situation where you have an irrelevant memorandum that the witness said he can't recall what was in his mind at the time he wrote it, and now you are asking him to speculate why he would have said something in this memorandum when he can't remember today the reason.

It is clear he is not required to

answer that question. A speech in which you mischaracterize the facts is not going to help you get an answer.

MR. SELTZER: I would like to mark for identification as GPU Exhibit 115 an April Activities Report from Mr. Dunn to Mr. Roy dated May 2, 1978.

(April Activities Report dated May 2, 1978 was marked GPU Exhibit 115 for identification, as of this date.)

BY MR. SELTZER:

Q Is GPU Exhibit 115 a copy of your April Activities Report for 1978?

A Yes.

Q By April 1978 your unit had begun to analyze the pump discharge break referred to in GPU Exhibit 114, right?

A Yes, that is indicated by the progress report.

Q Is April 1978 the first time that any extensive examination had been performed by your unit on the pump discharge line break?

MR. FISKE: I think you ought to clarify what you mean by "extensive."

Q The first time there had been a serious investigation of the concern that you had been voicing for over a year?

MR. FISKE: You can answer that.

A Sometime before April 10. April 10 is given as the date we filed the PSC, although it appears at that time it may have been referred to as a PSDR, so we would have performed an evaluation sometime before that.

Q Is the evaluation you commenced sometime shortly before April 10 the first time you had done a serious investigation of the concern over pump discharge line break?

MR. FISKE: He didn't say that it started shortly before April 10.

Q How long before April 10 do you believe you began work on the pump discharge line break?

A I am not absolutely sure. I do recall it proceeded reasonably rapidly once funds were identified for the project.

Q You worked two shifts a day, right, ten to 12 hours a day, for nearly two and a half weeks, isn't that right?

A It seems like you are reading that.

Q Yes, page 3 from your writing, GPU Exhibit 115.

MR. FISKE: I don't know what time period you are referring to in your question.

Q Do you see the last paragraph on page 3?

A Yes.

Q Did you write there that "In obtaining our present status ECCS personnel worked in two shifts, averaging 10 to 12 hours per day, for nearly two and a half weeks"?

A Yes.

Q You were referring to the analysis that had been done by your staff on the pump discharge line break, right?

A Yes, and the analysis after April 10.

Q How much if any analysis had been done before April 10?

A Again I am not absolutely sure, but it was I believe a single case which upgraded the concern in terms of its validity and led to the filing of the PSDR.

Q Did that analysis verify the concern?

A I think at the time we proceeded into that analysis we did not believe that the consequences would be as severe as the analysis showed us, so it did not really verify it. It actually made it something that was in a fashion new.

Q Who performed that analysis for one case?

A I don't recall.

Q Was it a computer-assisted analysis?

A Yes.

Q About how long did it take to run?

A As I mentioned before, I believe that once we obtained funds, we proceeded reasonably rapidly. I think it was on the order of a month to get through it.

Q A month to do the one case?

A Yes, from the time that it was funded to the time when all the boundary conditions were determined and the computer actually ran and the results reduced and examined from the standpoint of their validity. You can't just accept the output of a computer. You have to determine that

it has done its job right.

Q As soon as you finished that month of analysis, did you and Jones proceed to prepare the PSC?

A Yes. That is my recollection.

Q So if the PSC is dated April 12, 1978, and you proceeded to write the PSC immediately after the one month's work, is it correct to conclude that the one month's work was done in or about March 1978?

A Yes.

Q And the work done in March was the first time you had proceeded to do serious, detailed analysis of the concern that you had had over the pump discharge line break, is that right?

A For the 177 plant, yes.

Q That was the first time you had done serious, detailed work, even though you had articulated that concern at least as early as April 1977, is that right?

MR. FISKE: I think maybe the problem in your question is, you keep using these adjectives like "serious" and "detailed"

and "extensive."

The document that you referred to, which has been previously marked as an exhibit, itself reflects that work was initiated in performing this analysis back at the time in April 1977. So the document itself shows that work was done back in 1977.

MR. SELTZER: But apparently not any serious, detailed work, because this witness has just sworn that the first time they did serious, detailed work was March 1978.

MR. FISKE: I don't know whether he said that was when they first did serious, detailed work or not, but I think the problem --

MR. SELTZER: I think you are also mischaracterizing the document. It says work was initiated on performing small break analysis, and now he is seeking funds to perform the analysis. When they couldn't get the funds, apparently the plant dried up and died and they were never

able to do the serious, detailed work that was necessary.

MR. FISKE: I think maybe it would be useful, instead of trying to deal with these adjectives which one person can construe one way and someone else would construe another way, just ask him the progress that was done on this matter. I am sure he will tell you. Then we can all decide afterwards whether that is serious or detailed or whatever.

BY MR. SELTZER:

Q Would you look at page 3 of GPU Exhibit 115.

In the paragraph just below the chart, the third sentence, that begins with the words "To be blunt."

A Yes.

Q Correcting the typographical error, I think you stated there, "To be blunt, the high pressure injection system on 177 or lowered loop plants is undersized."

Is that a correct reading of what you were saying?

A No, I think I said "underdesigned."

Q I am sorry.

What did you mean by "underdesigned"?

A Did not provide sufficient flow to mitigate the consequences of licensing accidents.

Q Did you ever tell the NRC that?

A I don't think I ever used the phrase "to be blunt" with the NRC.

Q Did you ever tell them the high-pressure injection system was underdesigned?

A I would say that was the essence of what we were communicating at that time. That there was insufficient flow provided by the high-pressure injection system for these accidents. I don't know that the word "underdesigned" was used.

MR. SELTZER: I would like to mark as GPU Exhibit 116 a memo from Mr. Dunn to Ed Kane in Licensing, subject: Telephone Conversation with Zoltan Rosztoczy on May 15, 1979 on Stuck Open PORV With Pumps Running and No Auxiliary Feedwater, May 29, 1979.

(Memo dated May 29, 1979 from Mr.

Dunn to Ed Kane in Licensing, subject: Telephone Conversation with Zoltan Rosztoczy on May 15, 1979 on Stuck Open PORV With Pumps Running and No Auxiliary Feedwater, was marked GPU Exhibit 116 for identification, as of this date.)

Q Is GPU 116 a copy of a memo you sent to Kane on or about May 29, 1979?

A Yes.

Q Turning to page 2, the first full sentence, you stated, "As an over-riding concern, I pointed out that there is no intention within the operating guidelines to cause an RC 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 RC 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."

You previously testified the reactor coolant pumps could continue pumping with up to

and including a 100 percent void fraction, right?

A Yes.

Q You also said you understood that the pumps could continue running with a 100 percent void fraction for a matter of days, at least, is that right?

A Yes, I expressed my expectation of the time frame in the day frame.

Q In the days frame, is that what you are saying?

A Days.

Q You weren't sure how many days, but it was several days, right?

A Yes.

Q Have you seen any reports at B&W that enunciate that finding or conclusion?

MR. FISKE: You mean on how long they could continue running?

MR. SELTZER: Yes, namely, that the reactor coolant pumps can continue to run for a matter of days at a 100 percent void fraction.

A I am not sure whether the Cudlin memorandum addresses that time period or not. Other than

that, I don't believe I have seen any reports.

Q How do you spell "Cudlin"?

A C-u-d-l-i-n.

Q Who is Cudlin?

A Joe Cudlin.

Q Is he a B&W employee?

A Yes, he is a Manager of System Analysis Technology.

Q What is the Cudlin report?

A It is a memo that indicates the capability of the pumps to pump two-phase fluids.

Q When did Joe Cudlin write that?

A I believe it was sometime after Three Mile Island.

Q You testified that you knew before the Three Mile Island accident that the reactor coolant pumps were capable of continuing to pump with up to 100 percent void fraction. What was the source of your knowledge before the Three Mile Island accident?

A There had been experiments in which pumps had been involved in a two-phase testing in which they had run for considerable lengths of time during the testing procedure.

Q Had the pumps been tested up to 100 percent void fraction?

A At least in one set of experiments.

Q Are these experiments that had been done at B&W?

A No.

Q Were they experiments that were done for B&W?

A One of them.

Q Did the experiment that went up to 100 percent void fraction get performed for B&W?

A No.

Q Who performed the experiment running the pump up to and including 100 percent void fraction?

A The NRC.

Q When was that done?

A I am not sure. I put it in the '74 time frame.

(Continued on next page.)

Q Are you aware that at the time of the Three Mile Island accident, B&W had issued limits and precautions that were instructions on the operation of B&W supplied equipment?

MR. FISKE: I object to the form of the question.

Q Have you heard the phrase "limits and precautions"?

A Yes.

Q Are you aware B&W had issued limits and precautions before the Three Mile Island accident?

Let me make it a simpler question. Have you become aware at any time that B&W had been issuing limits and precautions for its nuclear plants prior to the Three Mile Island accident?

A No, I think you are going to have to get somebody more intimately involved with that process to answer the question. I don't know. I know that on certain pieces of equipment I have become aware that we issued some types of instructions.

Q Did you know that B&W has issued

some types of instructions for the operation of reactor coolant pumps?

MR. FISKE: You are asking him before the accident?

MR. SELTZER: He can have the awareness at any time.

Q But are you aware, including up to today, that B&W had issued instructions for the operation of reactor coolant pumps to its operators prior to the Three Mile Island accident?

A No.

Q Do you know that as the void fraction increases, the vibration on the reactor coolant pump shaft increases?

A No.

Q Have you ever known that as void fractions in the reactor coolant system increase, vibration on the frame of the reactor coolant pump increases?

A No.

Q Have you ever come to know that during the Three Mile Island accident, shaft and frame vibration on the reactor coolant pumps were increasing as the void fraction was increasing?

A Yes.

Q Had you forgotten about that when I asked you the previous questions about knowing that shaft and frame vibration increase as void fraction increase?

A No, I had not forgotten that.

Q Do you have any knowledge to the contrary that negates your experience from Three Mile Island?

MR. FISKE: I object to this. You are asking him now a question which is asking for his present knowledge, and that is objectionable in and of itself, but beyond that, this is clearly an area in which Mr. Dunn has no expertise.

MR. SELTZER: That is quite an admission. The head of ECCS Analysis?

MR. FISKE: On the vibration of the pumps.

MR. SELTZER: If the operation of the pump is important to continue the emergency core cooling.

MR. FISKE: There is no point in debating whether the core could be

cooled by the pumps or HPI or whatever.

BY MR. SELTZER:

Q I think you are a very good expert.

MR. FISKE: The question is not whether he is a good one or bad one. The question is whether he is one.

Q Other than the Three Mile Island accident, do you have any experience with other situations in which you have heard reports or seen reports of pump vibration as void fraction increased?

A Yes.

Q What other reports have you received?

A Pump vibration occurred in the Bingham pump tests.

Q Were those tests that were being run at various void fractions?

A Yes.

Q Was there more vibration on the pump when it was pumping two phase fluids as contrasted with solid water?

A That is my opinion generated from the communication I have gotten on that testing.

Q Have you received any reports which showed no increase in pump vibration as the pumps began handling increasing void fraction as contrasted with operating with solid water?

A No.

Q So all of your experience is consistent with a conclusion that pump vibration increases as the pumps are handling increasing void fractions as contrasted with pumping solid water, is that right?

A No.

Q Do you have any experience to the contrary?

A Yes.

Q What experience is that?

A Outboard motors.

Q What brand of outboard motor are you talking about?

A I think I would say generally.

Q Have you run experiments on that?

A No.

Q How have you determined whether the vibrations are increasing on outboard motors as the void fraction increases?

MR. FISKE: Are you suggesting that Mr. Dunn's experience with outboard motors has something to do with the Three Mile Island accident?

Q Do you think your experience with outboard motors has anything to do with the Three Mile Island accident?

MR. FISKE: I don't think Mr. Dunn is required to draw that conclusion.

MR. SELTZER: Then I will proceed since he has injected his experience with outboard motors as being relevant.

MR. FISKE: He answered a question that you asked him which may or may not be a relevant question. Go ahead. Answer this. It is probably easier to let you answer it than debate it for five minutes. It is no further removed than any of the other issues.

A No.

Q What was the question?

A Whether or not my experience with outboard motors had anything to do with the Three Mile Island accident.

Q When did you get the Bingham results that showed increasing vibration as void fraction increased?

A I would have to go back and look. I believe it was before Three Mile Island.

Q Are you aware that B&W instructions to Met Ed set an upper limit on the permissible mils of vibration that could be experienced on a reactor coolant pump?

MR. FISKE: I object to the form of the question and also Mr. Dunn said a minute ago that he wasn't aware any instructions had been issued. I think he answered it.

MR. SELTZER: This may be a subset of the previous answer.

A No.

Q In saying that your position was that at least one pump per loop will run until it dies, did you mean that the reactor coolant pump should be left running regardless of the level of vibration observed on it?

MR. FISKE: I object to that. I think what he said is perfectly clear.

Q You may answer.

MR. FISKE: Let me read this paragraph before you answer.

(Record read.)

MR. FISKE: I object to that question unless you make clear what set of circumstances you are contemplating in putting that question to Mr. Dunn.

MR. SELTZER: During a transient.

MR. FISKE: Any transient?

MR. SELTZER: During a transient as he has used that word on page 2 of GPU Exhibit 116. In the same sentence that I have been reading from, "As an overriding concern, I pointed out there is no intention within the operating guidelines to cause a reactor coolant pump trip during that transient."

MR. FISKE: Now the question is?

(Whereupon, the record was read by the reporter as follows:

"Q In saying that your position was that at least one pump per loop will run until it dies, did you mean that the

reactor coolant pump should be left running regardless of the level of vibration observed on it?")

A Yes.

Q Did you also mean that it should be left running regardless of the void fraction in the reactor coolant system?

A No, I would have meant in voided circumstances, where there was reason to question their results after termination of reactor coolant pump, and the system had returned to a subcooled status and there was a reason to take the reactor coolant pumps out of service, I would have allowed that.

Q You previously testified that effective core cooling would continue so long as reactor coolant pumps remained on with void fractions up to and including 100 percent, right?

A Provided that there is some heat sink available to keep the superheat content of the steam from becoming significant.

Q Have you ever run an analysis or case in the following situation: A pilot operated relief valve stuck open, little or no

high pressure injection flow, reactor coolant pumps on at least one pump per loop.

Let me add as a condition. AFW being supplied to the steam generator.

A No.

Q Has your ECCS unit ever studied such a situation? Have you or your ECCS unit ever studied such a situation?

A Yes.

Q When?

A At the time that we performed the pumps running small break evaluation, the 205 plants, I think it was in the early spring of 1979 or the winter of 1978. It could be timed earlier in the deposition in relationship to some Toledo issues that came down and focused on whether or not we had considered the pumps running case as the worst case. We checked it, and post-Three Mile Island, we also considered it.

Q I thought Toledo has a 177 plant and not a 205?

A It does.

Q Did you study it for the 177 plant also?

A No, we considered the evaluation performed to be generic.

Q How long could the core remain or be maintained effectively cooled with those criteria prevailing?

MR. FISKE: Let's state the criteria again. You are asking him what was shown by this analysis that he testified was done?

MR. SELTZER: Yes.

A What the analysis showed was that for pump steam flow,clad saturation, temperatures, and at a pressure of approximately a thousand pounds, the rise in temperature across the core -- excuse me. The rise in the temperature cladding was less than 100 degrees Fahrenheit. We had concluded that almost any pumped steam media, if the superheat did not get out of control, would be able to provide effective core cooling. We have not done the work to tell exactly how long that situation could be maintained.

Q From the analysis that you have done, what is the order of magnitude that the analysis shows effective cooling could be maintained?

A I don't think the analysis can give you

that.

Q From the analysis, what is a minimum time that the analysis would show you would still have effective core cooling?

MR. FISKE: Can you answer that?

THE WITNESS: No, not for this parciular case.

Q For what case would you be able to make such a statement?

A The actual case that was evaluated which was a different break size in the PORV.

Q Was it larger or smaller?

A I believe it was somewhat larger.

Q So you would have less mass loss through a PORV break than you would through the break that you studied, right?

A Yes.

(Continued on following page.)

Q So that if in the case that you studied, the plant could have effective cooling for seven hours, the PORV break would have effective cooling for a longer period, is that right?

A Yes.

Q What is a conservative figure which the analysis shows you would maintain effective cooling for the case you studied?

A I believe that analysis progressed no further than approximately one-half hour. It had also not arrived at 100 percent void fraction. The work on the 100 percent void fraction was a hand calculation.

MR. FISKE: I think I should note here that I have no objection to these questions in terms of general discovery. Obviously, in terms of anything probative, the report itself or the analysis itself is going to have to be relied upon.

Q Who did the analysis that you have been describing?

A Which one? We have two on the board now.

Q What are the two?

A The hand calculation which showed that the core

could stay effectively cooled with poor steam flow, and the computer evaluation which indicated the nature of the transient with the pumps running.

Q Who did the hand job?

A I am not sure.

Q Was it someone in your unit?

A Yes.

Q Who was responsible for the computer calculation?

A Nehru Shah.

Q For what purpose was the computer work done?

A Internal questions had been raised about our assumption that pumps running was a better case than pumps off or that the significant challenges to the high pressure injection system and other parts of the ECCS system would occur for the pumps-off case as opposed to the pumps-on case.

Q Have you ever discussed with anyone what the results at Three Mile Island would have been if the reactor coolant pumps had been left on so there was at least one pump per loop in continuous operation?

A I think so.

Q I think the records show that the blocked value was closed two hours and 20 minutes into the transient.

From your discussions and the reports that you have read on the subject of pumps running, would the core have remained effectively cooled if the reactor coolant pumps had been kept on through the time that the blocked valve was closed?

MR. FISKE: I object to that question, because you are asking Mr. Dunn for his present opinion.

MR. SELTZER: No, I am asking whether he has discussed that or whether any of the analyses that he has done have --

MR. FISKE: You are asking him from the question to put together several analyses that he has done.

MR. SELTZER: Let me take it in smaller steps.

BY MR. SELTZER:

Q You said you have discussed with others what would have happened if the reactor coolant pumps, at least one pump per loop, had remained on the day of the Three Mile Island accident?

MR. FISKE: He said he thinks he did.

MR. SELTZER: Yes. That is what I want, what he thinks.

BY MR. SELTZER:

Q With whom do you think you have had such conversations?

MR. FISKE: I object to that unless it is based on a recollection.

MR. SELTZER: Why don't you horsewhip him outside of the room. I find it embarrassing to see it happen right in front of me.

He testified he thinks he had a conversation. I think you are trying to scare the pants off him, make him think "Oh, God, now we are getting into something serious, don't testify [illegible]."

MR. FISKE: Maybe a bell goes off every hour where you feel compelled to make some saber rattling speech. It doesn't help very much.

You know the rules by which depositions are conducted. Just because you shout and scream periodically doesn't change the rules.

I have no objection to Mr. Dunn, as I have said, testifying about his recollection about conversations. I say that again.

MR. SELTZER: He is a grown man, responsible manager at B&W. I am sure he understands that he is sworn to tell the truth, and he is going to testify to things that he only recalls and he is not going to tell me about his dreams or fantasies.

When I ask him who he met with, I assume he is going to tell me who he met with.

MR. FISKE: That is precisely what I suggested he do.

BY MR. SELTZER:

Q Could you answer the question.

A We are talking about seeing?

MR. FISKE: You are talking about recall.

A I recall where I think I discussed it.

Q Why don't you testify to that?

A In the Kemeny Commission depositions and as a preventive measure when we formulated the

instructions to keep the reactor coolant pumps operating.

Q What is your best recollection as to what you said would have been the effect on the Three Mile Island accident if at least one reactor coolant pump had been kept running per loop?

MR. FISKE: I think he said he testified in the Kemeny Commission. Why don't we get out the testimony and see what he said. Certainly, you wouldn't quarrel with that, I assume.

Q Is that the only time you think you said anything to anybody about what would happen at Three Mile Island if the reactor coolant pumps had been left on?

A I allowed the other circumstances, too. Yes, when we determine, it is based on a recollection.

Q With whom else do you have a recollection of discussing it?

A The question is have I had discussions about what would have happened at Three Mile Island if the reactor coolant pumps had kept running.

I said -- how did I say it?

MR. FISKE: I believe you said you

thought you testified about that before the Kemeny Commission.

A I thought I testified about that before the Kemeny Commission, and in the form of the preventive measure. I recall I think I talked about it during the meeting with Taylor and Norm Elliott when we decided to write the instruction to keep one pump operating, but that was in a short time frame, not necessarily all that happened at Three Mile Island.

Q The instruction to keep the pump running was an instruction that was sent out just after the Three Mile Island accident, right?

A Yes.

Q In the context of discussing the advisability of sending out a pumps-running instruction, you and Elliott and Taylor discussed what would have happened at Three Mile Island if they had left the reactor coolant pumps running?

MR. FISKE: With the HPI off?

MR. SELTZER: With the HPI doing whatever it was doing. Ceterus parabus.

A I said I think we discussed it in the short time frame.

Q What is the short time frame?

A Not an hour afterwards. Not from the standpoint of considering all the other things that happened at Three Mile Island following that, but that the pumps were tripped in the condition where we still had two-phase fluid in the plant, and that is the time in which we expected things started to really go favorably, and keeping the pumps running could have extended that time. That is why the instructions --

Q Let me try this, and then we will adjourn for lunch. The blocked valve was closed at two hours and 20 minutes into the Three Mile Island accident.

Have you ever discussed with anybody whether there would have remained enough liquid or steam inventory in the reactor coolant system up to the point of two hours and 20 minutes to keep the core effectively cooled, if the reactor coolant pumps had remained on at Three Mile Island?

Have you ever discussed that with anyone before today?

MR. FISKE: The question whether the

core would have continued to be cooled up to that point in time you referred to?

MR. SELTZER: Yes. Cooled within the criteria that you and Taylor and others talk about effective core cooling.

A I indicated, I think, -- O.K. I see the difference.

What I believe occurred in the Kemeny Commission --

MR. SELTZER: That is relevant.

MR. FISKE: I object to Mr. Dunn trying to paraphrase what he said in the Kemeny Commission. Whatever he said there, he said there.

MR. SELTZER: Fine. Now we want to find out any other.

MR. FISKE: Other than that in reference to the closing of the blocked valve.

A Let me try it another way.

MR. FISKE: Just answer the question.

MR. SELTZER: I am sure he is trying to.

THE WITNESS: Repeat the question.

(Record read)

A Based on my recollection, if I did, it was in the Kemeny Commission.

Q Did you keep a copy of the hand calculation that you were referring to earlier?

A No.

Q When is the last time you saw the hand calculation?

A I don't remember.

Q Does your analysis of pumps running with high void fractions confirm that if there were any void fraction up to but less than 100 percent in the reactor coolant system at the time the blocked valve was closed that the core would remain effectively cooled thereafter if the reactor coolant pumps stayed on?

MR. FISKE: I object to that question because that is asking him for a present opinion.

MR. SELTZER: I am asking whether the analysis shows that.

MR. FISKE: No, you are asking him whether to apply the analysis to that situation which, I think, is asking him for his present

opinion.

I object.

(Luncheon recess: 12:30 p.m.)

(AFTERNOON SESSION)

(Date: April 7, 1981)

(Time noted: 1:40 p.m.)

B E R T M. D U N N, resumed, having been previously duly sworn, was examined and testified further as follows:

EXAMINATION (Cont'd.)

BY MR. SELTZER:

Q Where would you look at B&W today if you wanted to find any reports or data on the Bingham pump tests?

A I would talk to two individuals first, Dr. Joe Cudlin and Mr. Bob Winks.

Q Winks?

A Yes.

Q How do you spell Winks?

A W-i-n-k-s.

Q Anybody else that you would speak to to locate the Bingham test results?

A No. I am pretty sure that would be adequate.

Q Who at B&W, to your knowledge, is most knowledgeable about the ability of reactor coolant pumps to operate at high void fractions?

A I think you would have to define the word "ability" to me.

Q Let's say the performance of pumps at high void fractions. Who is most knowledgeable at B&W about the performance of pumps operating against high void fractions?

A Dr. Cudlin. I think Dr. Cudlin would be the most knowledgeable person.

Q Where would you look if you wanted to get a copy of the documents that relate to Nehru Shah's analysis of core cooling with high void fraction?

A I would ask Nehru for a reference number. If that wasn't available, I would look in my own unit files.

Q What do you mean by reference number?

A The calculation was documented in what we term a calculation file and it has a unique number assigned to it that would make it easier to find it if I could determine in advance the number. If not, we can find it in the files.

Q Would the same file or similar file include the hand calculations that you referred to?

A I don't know.

Q Where would you go if you wanted to find the hand calculations?

A I'm not sure.

Q Whom did you say you thought did the hand calculations?

A I didn't recall who did the hand calculations.

Q You have no idea how you would go about trying to find them?

A I would probably ask some people.

Q Who?

A Bob Jones, Nehru Shah, Bill Bloomfield.

Q How would you refer to the calculations that you were looking for?

A As back-of-the-envelope estimations on the cocling possible with steam-only flow at pump flow rates.

MR. SELTZER: I would like to mark for identification as GPU Exhibit 117, Mr. Dunn's January 1979 activities report.

(Covering memorandum dated January 31, 1979 from B. M. Dunn to E. A. Womack enclosing January Actitivies Report marked GPU Exhibit No. 117 for

identification, as of this date.)

Q Is this a copy of a monthly activities report which you sent to Al Womack on or about January 31, 1979?

A Yes.

Q On page 3, under the heading "Unscheduled Activities," does that refer to the hand calculations on pumps running that you were just describing?

A I'm not sure.

Q From reading your monthly report, does it appear to you that this could be another analysis that you did on pumps running with steam cooling?

A It appears that that is possible.

Q Do you know who did this hand calculation referred to in GPU Exhibit 117?

A No.

MR. SELTZER: I would like to mark as GPU Exhibit 118, a memorandum from Jones to Taylor with a copy to Mr. Dunn dated June 7, 1979, subject "Pumps Running Analyses - Record of Telecon."

(Memorandum dated June 7, 1979 from

R. C. Jones to J. H. Taylor, subject "Pumps Running Analyses - Record of Telecon" with a copy to Mr. Dunn, among others, marked GPU Exhibit No. 118 for identification, as of this date.)

Q Is GPU Exhibit 118 a copy of a memorandum which you received in or about mid-June 1979?

A I recall the issue, not the memo.

MR. SELTZER: I would like to mark as GPU Exhibit 119, a memorandum from Taylor to Distribution, copy to Dunn, subject "Longer Term Work Expected by NRC," June 8, 1979.

(Memorandum dated June 8, 1979 from J. H. Taylor to Distribution, subject "Longer Term Work Expected by NRC," with a copy to Mr. Dunn, among others, marked GPU Exhibit No. 119 for identification, as of this date.)

MR. SELTZER: I also would like to mark a memorandum from H. A. Bailey to Distribution, in copy to Mr. Dunn, subject "Small Break LOCA with Reactor Coolant

Pumps - PSC," June 8, 1979.

(Memorandum dated June 8, 1979 from H. A. Bailey to Distribution, subject "Small Break LOCA with RCP's - PSC," with a copy to Mr. Dunn, among others, marked GPU Exhibit No. 120 for identification, as of this date.)

Q Is GPU 119 a copy of a memorandum which you received in or about mid-June 1979?

A I don't recall it.

Q You don't recall it?

A No.

Q Is GPU Exhibit 120 a copy of a memo which you received in or about early June 1979?

A I don't specifically recall this.

Q Prior to the analyses that were being done in 1979 on pumps running cases, what guidance had B&W given the operators on when to have reactor coolant pumps on and when not to have them on during the loss of coolant accident?

MR. FISKE: I object to that question.

MR. SELTZER: I will try to rephrase

it.

Q Are you aware of any instructions that B&W was giving operators prior to June 1979 on the operation of reactor coolant pumps during loss of coolant accidents?

A No, not one way or the other.

Q Have you ever learned what, if any, instructions B&W was giving operators prior to June 1979 on whether to leave reactor coolant pumps on or not on during the loss of coolant accident?

A No.

Q Would it be fair to say even though you were the ECCS Unit Manager, you were not in the general flow of information going from B&W to operators on how to handle their equipment?

A Yes.

Q Was anybody in your unit, to your knowledge --

MR. FISKE: I think he answered all these questions once before but go ahead.

Q Was anybody else in your unit reviewing instructions that B&W was giving operators on how to run their equipment prior to

the Three Mile Island accident?

MR. FISKE: I object to the form of the question. You can answer it.

A No.

MR. SELTZER: I would like to mark as GPU Exhibit 121, a memorandum from Cartin to Womack, copy to Dunn, subject "Small Breaks Guidelines," June 22, 1979.

(Memorandum dated June 22, 1979 from L. R. Cartin to E. A. Womack, subject "Small Breaks Guidelines;" with a copy to Mr. Dunn, among others, marked GPU Exhibit No. 121 for identification, as of this date.)

Q Is GPU Exhibit 121 a copy of a document which you received in or about late June 1979?

A I don't recall the actual receiving.

Q Are you familiar with the document?

A Yes.

Q Would you turn to page 3. In the first full paragraph, it begins with the statement, "As indicated in Table 3, the assumptions regarding equipment availability are different than those

in standard licensing submittals," et cetera. Then it lists three assumptions.

Below that, it says, "The above failure assumptions cannot be justified under known regulatory rules for the operating plants without design changes."

In what way did you understand when you read this that these three failure assumptions could not be justified under known regulatory rules?

A I don't recall.

Q You said you were familiar with GPU Exhibit 121. From what are you familiar with it?

A A great deal of the work contained in the exhibit was generated within ECCS Analysis. The operating guidelines given at the end in Attachment 4 were prepared in conjunction with ECCS Analysis and the ECCS was participating in the whole effort at the time that the memo was generated.

Q Did you know that assumptions regarding equipment availability were being made in the small break analyses that were different

from those used in the standard licensing submittals?

A In some of the analyses, yes.

Q Which assumptions were different from those used in the standard licensing submittals? Let me ask you -- I will withdraw that.

Under the heading "Single Failure" on page 3, the second item says, "If a failure occurs which prevents an emergency steam generator blowdown, 2 high pressure injection pumps are assumed available."

Do you see that?

A Yes.

Q That assumption that two high pressure injection pumps were available is different from what is assumed in standard licensing submittals, is that correct?

A That's correct.

Q What is assumed available in the standard licensing submittals?

A One HPI is assumed available. One HPI train. The subject of emergency steam generator blowdown is not treated.

Q In order to demonstrate effective core cooling, was it necessary for your analysis to assume that both or two HPI trains were available?

MR. FISKE: Which analysis?

MR. SELTZER: The analyses that were done in support of GPU Exhibit 121.

A No.

Q Why, if you know, were two HPI pumps assumed available?

A To provide some chance that the analysis would produce the expectation of cladding temperatures within the five criteria of 10 CFR 50.46.

Q "To provide a chance," what does that mean?

A At the time this work was done, I don't believe that we were under the impression that even with two high pressure injection pumps operating, that we could assure that the peak cladding temperatures could be held below 2200 degrees Fahrenheit, and we had strong indications that they couldn't be held below those values for one HPI.

Q What did the analysis eventually show?

MR. FISKE: You mean as reflected in this exhibit?

A I would really prefer being able to check.

Q What would you like to have at your disposal to check? Table 5?

A Yes, Table 5.

Q What is the answer?

MR. FISKE: What is the question?

(Record was read back.)

MR. FISKE: As to what?

MR. SELTZER: Whether even given the chance the assumptions that were less conservative than the licensing standards, the plans could achieve effective core cooling.

A The resultant temperatures are indicated in Table 5 and they indicate for the .075 square foot break, the case with no steam generator blowdown, two HPI's operating, it is expected to exceed 2200 degrees Fahrenheit. The steam generator blowdown treatment with one HPI available also expected to exceed 2200 degrees

Fahrenheit. A combination of steam generator blowdown and two HPI pumps available is indicated to exceed approximately 1600 degrees Fahrenheit and was believed to be below 2200.

Q Subsequent analysis confirmed that it is below 2200?

A The way the general evaluation proceeded after this was to install a pump trip as opposed to utilizing steam generator blowdown. I don't believe any subsequent analysis on that particular point has been made.

Q Install a pump trip to trip which pumps?

A Reactor coolant pump trip.

Q Would you turn to page 6 of GPU Exhibit 121. Do you see just above the middle of the page where it says, "In summary, the results from this preliminary analysis indicated the following"?

A No. Yes.

Q Item 2 of the summary says, "If an arbitrary reactor coolant pump trip at the worst time must be assumed, compliance to 10 CFR 50.46 cannot be shown with present plant equipment,

realistic operator actions, and a single failure."

Is that conclusion a correct summary of the analysis?

A I would not say so today.

Q Did you believe it was a correct summary of the analysis at the time it was written in June 1979?

A I don't know that I asked that question that way.

Q If the peak clad temperature exceeds 2200 degrees, then it has exceeded the limits of 10 CFR 50.46, right?

A Yes.

Q Table 5 showed that for two of the three cases, peak cladding temperature did exceed 2200 degrees, right?

A Yes.

Q Was this the first time that the ECCS Analysis Unit had apprised itself of peak cladding temperatures for termination of reactor coolant pump in the middle of a transient?

A This is the first time we had performed in-depth analysis on accidents which involved the termination of the reactor coolant pumps during

the course of the accident and had reasonable high pressure injection flow.

Q Before doing these analyses, ECCS Analysis had assumed that no pumps running was a worst case, isn't that right?

A We had assumed there were two conditions which had to be included in the licensing base, no pumps and continuous pumps.

Q Did you think that no pumps and continuous pumps bounded the case of pumps terminated in the middle of a transient?

A No.

Q Are you saying that before you did the analysis that is reflected in GPU Exhibit 121, you did not consider that you had bounded the case of pumps being terminated in the middle of a transient?

A That's correct.

Q Had you ever discussed within B&W why the pumps terminated in the middle of a transient case had not been analyzed prior to June 1979?

A Prior to approximately June 1979, it was the established practice within the industry that

a loss of outside power would occur at the time the plant was removed from the grid, and if the loss of outside power did not occur at that time, or reasonably quickly thereafter, power would be available.

Q Was anything available to operators that you know of prior to the Three Mile Island accident that would alert them to the fact that terminating pumps in the middle of a transient might be a worst case than terminating pumps right at the start of a transient or leaving pumps on throughout a transient?

A Nothing was available that I know of.

Q On page 6, item 3 says, "If an early pump trip is utilized, this action must be completed quickly (1 to 2 minutes after ESFAS actuation)."

Does that refresh your recollection that one to two minutes after emergency safeguards actuation was the time within which B&W concluded the reactor coolant pump should be tripped?

I think you testified this morning that you couldn't recall exactly how many minutes.

MR. FISKE: You mean concluded as a

result of this analysis? You are talking of this time frame of June 1979, right?

MR. SELTZER: Yes, after the Three Mile Island accident.

A This sentence indicates one to two minutes. Our evaluations have consistently indicated that trip action is needed early. As to whether our past or present decisions on what the exact time might be, this does not assist my recollection.

For the record, that sentence is obliterated on the official copy or the first line of it.

Q You said it was industry-established practice that either you were disconnected from the grid at the moment of the start of the transient or you had off site power throughout the transient.

Do you know what competing NSS manufacturers were prescribing before June 1977 with respect to pumps running or pumps off?

MR. FISKE: You mean June 1979?

MR. SELTZER: Yes.

A No, I do not.

Q You don't know that Westinghouse

previously had been prescribing shutting off the reactor coolant pumps at the onset of a transient?

A No, I do not.

Q Do you look at the topical reports of your competitors?

A Not frequently.

Q Do you make it a practice to ask people in your unit to review competitors' topical reports?

A Not frequently.

Q Is there some reason why you do not think those are a source of useful information?

A Yes.

Q Why?

A They are mostly blank.

Q Why, because data is proprietary?

A Yes.

MR. SELTZER: I would like to mark as GPU Exhibit 122, a memorandum from Cartin to Luken, subject "Toleco Edison Company Status Report," December 19, 1978, with a copy to Mr. Dunn.

(Memorandum dated December 19, 1978 from L. R. Cartin to R. C. Luken, subject

"TECO Status Report," with a copy to Mr. Dunn, among others, marked GPU Exhibit No. 122 for identification, as of this date.)

Q Is GPU Exhibit 122 a copy of a memorandum which you received?

A Again, I don't recall the receiving.

Q Are you familiar with it?

A I'm familiar with the subject matter discussed. Certain parts of it.

Q Are you familiar with the subject matter discussed in item 6?

A Yes.

Q What is the dual setpoint control logic that is referred to here?

A The steam generator setpoint control for the level of auxiliary feedwater was to have been one level for non-LOCA events and an alternate level for LOCA events.

Q What did that have to do with the pumps running case?

A At one time, it was suggested that the key for switching from one setpoint to another value could be the status of the reactor coolant

pumps.

Q Is this what triggered your study of pumps running case?

A Evaluation of the pumps running case on the 205 plant was performed because of concerns generated by Integration, concerns which to some extent center out of Toledo issues at that time and the Integration personnel were Mr. Cartin, on the one hand, and Mr. Swanson on the other. I think that is about as much as I know.

Q Is the answer yes?

A No, the answer is what I said.

Q I thought you said Cartin and Swanson and Integration pushing for this study was an outgrowth of Toledo Edison's concerns?

A Yes, but as to whether they were the particular ones mentioned in this section here --

Q Do you see the note that ends item 6?

A Yes.

Q There is something referred to there as a "FOAK analysis." Do you see that?

A Yes.

Is FOAK B&W's secret code for "first of a kind"?

A Yes.

Q The note writer says, "The customer should not be informed of the ECCS Analysis efforts to examine the pumps running case. It is imperative that B&W be totally prepared to defend an FOAK analysis of this type or to have a planned course of action if results are unacceptable."

Is it correct that as of December 19, 1978, ECCS Analysis had not studied the effects of the pumps running case?

A No, I don't think that is fair.

Q What had you done as of this date on the pumps running case?

A We had reached a judgment on the issue. The judgment had been consistent since a time frame on the order of 1973, that in the pumps running case, a small break -- in a small break, the core would be cooled by a flow process, and working with the individuals involved in the Toledo effort, there were questions in their mind about that judgment.

Q There is a reference to B. M. Dunn in the middle of item 6. Do you see that?

A Yes.

Q The sentence that surrounds the use of your name says, "This course of action will require identification of funding (B. M. Dunn to secure) to resolve this unanalyzed small break."

What did you understand they were referring to when they said "an unanalyzed small break" for which you were going to obtain the funding?

A The resolution, chosen resolution, for the concerns raised by these individuals was to do a computer evaluation of a small break and to demonstrate that the pumps running situation was not more severe or did not pose as significant a challenge to the core cooling system as the pumps off case.

Q So that was an ECCS analysis of a small break with pumps running that had not been analyzed before?

A That was to computerize it.

Q It had not been computerized before?

A I'm not sure. At this time, we could not recoup any computerization of such an accident.

Q After you got Cartin's note saying,

"The customer should not be informed of the ECCS Analysis efforts to examine the pumps running case," did you then keep your work quiet from Toledo Edison?

MR. FISKE: You mean did Mr. Dunn tell them?

MR. SELTZER: That's right.

Q Or did you keep it a secret?

A I don't recall whether Toledo was informed of this or not. I don't believe I did any informing.

Q You did not leak it to them?

MR. FISKE: I object to the form of the question.

A I did not respond to this note, if that is what you are talking about, or any implication that anybody there can make me keep my mouth shut if I don't want to.

(Continued on the following page.)

Q The blue book was issued when, May 7?

A Approximately.

Q 1979. Were any new analyses performed in order to generate what is the blue book?

MR. FISKE: What do you mean by "new"? New after when?

MR. SELTZER: After the Three Mile Island accident.

Q Or was the blue book based on things that you already knew at least qualitatively?

MR. FISKE: You are sort of qualifying the question. I am not quite sure where it is now.

Are you asking him how much if any additional work was done after the Three Mile Island accident before the blue book was issued?

MR. SELTZER: No. That is a different question.

Q Does the blue book rest on any knowledge that was generated after the Three Mile Island accident?

A In that the blue book contains specific

numbers created by computerizing simulations of certain events, it in part rests on information put together after Three Mile Island.

Q You have referred in your testimony to conclusions which you knew qualitatively. As you have used that phrase, did the blue book contain anything which you had not known qualitatively prior to the Three Mile Island accident?

MR. FISKE: Number one, I don't remember Mr. Dunn using the phrase "qualitatively," but I might be wrong. In any event, I think it requires some definition before he answers this question.

Q In discussing ECCS, you have referred from time to time to understanding something qualitatively, haven't you?

A I don't know whether I have done that in the deposition or not right now. I have done it outside of the deposition.

Q What does that mean?

A I think it can have a great many meanings.

Q For example, as you use it, could it mean knowing that the pumps ought to be turned

off promptly but not knowing whether "promptly" means one minute, two minutes, or four minutes.

MR. FISKE: I object to the form of that question.

If you are asking him if he reached that conclusion before the Three Mile Island accident, I will let him answer that.

MR. SELTZER: I am not using that as a specific example of something he knew qualitatively. I am just saying that that is what I mean by "qualitatively." You couldn't put a quantified judgment on something, but you more generally understood it.

Q Do you understand what I have just said, or is that still confusing you?

MR. FISKE: It is still confusing me.

Q You said that the only new analysis that was incorporated in the blue books was on computer generated numbers. Were all of the concepts that were in the blue book concepts that you had developed before the Three Mile Island accident?

A The entire blue book is not mine. Nor is

it ECCS Analysis'.

Restricting my comments to Chapter 6, which contains the analytical contributions by ECCS Analysis, the basic model utilized for those evaluations was model developed prior to Three Mile Island. Certain alterations were made in the model to demonstrate, or rather to quantitatively evaluate specific transients.

The term "quantitative" is used because it was desired to compute numbers, and the conclusions of those evaluations were consistent with the assumptions and beliefs of ECCS analysis prior to Three Mile Island.

Q What is the B&W Comprehensive Business Plan?

A It is a high-level report generated by the top officials of the company and meant to communicate the general direction of the company over the period indicated in the report.

Q How frequently is a comprehensive business plan generated, to the best of your knowledge?

A To the best of my knowledge, which is based only on the periods of time in which I have been

involved in it or come in contact with it is once a year.

Q Do you receive a copy of the comprehensive business plan?

A I would say not normally.

Q Have you been asked for your comments on any B&W comprehensive business plan?

A I don't recall being asked for any comments on the comprehensive business plan.

Q Why did G. E. Anderson give you his comments on the B&W comprehensive business plan in November 1979?

MR. FISKE: Which document is that?

MR. SELTZER: Anderson to Dunn, November 21, 1979, subject: Comments on B&W Comprehensive Business Plan. It is going to be GPU Exhibit 123.

Q Do you know why he gave you his comments?

MR. FISKE: I object to the question unless it is limited to something Mr. Anderson said to him.

Q Do you know why Anderson was sending you his comments on the B&W comprehensive

business plan?

A I believe I do.

Q Good. Tell us.

MR. FISKE: I don't object as long as it is not speculation.

A At one time, Dr. Don Roy sent a document around which was like a comprehensive business plan. It was, however, no more than Don Roy's support work for a B&W comprehensive business plan. Employees in the company were asked to comment on Dr. Roy's paper and provide feedback. I believe this is feedback on that and mislabeled as the B&W comprehensive business plan.

I have not asked for feedback on a B&W comprehensive business plan.

(Continued on next page.)

Q On page 2, Anderson tells you that --

MR. SELTZER: Let's mark that.

(Two-page memo dated November 21, 1979 from G. E. Anderson to B. M. Dunn, re "Comments on B&W Comprehensive Business Plan" was marked GPU Exhibit No. 123 for identification as of this date.)

BY MR. SELTZER:

Q You see opposite page 13, Anderson comments that "The details of 10 CFR 21 have not been passed down to everyone in B&W Engineering."

10 CFR Part 21 is the portion of the NRC regulations that require people who have knowledge of defects in nuclear equipment to notify the NRC and owners, right?

A Yes.

Q Did you ever talk to Anderson about why he believed that the details of that Federal regulation had not been passed down to everyone in B&W Engineering?

A No, I don't believe I did.

Q Did you keep a copy of Don Roy's draft to which you believe Anderson is commenting?

A I don't know.

Q Anderson is the representative from your unit who you say regularly gives lectures at training sessions for operators, is that right?

A Yes.

MR. SELTZER: I would like to mark as GPU Exhibit 124 a memo from Mr. Dunn to Mr. Parks, subject "Technical Training Program for B&W," April 7, 1980.

(Memo dated April 7, 1980 from B. M. Dunn to C. E. Parks, re "Technical Training Program for B&W," was marked GPU Exhibit No. 124 for identification as of this date.)

BY MR. SELTZER:

Q When I referred to Anderson's participation in training programs, that is participation that he has had since the Three Mile Island accident, right?

A Yes.

Q Is GPU 124 a copy of a memo that you sent to Parks on or about April 7, 1980?

A Yes.

Q Is the Anderson who sent you the attached memorandum the Anderson who gives training

courses on behalf of ECCS?

A Yes.

Q Since April 1980, has he been given a chance to improve his background in thermodynamics?

MR. FISKE: Who, Mr. Anderson?

MR. SELTZER: Right.

A I don't know. I don't share his opinion.

Q You don't share his low opinion of his background in thermodynamics?

MR. FISKE: I object to the form of the question.

Q What opinion of Anderson's don't you share?

A That his background in thermodynamics has hampered his working efficiency.

Q Have you ever told him that?

A I don't know.

MR. SELTZER: I would like to mark as GPU Exhibit 125 a memorandum containing statements by someone and additions by Mr. Dunn, Mr. Bingham, and no date.

(Memorandum undated, containing statements by someone and additions by Mr. Dunn and Mr. Bingham was marked GPU Exhibit

No. 125 for identification as of this date.)

BY MR. SELTZER:

Q This was produced very recently from your files.

Can you identify the GPU Exhibit 125?

A GPU Exhibit 125 is the notes from a creative decision-making process performed several years ago on the general subject of what will happen within the overall area of ECCS in the next few years.

Q Who attended this consciousness raising session?

A I attended it. Bill Bingham attended it.

Q Bob Jones?

A I don't know. I am trying to place the other person that I know of. I think it was Said Farrek. There were approximately seven or eight people in attendance.

Q From what group were those seven or eight people drawn?

A In such a seminar, we draw from a wide variety. We had some ECCS personnel, some systems analysis technology personnel, and some people from unrelated fields.

Q All from B&W?

A I believe they were all from B&W.

Q Would you turn to page 4, at the top of the page.

What is item 16 at the top of the page, "We should eliminate the Cat & Mouse relationship between NRC and B&W"?

MR. FISKE: That is one of Mr. Bingham's additions?

MR. SELTZER: No, that is under item 27, further discussion, just before "We should hire a sexy pulic relations person..."

A In the creative decision-making process, and I am not sure if you are familiar with the process, any and all ideas are put down as raised by an individual. No accounting that the individual raising the idea is made, no negative comments about any idea is allowed. This process took place several years ago. I could only guess what that means.

Q Was that your suggestion?

A No. I believe I was operating the process and not allowed to make suggestions.

Q Why do you and Bingham have items

that appear as Dunn additions and Bingham additions?

A I think that -- I do not know actually. I don't recall it that much. I was speculating.

Q Was there any follow-up after this list of ideas was generated?

A No.

As I recall, I wanted to follow up with it and do something with it, make some use of it, but my time became not available.

Q Do you do this often?

A Not as structured as this.

Q On page 78, in the lower right-hand corner, --

MR. BENEDICT: Page 478.

Q -- you see item 18 at the top?

A Yes.

Q "We should engineer the plant before we sell it."

Do you know whose idea that was?

A No.

Q Did you think it was a good idea when it was said?

A This process was several years ago. I don't

know what I thought at the time it was said.

Q What is the Hatchet Committee?

A I recall the words "Hatchet Committee," the title, but I don't recall what it was or is.

Q Don't people in your business talk about being hatcheted by the NRC?

A Yes.

Q What does that phrase mean?

A It can mean one of two processes. The most prevalent use of the word refers to the identification and working of one vendor through a process and saving the other two for later. Within the vendor definition here, I am thinking of mainly the PWR's. Some problems would involve the PWR's as well. Saving the other two vendors, reaching a resolution to some extent with the first vendor, going after the second vendor following that, and going after him to a more severe level of compliance, and I am speaking of it as a vendor issue which certainly also involves all the vendors' customers.

The second use of the word is just plain arm twisting by the NRC.

Q GPU Exhibit 125 reflects a serious

effort to generate good ideas for future operations, is that right?

A Yes, it did. At the time it was generated, I felt it was a serious effort to develop some insight into what may be occurring over the coming years in ECCS-related matters.

MR. SELTZER: I have no further questions at this time.

Your witness, Mr. Fiske.

MR. FISKE: I don't think we have any questions for Mr. Dunn.

(Time noted: 3:45 p.m.)

Bert M. Dunn

BERT M. DUNN

Subscribed and sworn to
before me this 29 day
of October, 1982.

Danita R. Kidd - Notary
Commissioned Notary as Danita D. Robertson
Commission Expires: July 1, 1983

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 BERT M. DUNN was taken before me on April 7, 1981 consisting of pages 845 through 964;

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

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

IN WITNESS WHEREOF, I have hereunto set my hand this _____ day of _____, 1981.

Joseph R. Danyo

JOSEPH R. DANYO

I N D E X

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E X H I B I T S

E X H I B I T S

(Continued)

April 7, 1981

E X H I B I T S

(Continued)

GPU FOR IDENTIFICATION		PAGE
123	Two-page memoranum dated November 21, 1979 from G. E. Anderson to B. M. Dunn, re "Comments on B&W Comprehensive Business Plan."	957
124	Memo dated April 7, 1980 from B. M. Dunn to C. E. Parks, re "Technical Training for B&W."	958
125	Memorandum, undated, containing statements by someone, and additions by Mr. Dunn and Mr. Bingham.	959

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Deano - Volume 8

847-880
TVA communications / Michelson

848-49 - recalls phone call to Stuck re NA ltr & Michelson report were discussed

850 - does it think he ever spoke to Michelson about report

850-51 - for certain SBLOCAs, SGs are relied upon to remove decay heat

851-52 - Deano thinks statement re: problem of repressn in impeding HPI is wrong: draws from 2 different accidents which can't physically combine

853-54 - explains boiler condenser mode of NC, that NRC accepts as a method of providing energy transport during SBLOCAs

855-56 - agrees that DH removal via condensation ceases when wtr level in SG tubes exceeds secondary side wtr level; read this & drew this conclusion after TMI-2 accident; Deano DNR receiving when issued

857 - disagrees with engr's use of loop seal, agrees it'd be inaccurate indicator of inventory

858 - on 3/28/79, took time to explain consistency of pzr containing wtr which low levels of coolant existed in RCS; not saw treated situation as a partially covered core

859 - reads from Deano's DOR notes re: consistency of uncovered core and full pzr

86/62 accidents causing repressn not severe, had no core recovery, didn't challenge ECCS; didn't specifically analyze whether steam bubble at top each OTSG'd interrupt NC, tho Deano says it's a fact,

basis - bounded - 83 this has since been analyzed by ECCS, the basis 'll be in 4/78

→ 865-66 did work subsequently on SG level and altered level for 177-FA plants; raised to 95%; work was done w/in a few months after TMI - advantage of this is that any condensate in SG wd be available able to return to vessel & give better assurance of core heat sfer

866-67 - more of a mass concern that DH removal concern: assure condensate wd return to core

867 - by this phase of accident, prime concern is control of plant systems

868-69 for certain break sizes, after pump trip, water circulation depends upon NC; in 177-FA, 95% level helps, but analyses show effective core cooling even at 50%

870-72 - GPU111, Bailey memo: Denn aware prior to TMI that NYA had raised concern over erroneous op action based on LP; Jones told him

873 - meet had decided nothing critical in CH's report and wd handle it as work load allowed

874 - first response was in Christmas '78 - agreed w/ NYA on LP - Jones prepared response; Denn DN recall reviewing, thinks told he did & signed approval

875-76 - associated NYA concern w/ his 2/78 memos - dedn't say shd read NYA his memos or check to see if Cent Service had sent out instructions; nobody told him his instructions had been sent

877-78 - GPU112 - 1/9/79 response to NYA - reviewed & approved by

by Davis

878-79: statement to NRA or GP not as explicit as Davis's 2/78 instructions; never considered inserting his instructions

880-901 Secondary Water Level/ Pump Damage

880-81- if primary level ≥ secondary level, no auto shutoff of AFW; shutoff for AFW not related to primary side, shut off is 95% of operate range

882 - prior shut off was 50%

890 - when PDSBLOCA problem reported to NRC, B&W didn't report it had been aware of issue for a years

891 - no clear understanding of when NRC expected rpt'g of concern; NRC wd have expected prompt rpt'g once it had been validated

895-96 - when PDSBLOCA problem identified, ECCS changed double shifts to solve problem

897 - analysis showed problem to be worse than previously thought - more than just validation of concern

898 - Mar '78 was first detailed analysis of PDSBLOCA.

900-901 - GPU115 - "177 FA HPI system underdesigned": do it deliver suff'n flow to mitigate consequences of licensing accidents. - told this to NRC

901-954 Pumps Running

901-02 - GPU116 - B&W memo ~~[illegible]~~ re: open PORV w/o AFW and with pumps running

902-03 - pumps cd run at 100% void fraction for days

903-04 - Collins memo, post-acc, addresses ability of pumps to function

904-05 pre accident, had been experiments in pumps on 2-phase flow & ran for considerable lengths of time

905- B&W did some pump experiments; NRC did the 100% void exp't

907- Dunn not aware of limits & precautions for RCP op'n; DNB that vibration increases w/ void fraction

908-09- then says he knows of vibration at TMI; pump vibration also occurred in Bingham's tests.

909- Dunn's d/s: more vibration as 2-phase flow being pumped

912- Thinks he knew this pre-TMI- not aware of B&W vibration limits

913-14: meant in memo (6/8/16) that RCP should be kept on regardless of vibration during a transient.

914- RCP could run at 100% void so long as a heat sink & prevent too much superheated steam

914-15 - Dunn never analyzed PORV open, no HPI, RCPs in at least 2 loops, w/ AFWS - ECCS must stopped such a situation: pumps when did pumps on actuation in early spr '79 or winter '78 - called it for TEC and also considered it after accident

916- analysis showed core in cladding temp to be <100° above sat'd pumped steam media w/ effectively cool core, so long as superheat under control; haven't done w/ it tell how long that could be maintained

917- analysis used break size larger than PORV, & was not less than 6in

918- w/ PORV the w/d have effective cooling for longer than an analyzed break-; analysis progressed no further than 1/2 hr and didn't get to 100% void; work on 100% void was a hand calc

919- computer analysis done HC Dr raised about assumption that

pumps on was a better case

922-23: discussed effect of keeping pumps on at TMI in RC depressurization as a preventive measure when sending out RCPs on instructions after accident

924 - thinks talked about it w/ Taylor & Elliott

934
~~928~~ - prior to June '79, Dunn not aware of any instructions from B&W on how to operate RCPs during SBLOCAs; Dunn not aware of the gen'l flow of info from B&W re ops on how to handle eg's

934-35: knows of no one in his unit who was reviewing such instructions

935: GPU121 'SB Guidelines': assumptions regarding eg's availability different than Lee's submittals

936-37 - Dunn knew these assumptions were different; for ex. 2 HPI pumps assumed instead of one

938 - assumed 2 pumps ok as it provide "some chance" that analyses will produce acceptable PCTs; strong indications PCTs can't be held below 2200°

939 for indicated peaks, PCTs > 2200°, except 2 HPI plus SG blowdown, which was below 2200°

941-42. Lees was first analyses of transient w/ RCPs turned off in middle

942 - Dunn decided to trip 4 pumps or 4 pumps off bounded pumps Lees'd in mid-transient

943 - Dunn knows of nothing available to ops prior to TMI to alert them that Lees' 4 pumps in mid-transient not be the worst case

943-44 - analyses indicated had to turn off RCPs after 1-2 minutes ECCS actuation

945 - DNK that (W) prescribed pumps off at outset

945-46 - OHO 122 - 12/19/78 Cantin memo on RCPs

946-47 - was suggested that they for switching AFW setpts w/ be cond'n of pumps; pumps on eval'd on 20 s't Dc, to some extent, of concerns from Toledo

948 - Denn no pumps on analysis doc. says judgment reason '77 bld bec that if pumps on, flow at cool core

949 - chosen resolution was to do computer eval'n for SB LOCA when pumps on even tho more severe

954 - basic analytic models in blue bks generated pre-TMI; certain alterations made to quantitatively evaluate specific transients

954 - 957 Pt. 21

957 - (HD 23) Denn never talked to Anderson about why he that details hasn't been passed down to everyone in Engineering