UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

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

:

Plaintiffs,

: 80 Civ. 1683
-against- (R.O.)

:

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

Defendants. :

---

cb

Deposition of GPU NUCLEAR CORPORATION, by WILLIAM H. ZEWE, taken by Defendants, pursuant to notice, at the offices of Davis Polk & Wardwell, Esqs., One Chase Manhattan Plaza, New York, New York, on Thursday, May 20, 1982, at 9:45 o'clock in the forenoon, before Harvey B. Kramer, a Certified Shorthand Reporter, Registered Professional Reporter and Notary Public within and for the State of New York.

* * *

8306290761 820520
PDR ADOCK 05000289
T PDR

Appearances:

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

By: DAVID KLINGSBERG, ESQ.
-and-
ANDREW MacDONALD, ESQ.,
of Counsel

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

By: ROBERT B. FISKE, ESQ.
-and-
WILLIAM E. WURTZ, ESQ.,
of Counsel

KILLIAN & GEPHART, ESQS.
Attorneys for the Witness
Box 886
Harrisburg, Pennsylvania 17108

By: KEVIN WALSH, ESQ.,
of Counsel

Also Present:

JONATHAN QUINN and
ERIC ABRAHAMSON,
Law Assistants
Davis Polk & Wardwell, Esqs.

* * *

IT IS HEREBY STIPULATED AND AGREED by and between the attorneys for the respective parties hereto, that the sealing, filing and certification of the within deposition be, and the same hereby are, waived; and that said deposition may be signed and sworn to before any officer authorized to administer an oath, with the same force and effect as if sworn to before an officer of this Court.

IT IS FURTHER STIPULATED AND AGREED that all objections, except as to the form of the question, are reserved to the time of the trial.

* * *

W I L L I A M H. Z E W E, having been first duly sworn by the Notary Public, was examined and testified as follows:

EXAMINATION BY MR. FISKE:

Q What is your name?

A William H. Zewe.

Q How old are you, Mr. Zewe?

A 36.

Q What is your home address?

A Border Lane, R.D. 1, Hershey, Pennsylvania.

Q What is your present employment?

A GPU Nuclear.

Q What position do you hold there?

A Shift supervisor, Unit 1.

Q How long have you held that position?

A Since May of 1976.

Q Has there been any change in your position at Met Ed since the accident in 1979?

A Yes. I was a station shift supervisor at the time of the accident, with responsibility in Units 1 and 2. Now I am only a Unit 1 shift supervisor.

Q Is there any difference between a station shift supervisor and a shift supervisor?

A Only that I had responsibility in both units. Now I only have responsibility in Unit 1.

Q Are you aware that a request has been made for the production of documents in connection with this litigation?

A Yes, I am aware.

Q Have you ever seen that document request?

A I have seen a request and heard of a request from our lawyers, but I am not sure of the actual one that you are referring to here.

Q Without going into the substance of the communication back and forth between you and your lawyers, is it correct that you have been requested by lawyers for GPU to gather together documents and give them to the lawyers, in connection with this litigation?

A That is correct.

Q And have you given to the lawyers all of the documents that they asked you to give them?

A Yes, I have.

Q During the course of your employment at Med Ed before the accident, did you have occasion to take documents back to your home, to keep some documents there?

A Yes, I have.

Q In the process of getting together documents to give to your lawyers, have you gone through the documents in your home as well as documents that you might have kept on the premises?

A I have.

Q You are represented here today by Mr. Klingsberg and Mr. MacDonald from Kaye, Scholer; right?

A Yes, I am.

Q And also by Mr. Walsh?

A That is true.

Q At any time since you retained Mr. Walsh, have you given documents to him?

A I have not given any documents to Mr. Walsh, and I do not recall giving documents to his firm either.

Q I recognize, Mr. Zewe, that since the accident you have given testimony and have been interviewed on a number of different occasions. I know it may be difficult to sort them all out from memory, but I would like to go through that with you and see if we can get your best recollection today of the different places that you have testified.

You have testified in connection with an investigation being conducted by the President's Commission, the so-called Kemeny Commission?

A Yes.

Q And you have also given testimony in connection with an investigation by something called the Special Inquiry Group of the Nuclear Regulatory Commission, the so-called Rogovin Commission?

A Yes, I have.

Q And you have given interviews, have you not, to people from the Inspection and Enforcement Division of the NRC?

A Yes.

Q And you have also given interviews to people from GPU that were conducting an investigation into the circumstances surrounding the accident; correct?

A Yes.

Q In addition to those four different types of interviews, have you given any statements or testimony to any other group that has been investigating the accident?

A Yes, I have.

Q Would you tell us what group that was?

A The Hart Commission group.

Q That is a Congressional committee; right?

A Yes.

Q While we are on the subject of Congressional committees, I guess you also gave some testimony to Congressman Udall's committee; is that right?

A Yes, I did.

Q Are there any other groups you have given testimony to?

A Yes. The ACRS.

Q When was that, Mr. Zewe?

A I don't recall the exact dates, but one time occurred in Middletown at the Penn State extension campus there. And another one took place in Washington, D. C.

Q Were each of these within a year after the accident?

A As I recall, yes.

Q Taking the one in Middletown first, what was the format under which that took place?

A As I recall, it was -- they were trying to determine what had happened. More of a fact-finding group.

Q Were you the only one from Met Ed that appeared at that time or were there others?

A There were others.

Q Did this take the form of a question-and-answer session?

A Yes, it did.

Q With someone taking it down the same way that the reporter is taking this deposition down?

A I don't recall how the meeting was recorded.

Q Do you know whether some record was made of the questions and answers?

A It's my recollection that there was, but I'm not certain of that.

Q Have you ever seen it since then?

A There were times when I was asked to further amplify or to explain certain questions that came up during the course of those discussions.

Q Do you remember the names of the individuals from the ACRS that were conducting this?

A I can only recall two of the gentlemen's names. One of them was Mr. Michelson and another one was a Rags Mueller.

Q Is that all one name?

A No.

Q Two names?

A I believe his last name was Mueller and his first name was Rags, as I remember. I could be mistaken there.

Q Do you remember Mr. Michelson's first name?

A I believe it is Carl.

Q Did you ever see any report that was written by the ACRS as a result of the investigation that they had made?

A I have seen portions of it, though I don't recall exactly when or to what degree.

Q You referred to a second time when you gave information to the ACRS, which you said was in Washington.

A That is correct.

Q That was also a question-and-answer session?

A Yes, it was.

Q Was there a record made of that proceeding?

A My recollection of that meeting, also -- I am not sure -- probably records were kept, if in fact they were.

Q Do you remember seeing a record of that sometime after you appeared?

A My recollection is that I did see portions of it. But there again, I don't have a very good recollection on exactly how much of it.

Q In addition to those two sessions with the ACRS, have you given information concerning the accident to any other group other than the ones we referred to earlier?

A Just a moment.

Q Kemeny, Rogovin, Congress, the I&E section of the NRC, and GPU. And now the ACRS.

Are there any others?

A Not that I can recall at this time.

Q Did you give any testimony in connection with the proceedings relating to the restart of TMI-1?

A I did not.

Q Did you give any testimony in the proceeding conducted by the Administrative Judge Gary Milhollin relating to cheating on examinations?

A I did not.

Q Have you been subpoenaed to testify before a grand jury concerning anything relating to your duties at Met Ed?

A I have not.

Q Going back to the period of time before the accident -- let's take the period of a year from March '78 to March '79 -- were you working as station shift supervisor for Units 1 and 2 at that time?

A Yes.

Q I am interested now particularly in Unit 2. My questions relate to that unless I state otherwise.

What records were kept in the control room concerning the daily operations of Unit 2?

A We kept a shift foreman's log. A control room log. Switching and tagging log. Special operating procedure log. Temporary change notice log. Lifted lead jumper and mechanical modification log. A dispatcher power outage log.

Also in the control room we had our completed surveillance files and our completed procedure files.

Operating memo book. Revision review book.

That's about as complete as I can remember at this point.

Q Who had responsibility for making the

entries in the shift foreman's log?

A The on duty shift foreman.

Q What did you understand the purpose of that log was?

A To give a detailed account and description of the shiftly activities.

Q Who was responsible for making entries in the control room log?

A The on duty control room operator.

Q What was the purpose of that log?

A To again show the shiftly activities that occurred while they were on the shift.

Q Did you understand that there was any particular type of information that was supposed to be recorded in one log rather than the other?

A We had in place an administrative procedure that gave guidelines on what type of information could and should be displayed in the shift foreman's log and in the control room operator's log.

Q Can you tell us now in substance what that said?

A As I recall, without having it before me, it would require you to list major power changes,

reactor trips, any major plant equipment that was taken out of service or put in service. Generally, anything that the operator felt was significant. And if he wasn't sure if it was significant or not, then he would write it down to make sure that it was caputred for that particular date and time.

Q And that same general guideline applies to the shift foreman's log? The shift foreman was supposed to write down anything that he considered significant?

A Yes.

Q Was there a log called the shift test engineer's log?

A Yes, there was.

Q Did you include that by some other name in the list you gave me before?

A I did not, because the shift test engineer's log is not a normal log as such that we keep in the control room.

Q What did you understand was the function of the shift test engineer's log?

A Its function, in my understanding, was to relate information from one shift test engineer to the other, and to their supervision, on a

shift-by-shift basis.

Q What kind of information did you understand was recorded in the shift test engineer's log?

A Generally, who had that particular shift during a particular shift period, and who relieved him, and anything else that that particular shift test engineer felt was appropriate to capture and to pass on.

Q Well, did you understand in a general way that the shift test engineers were supposed to write down in their log anything that they considered significant that had happened during their shift, the same way the control room operator and the shift foreman were supposed to?

A I am not really sure what guidance they had in maintaining their log. So I would only be guessing in saying that I would expect that they would write down things that they felt needed to be passed on and captured from their standpoint.

Q Was there any practice at Met Ed before the accident for periodic reviews by anyone of the information in the shift foreman's log or the control room log?

A Would you restate that again, please? I missed the first part of it.

Q Sure. Was there any practice or procedure at Met Ed before the accident for periodic reviews by anyone of the information that was recorded in the shift foreman's log or the control room log?

A Yes, there was. The supervisor of operations would review the log. And I believe then he would initial the log, saying that he had reviewed it up to that particular point in time. Plus, it was a practice of the shift supervisors to review the control room operator's log and the shift foreman's log on a periodic basis.

Q You were one of the shift supervisors; is that correct?

A Yes.

Q You had said that.

A Yes, I did.

Q And the supervisor of operations during the period of time March '78 through March '79 for Unit 2, who was that?

A James Floyd.

Q What did you understand was the purpose of having the supervisor of operations review the

information in the shift foreman's log and the control room log?

A I felt it had two purposes. One, to insure that the logs were being maintained in the proper fashion, that they were complete and up to date. And also, as a review for Mr. Floyd himself.

Q What did you understand was the purpose of having you and the other shift supervisors review these logs?

A I felt that it was also my role to insure that the records were up to date and accurate and also as a personal review for myself.

Q And when you say a "personal review" for yourself, what do you mean by that?

A We worked on an eight-hour shift basis. And between the time that I left and when I came back for my next eight hours of duty, I would review the logs since the last time that I had left, just to make sure that I was up to date on what had transpired while I was gone.

Q What practices or procedures were there before the accident to have operating personnel review the information in the shift test engineer's log?

A As I recall, there was no set practice of reviewing the shift test engineer's log on a regular basis.

I have reviewed portions of it from time to time. Other than that, that's all I remember.

Q Under what circumstances would you review the shift test engineer's log?

A The shift test engineer and the shift supervisor would get together at the start of each shift. And if he would point out to me that there had been something written in the book by a previous shift test engineer that was worthy of note, if he would mention it, then I would go and review the book itself, to try to gain a better understanding.

Q Do I understand from that that it was your practice as shift supervisor to try to get together with a supervising shift test engineer at the start of each shift to find out if either of you thought there was anything important that ought to be discussed relating to anything that had happened on the preceding shift?

A Yes. There was a pretty good relationship, I felt, between the shift and the shift test engineers and they were there to help

us, and that we would certainly get together to brief on the next evolutions or past evolutions or anything of interest that could affect the operation of the plant or improve our involvement.

Q Was that a practice that was followed also by other shift supervisors and other supervising shift test engineers?

A It was my observations that that was generally true.

Q You weren't the only one that was doing that?

A I don't believe that I was, no.

Q How many shift supervisors for Unit 2 were there in the year before the accident? How many different people held that title?

A At any one time?

Q Yes.

A Six.

Q And was there a comparable title for shift test engineers to shift supervisor?

A I'm afraid I don't understand what you are asking.

Q I probably didn't make it very clear. You were a shift supervisor for the

operators that were on duty during that particular shift; right?

Right?

A Yes.

Q There were also shift test engineers on duty during that same shift; right?

A That is correct.

Q O. K. Was there somebody that held the same position relative to the test engineers that you held relative to the operators?

A (No response.)

Q Somebody in charge?

A Yes, there was.

Q What was that person's title?

A As I recall, his title was start-up and test superintendent.

Q How many of those people were there in the year, year and a half before the accident?

A Only one.

Q What was his name?

A Ron Toole.

Q When you said that at every shift you would get together with somebody from the shift test engineers to discuss significant events that

had occurred on the preceding shift, was that always Mr. Toole?

A No, it wasn't.

Q What was the title of the person that you would meet with to have that kind of a discussion?

A Start-up and test engineer.

Q Just, again, so I understand the way this worked, would these discussions that you would have, would these be with somebody that was just coming on the next shift or would these be with somebody that had just finished the last shift?

A Normally, I would have the discussion with the shift test engineer that would be coming on to be with me for the next eight hours.

Q Right.

A He would interface with his off-going counterpart and I would interface with my off-going counterpart.

Q Right.

A And then we would get together.

Q To discuss things that your off-going counterparts had relayed to either one of you they felt were significant on the preceding shift?

A Yes.

Q Was there a log that you yourself had to keep, a so-called shift supervisor's log?

A No, there wasn't.

Q You mentioned a technical change notice log? Did you? Is that correct?

A Temporary change --

Q Temporary change notice. I'm sorry.

A Right.

Q What was contained in that log?

A That listed the temporary change notices that were in effect at any particular time.

Q What was a temporary change notice?

A Whenever a procedure needed to be changed, we had two modes of changing it. Either a permanent change or a temporary change which would normally lead to a more permanent change at a later date. So if you needed to change a procedure that you needed to use in the very near future, we had a mechanism that you could change certain portions of a procedure, and all of these changes then were attached to the individual procedures and they were also put in this temporary change notice logbook.

Q What were the circumstances under which

you would be allowed to change a procedure by a temporary change notice?

A If we needed the change in the very near future and there was not sufficient time for it to go through the permanent normal change routing, then we would use a temporary change. Or if the change was only going to be in effect for a special plant test that we were going to perform that would not require a permanent change to the procedure, we used to use it then also.

Q How high up in the organization did you have to go to get approval for a temporary change notice?

A Temporary change notice went through what we called the plant operational review committee review.

Q So-called PORC?

A PORC, yes. And upon its approval, then the unit or station superintendent would approve it, and then the shift upervisor would then issue it and carry it out.

Q We are now talking about a temporary change notice?

A That is correct.

Q What further review than that was required for a permanent change?

A Permanent changes at that time had the same channel to go through, the same routing. Through PORC, through the superintendent. But it did not come back up to the shift supervisor then. It was then -- the procedure itself was then revised and rewritten, and it came up then as a new procedure or a new portion of the procedure.

Q You referred to something called an operating memo book.

A Yes, I did.

Q Could you tell us what kind of information was put in that book?

A It was a book used by Mr. Floyd to give some further guidance to the operations department concerning particular phases of the operation.

Q Who was responsible for making the entries in this book?

A The supervisor of operations.

Q Did you ever review this book?

A I did.

Q Do you know where Mr. Floyd obtained the information that he put in the book?

A Wherever he could. Whatever source he had available to him.

Q I guess I am still a little unclear as to what kind of criteria he had for putting information in this book. I mean, what kind of things did you understand he was trying to record in this operating memo book?

A As I recall, he was trying to insure that all of the six shifts operated under his operating philosophies.

Q Was his operating philosophy recorded in this book?

A Not as such.

He would give -- each of the memos that were in the book dealt with a topic, a certain specific topic itself. And then he would address that one area, and then the next time that he wished to address another area or even a related area, he would make a separate memo that would address that area.

Q Were these memos circulated around among the various shift supervisors?

A Yes. By virtue of the book being in the control room. And it was part of the reading

material that the shift supervisors and the on-shift personnel were periodically to read.

Q So in other words, there was some sort of an understanding prior to the accident that shift supervisors and operating personnel were supposed to go into the control room on a periodic basis and read this book?

A Yes.

Q To get Mr. Floyd's thoughts for the day and operating philosophy?

A They weren't really thoughts for the day. They were more items that he felt were necessary to further clarify, and not necessarily those that required a change in an operating procedure or a great change in the way that we did business, but just finally give direction in certain instances.

Q Just one last question on this. How frequently would Mr. Floyd put memos into this book?

A It really varied.

Q How frequently would you personally review it?

A I would review it every shift.

Q Then you mentioned a book called the revision review book.

A Yes.

Q Could you tell us what kind of information was in that book?

A When a new procedure or a permanent change had occurred relating to a procedure itself, then the procedure was placed in the revision review book for all of the operating shift to review and to make sure that they were aware that that particular procedure had been changed or that there was a new procedure that had just come into being.

Q And again, I take it, this book was in the control room at all times?

A Yes, it was.

Q And shift supervisors and operating personnel were supposed to review this book periodically?

A Yes. They would review it shiftly.

Q Could you tell us, Mr. Zewe, whether there were any other types of material in the control room that you and the operating personnel were supposed to review on a shiftly basis?

A I just remembered two other logs that we had there.

One of them was a locked valve book.

Another one was a transient cycle log.

Q By your answer, did you mean that those were two books that you were supposed to review on a shiftly basis?

A No, by and large, the transient cycle log was not reviewed on a shiftly basis. Entries were only made whenever you met the criteria to enter a reading there that you had had a particular evolution take place, so you entered it.

The locked valve book periodically was reviewed. I would review that shiftly.

Q Who was responsible for making entries in the transient cycle log?

A The shift foreman was.

Q And what kind of information was supposed to go into that book?

A Information like feedwater, use of emergency feedwater cycles on the nozzles. Heatup and cooldowns. Anything that had a cyclic effect on the components. Basically, the components of the primary plant.

Q Anything that had a cyclic effect on the components of the primary plant?

A Yes. There were set cyclic criteria

that we had listed, that if you met those you would then record it in the log.

Q You listed several things in the course of this discussion in the last half hour or so that you would review when you came on shift in the control room. Maybe you could just tell us or give us a complete list when you came on duty for a shift, what are the things that you understood you were supposed to read during the course of that shift, and if you happen to repeat a couple that you have already listed, that's O. K.

A The most important of which I believe I haven't mentioned yet was, we had a shift supervisor's handwritten current over-notes, which weren't a log as such and they weren't maintained, but they were from one shift supervisor to the next one so we could gain insight into what had transpired through the last shift and even through the last day.

I would review the shift foreman's log and the control room operator's log. The surveillance that was due for our particular shift.

I would review the locked valve book, revision review book, and the TCN book.

Q Was there information in the control room

concerning transients at Unit 2, prior transients?

A Ask that again, please.

Q Was there information in the control room concerning prior transients that had occurred at Unit 2? Other than what might be reflected in the control room operator's log or books that you previously referred to.

A I don't recall now.

Q Was there information in the control room concerning transients that had occurred at other plants?

A Yes, and I don't recall between now and back then exactly when the LER book was in the control room. I believe it was in effect during that time period though I may be mistaken.

Q What do you mean by the LER book?

A License event report.

Q I take it by an LER book, you mean a book that contained LER's concerning transients at other plants?

A Yes.

Q Did you have any understanding prior to the accident that you as shift supervisor were supposed to review that book periodically?

A We would review LER's as such in our training program. And I believe that I recall that we would review it on shift periodically. But I don't remember the requirement to do that on shift at any particular interval.

Q How would you know when a new LER had been added to the book?

A Periodic review, or another person would say, "Hey, there is a new LER that is there that you should read."

Q How often did you make your periodic review of the LER book?

A As I recall, it varied. I really couldn't say exactly.

Q Well, without trying to be completely specific about it, would you say that you reviewed that book at least once a month?

A At least that often.

Q And sometimes more frequesntly than that?

A Yes.

Q On the occasions when you were reviewing it more frequently, would that be something like once a week?

A Yes.

Q From your observation of the other people that worked with you on your shift, will you tell us whether it was their practice to review the LER book at about the same frequency as you did?

A It was my practice that whenever I reviewed it, that I would remind the operators, "Have you read it lately?" They should have a look at it, and if any particular event that was listed I thought they should review, then I used to point it out.

Q And were there occasions when one of them, having read it, would point a particular one out to you?

A Yes, there was.

Q And did that happen fairly often?

A As I recall, it was pretty much both ways.

Q You mentioned another log or book called the locked valve book.

A Yes.

Q That is one you said you read every time. What kind of information was in the locked valve book?

A Identified in our various procedures were valves where we were required to control the position of them, whether it be locked open or whether it be

locked closed. And there was a listing in the locked valve book that would list all the valves that were required to be secured in one particular position.

Any time that a particular shift would need to change the position, they would then log in the date and the time and the reason for changing the valve, what the valve was, and who made the change, and then it had a restoration part, too, where when you returned it to its normal locked position, you would again mark that and indicate who and when and so forth.

Q And why was it that you made it a point to read this book every time you came on shift?

A I felt that it was essential that I know the position of control valves of that nature.

Q How many different valves were referred to in this book?

A I don't remember the number.

(Recess taken.)

THE WITNESS: I would like to make one clarification, if I could.

BY MR. FISKE:

Q Yes.

A In relationship to the question that you asked me, whether there were anything in the Unit 2 control room that related to prior Unit 2 transients and I replied no, and then you refreshed my recollection about the LER books, all right?

Unit 2 transients were also included in that LER book.

Q O. K.

A I am still not certain yet whether the time frame was right for the LER book, whether it was as I remember.

Q I guess I understand from that statement, Mr. Zewe, that you are saying that the LER book contained LER's not only for transients at other plants but also for prior transients at Unit 2; is that correct?

A As I remember, yes.

Q And when you say you are uncertain about the time frame, do you mean by that you are not sure today whether the LER book in fact was in the control room before the accident or not?

MR. KLINGSBERG: I think that you are -- well, your question as I understand it was during the period March '78 to March '79.

MR. FISKE: Yes.

MR. KLINGSBERG: You are asking particularly about the time of the accident.

Q All of the questions that I was asking you before we took the break concerning the LER book and the review and so forth, all of my questions were referring to the time period roughly March '78 through March '79.

A I understood that.

Q Did you understand that?

A Yes.

Q And just so I understand what your testimony is now, it is your testimony that during that period of time -- that is, one year before the accident -- the book was in the control room and was reviewed the way you have described it earlier?

A As I recall, yes.

MR. FISKE: Now I would like to mark as B&W Exhibit 735 a letter from Mr. Zewe to Mr. Collins dated July 5, 1977.

(Letter from Mr. Zewe to Mr. Collins, dated July 5, 1977, was marked as B&W Exhibit 735 for identification, as of this date.)

Q Just before I ask you a question about that, Mr. Zewe, let me just go back to the LER book for one last question.

A O. K.

Q How much before March 1978 is it your recollection that the LER book was in the control room?

A I don't remember.

Q So if I asked you the same question for the period of time, let's say, from March '77 to March '78, your answer would be you don't remember whether the book was in the control room at that time?

A I don't remember with any certainty.

Q All right. But just so I understand your testimony, is it your testimony that for whatever period of time the book in fact was there, the extent to which you reviewed it was as you described it earlier?

A Yes, that is correct.

Q O. K. Now I think we can get to Exhibit 735. This is a letter that you wrote to Mr. Collins of the NRC in support of an application for senior reactor operator's license examination?

A Yes, it is.

Q This indicates that you graduated from West Mifflin North. Is that a high school? In 1964.

A That is correct.

Q And then you went for a year to Steel Valley Technical School in Pennsylvania.

A That was actually for a two-year period. My last year in high school was split between the Steel Valley Technical School and then the year after I graduated from high school, I completed the final year.

Q What course of study did you pursue at Steel Valley Technical?

A Electronic technician.

Q Then did you go from there into the navy?

A That's correct.

Q And you were in the navy for approximately five years?

A Five years and nine months.

Q On the top of page 2 of this letter it says U. S. Navy 1966-1971. It says, "I served aboard the USS BAINBRIDGE 1969-1971 as a reactor operator." Is that correct?

A Yes, sir.

Q Did you have to obtain some sort of a license to do that?

A Yes.

Q From whom did you obtain the license?

A From the ship's captain.

Q Back on page 1 of this letter it refers to education at Basic Nuclear Power School at Bainbridge and also the Nuclear Power Prototype School in New York.

A Yes.

Q Was that training that you received in preparation for obtaining a license to operate the reactor on the BAINBRIDGE?

A It was preparatory education for that license, yes.

Q What kind of a ship was the BAINBRIDGE?

A Nuclear powered frigate.

Q What kind of a reactor did it have?

A It had two pressurized water reactors.

Q Included in the training that you had before you received your license, was there any simulator training?

A In the navy, you are referring to?

Q In the navy.

A The prototype training at S3G at West Milton, New York was a simulator and training facility.

Q Did the pressurized water reactor on the BAINBRIDGE have a pressurizer?

A Yes, it did.

Q Did you have written procedures that were used by you as a guide to operating that reactor?

A Yes, there were.

Q Did you have training in the navy with respect to emergency conditions?

A Yes.

Q Did you have training in the navy on loss-of-coolant accidents?

A Yes.

Q What type of loss-of-coolant accidents did you receive training on in the navy?

A Gross failures in the primary that led to loss of coolant.

MR. KLINGSBERG: Did you say "gross"?

THE WITNESS: As I remember, yes.

MR. KLINGSBERG: "Gross," g-r-o-s-s?

THE WITNESS: Yes, large breaks.

Q I guess that leads to the next question.

Did you have any training in the navy on small-break loss-of-coolant accidents?

A Not that I can remember, no.

Q Did the pressurized water reactors that you were trained on have high pressure injection system?

A As I recall, it had a system called a flood system. I don't recall the exact name of it now.

Q Did it have any kind of system --

A I do remember now. Pardon me. It was called a fill system. Fill system.

Q Did it have any kind of a system for injecting water into the primary system that was actuated by a drop in pressure?

A As I recall, no. It was manually operated.

Q Did you have any training in the navy on this reactor with respect to saturation?

A Only in terms of saturation conditions existing in the pressurizer and the steam generator.

Q In the course of your navy training, did you ever have any discussions, either in the classroom or on a simulator or during the course of operating

solid" refers to?

A "Going solid" means adding enough water to the primary in order to completely fill the pressurizer.

Q Is it fair to say that it describes the situation in which the entire reactor coolant system including the pressurizer is full of water?

A Yes.

Q In the course of the experience that you had in the navy when you went solid during cold shutdown, as you have just described, did you have occasion to experience the reaction of the system to changes in pressure during solid conditions?

A I don't recall specifics on it, but I recall all of the precautions that we used to take in order to insure that we did not either drain from and reduce pressure or add to and increase pressure while we were solid.

Q Well, wasn't that because you learned that a small increase or decrease in water being added to or taken away from the system could produce very sharp changes in pressure at a time when the system was solid?

A That is my understanding, yes.

the reactor, about the possibility of saturation occurring in some part of the primary system outside the pressurizer?

A I have no recollection of that.

Q Did you have, on this reactor in the navy, something equivalent to the reactor coolant pumps that were at Unit 2?

A We had what were called main coolant pumps that would circulate the primary coolant, but they were much different than Unit 2's.

Q Did you have training in the navy on cooldown procedures following a reactor trip?

A We did have training on cooldown procedures, yes.

Q Did you have any training on use of natural circulation?

A Not to my recollection.

Q I think you had testified on several different occasions that during the time you were in the navy you did have experience with going solid.

A The only experience that I can recall going solid was in a cold shutdown condition in order to calibrate the primary instruments.

Q What do you understand the phrase "Going

Q Let me just read to you some questions and answers from testimony that you gave before the Nuclear Regulatory Commission special inquiry group.

MR. KLINGSBERG: Which is this? Rogovin?

Q Rogovin, September 11, 1979. Here is a copy (handing to the witness).

MR. KLINGSBERG: What page?

MR. FISKE: Page 195 and 196. I will tell Mr. Zewe what I am going to read.

THE WITNESS: I was just looking in front of that --

Q I will do this. I will tell you what I would like to read is from line 16 on 195 through down to the bottom of 196. Before I even read it, if you want to take time to look on either side of it, take as much time as you want.

MR. KLINGSBERG: O. K.

Q Line 16, page 195 starts with a question by Mr. Frampton. "MR. FRAMPTON: What were the things in your training and simulation that made you want to avoid or be wary of going solid, running solid?

"WITNESS ZEWE: It is inherently unstable. A solid system changing with large flow rates is

inherently a very large pressure transient, either up or down.

"If you are putting in a lot of water or removing a lot. It is inherently very difficult to control. From my previous experience in the navy also, we used to take the primary plant solid every year to do instrument calibrations and pressure was very hard to control.

"MR. FRAMPTON: When you say pressure is hard to control, is that because small changes in liquid inventory result in large changes of pressure?

"WITNESS ZEWE: Yes.

"MR. FRAMPTON: That is dangerous to the system for stress reasons among others?

"WITNESS ZEWE: The controllability aspect which relates to -- from going solid, you are worried about overpressurizing.

"MR. FRAMPTON: What was your experience in the navy with these tests of going solid? Can you describe a little more about that?

"WITNESS ZEWE: Well, we used to go solid just to calibrate the primary instrumentation, but while we were solid, we took every precaution that we could to avert any pressure change because of

charging in water or adding heat to the system or draining any water or removing any heat from the system, so that you didn't have this pressure excursion because of the change in inventory system affecting the pressure."

Do you remember testifying before this Rogovin Commission back in September of 1979?

A Yes, I do.

Q And were you asked those questions and did you give those answers?

A I didn't recall these exact answers, but I have no reason to doubt that this is accurate.

Q When you referred to a "pressure excursion" in that last answer that I just read, is that sometimes also referred to as a pressure spike --

A Yes.

Q -- which also means a very sharp increase in pressure; right? If you were adding water.

A While you were solid, yes.

Q Yes.

What was your understanding as to why it was during normal operations that you wouldn't get a pressure spike if you added water to the system?

A During normal operation with normal pressurizer level at 220 inches, we had about 700 cubic feet of steam space along with the 800 cubic feet of water in the pressurizer, and it would be through the action of the pressurizer to limit the overpressure condition from adding water.

Q In other words, the presence of steam acts as sort of a cushion to prevent that kind of pressure spike?

A Yes, the pressurizer saturation conditions result in dampening or limiting the pressure spike.

Q Did the pressurizer on the reactor on the BAINBRIDGE have something that was comparable to the pilot operated relief valve?

A (No response.)

Q Maybe I will withdraw the question and make it simpler.

Did the reactor on the BAINBRIDGE have any type of valve, safety valve, to allow pressure to escape in the case of an overpressurization?

A Yes, it had primary pressure relief valves.

Q What was it that caused those valves to open?

A An overpressure condition in the reactor coolant system itself.

Q Did you understand that those were safety items?

A Yes.

Q Did you have any other valve at the top of the system which performed a function of relieving pressure which was not a safety item?

A As far as I can remember, the only other valve that we would have that would help in an overpressure condition would be the spray valve.

Q Did you understand, as a result of your training in the navy, that if one of these pressure relief valves opened and failed to close, that you could have a loss of coolant?

A Are you asking if I had training on that specifically?

Q Yes, or did you have that understanding while you were running this reactor on the BAINBRIDGE?

A I don't recall the training on that, but I did have an understanding that if the relief valve would fail open, that you would lose RCS water out of it, yes.

Q Did you have any procedure, while you were running this reactor, that was designed to help you diagnose whether or not one of these valves had stuck open?

A Other than the loss-of-coolant procedure, I don't recall any other procedures that dealt with detecting that the primary relief valve was open.

Q Put it another way. If you were in the course of a transient and the thought crossed your mind that maybe one of these closed relief valves was open, did you have any way of determining whether or not that was the case?

MR. KLINGSBERG: This is hypothetical now. You are not asking if he ever had such a transient on the BAINBRIDGE.

MR. FISKE: Not yet.

MR, KLINGSBERG: All right.

A I am afraid I lost track of exactly what you were asking.

Q Let me start again. And maybe I will pick up Mr. Klingsberg's comment and put it in the question.

Did you ever in fact have a transient while you were in the navy where either one of these

valves opened?

A Not that I remember now, no.

Q As a result of your training or from whatever other source that was available, during the time that you were operating this reactor in the navy, did you understand that if there were such a transient, that there was a way that you could determine whether or not these relief valves had stayed open?

A I don't remember whether there was or not.

Q Now, sometime in 1971 you left the navy?

A Yes.

Q And did you go right from there to Met Ed?

A Yes, I did.

Q And you started out as an auxiliary operator in Unit 1?

A I did start out as an auxiliary operator, but I was really hired in the group that was the group of auxiliary operators for Unit 2.

Q You first were licensed, were you not, sometime in 1974?

A Yes. Yes, that is correct.

Q Your letter to Mr. Collins says in paragraph 3 on page 2, that from October 1973 to

May 1976 you were shift foreman; do you see that?

A Yes, sir.

Q That was at Unit 1?

A Unit 1, and also Unit 2.

Q Did you become a shift foreman before you received your control room operator's license?

A I was a shift foreman when I obtained my control room operator's license.

Q You became a shift supervisor in May 1976; is that right?

A That is correct.

Q And you have held that position ever since?

A That is correct.

MR. FISKE: Could we mark this document as 736.

(Document bearing at the top the name William Zewe and underneath that "Major Training Programs" was marked as B&W Exhibit 736 for identification, as of this date.)

Q Let me show you a document that has been marked as Exhibit 736, Mr. Zewe, which has at the top "William Zewe." Under that, "Major Training Programs."

Do you see that?

A Yes, sir.

Q Do you recognize this document?

A I do not.

Q Would you take a minute to look at it and tell us whether, after having looked at it, this document reflects accurately the training that you received from the time you started at Met Ed through January 1979?

MR. KLINGSBERG: Can we have the question back.

(Question read.)

MR. KLINGSBERG: You are asking if it reflects all the training or, as it is entitled the major training?

MR. FISKE: Let's put it this way.

Q Mr. Zewe, after looking at this, can you tell us that you did in fact receive all of the training that is listed in this exhibit?

A As I remember, this is most of the major training that I in fact received, yes.

Q Just so we understand each other, you did in fact receive all of the training that's listed in this document?

A All of these courses, times, hours and dates are familiar in a general sense, but not as

80 hours or 24 hours. Generally speaking, yes, but I really couldn't attest to the fact that at any particular time that it was 80 hours of training or 24 hours.

The subject matter seems true, but only in a general sense.

Q As you look through this, do you remember receiving any training down at Lynchburg, Virginia from B&W other than what's listed on here?

A It seems to me that between item 11 in 1975 and the next-listed simulator training in '77, I believe that I was down there in '76. My recollection is being at the Lynchburg, Virginia simulator facility every year since the original time in '73.

Q Am I correct that you went to the simulator in January 1979? That is item 30 on this list.

A That's correct.

Q And you went at that time in your capacity as a Unit 1 shift supervisor?

A That is correct.

Q With the exception of the 1976 situation that you referred to a moment ago, Mr. Zewe, is there any other training that you received at B&W that

does not appear on this list?

A Not that I could pick out at this time.

Q I would like to ask you some questions, Mr. Zewe, which now sort of really encompass all of the training and learning that you had about the operation of the reactor, Unit 2, right up to the time of the accident in March of 1979. So I am asking these questions in terms of your understanding of the system and so forth as it existed in March of 1979.

A Unit 2.

Q Yes, based on any learning in the navy, at B&W or Met Ed or wherever.

The reactor in Unit 2 was a pressurized water reactor.

A Yes.

Q How does that differ from a boiling water reactor?

A I have a very limited understanding of the operation of a boiling water reactor since all of my training has been on the pressurized water reactor. But it is my understanding that in a boiling water reactor, that the reactor coolant is allowed to boil and that this steam then flows to

the turbine, and that the control rods come in from the bottom versus the top, instead of at the top as in a pressurized water reactor.

Q Is it fair to say that a fundamental difference between the two is that in a boiling water reactor the reactor coolant itself boils, whereas in the pressurized water reactor it does not; is that right?

A State that again.

MR. FISKE: Why don't you read it.

(Question read.)

A The only boiling that occurs in a pressurized water reactor is in the pressurizer, whereas in the boiling water reactor it actually occurs in the RCS itself.

Q In the pressurized water reactor, the water in the reactor coolant system itself is at very high temperature; right?

MR. KLINGSBERG: What do you mean, "very high"?

Q Let's say 550, 600 degrees Fahrenheit.

A Yes.

Q What is it that keeps the water at that temperature from boiling?

A The system is maintained at a higher pressure than saturation for the particular temperature.

Q And under normal operations that pressure is 2155 pounds per square inch?

A Psig.

Q Psig.

A Yes.

Q And is it correct, Mr. Zewe, that the function of the pressurizer is to maintain that pressure to keep the water in the reactor coolant system from boiling?

MR. KLINGSBERG: Pardon me. Just as a matter of clarification, are you asking these questions based on his current understanding today?

MR. FISKE: No.

MR. KLINGSBERG: His understanding at some prior point in time?

MR. FISKE: Yes.

MR. KLINGSBERG: Would you make that clear.

MR. FISKE: I explained to Mr. Zewe when I started this series of questions, that I was

asking him for his understanding as it existed in March 1979, based on any information that he had learned from any source, navy, B&W, Met Ed, wherever, at any point up to then.

Maybe you would like to hear the last question again.

THE WITNESS: Yes.

(Question read.)

A It was my understanding that the pressurizer had several functions, one of which was to maintain an inventory level in the RCS to accommodate for in-surges and out-surges from the reactor coolant system on heatups and cooldowns, and also to provide the highest pressure source for the reactor coolant system.

Q But you did understand that it was necessary to keep the water in the reactor coolant system under high pressure in order to keep it from boiling and that it was the function of the pressurizer to provide that pressure?

A Pressurizer normally being the hottest portion of the RCS to maintain the overpressure condition, yes.

Q Let me show you an excerpt, a section of

the final safety analysis report filed by Met Ed with the Nuclear Regulatory Commission, which is section 5.5.10, captioned "The Pressurizer." I will just read one sentence from it and then show it to you. It says, "The pressurizer is designed to provide a capability of maintaining the reactor coolant system at saturation pressure to prevent boiling of the coolant."

Were you familiar with that section of the FSAR before the accident?

A I was generally familiar with the FSAR, Unit 2. And I don't recall this particular paragraph of section 5.

Q But based on your understanding of the system back in March of 1979, you wouldn't consider that an inaccurate statement of the function of the pressurizer?

A No, I would not.

Q You referred a moment ago, Mr. Zewe, to the fact that the water in the primary reactor coolant system is at different temperatures in different places. There is a so-called hot leg and a so-called cold leg; is that right?

A Yes.

Q And is it correct that the temperature in the hot leg ordinarily in normal operations is somewhere around 605 degrees?

A 602, 603, yes.

Q And the hot leg is the portion of the primary system after the water has gone through the core and been heated up; isn't that correct? Between the core and the time the water gets to the steam generator?

A The hot leg, yes.

Q Yes. And then after it goes through the steam generator, the water gets cooled down to temperature of around 550 degrees Fahrenheit?

A Yes.

Q And at that point it is in the so-called cold leg of the reactor?

A Yes.

Q And then it goes back through the core again; correct?

A Yes.

Q And in the process of going back through the core the water gets heated back up again to 602 degrees; right?

A Yes.

Q And isn't it correct that also in the process of going through the core, the water which enters the core at 555 degrees provides a cooling function?

A Yes, it does.

Q Now, in the course of everything that you learned about the system up to the date of the accident, what understanding did you have as to why it was important in running the reactor to keep the water in the primary system from boiling?

MR. KLINGSBERG: Well, I object to the form on the ground that I don't think you have established a predicate for the question. But the witness can answer, if he can.

THE WITNESS: Would you repeat the question again, please.

(Question read.)

A You are referring to other than boiling in the pressurizer which in fact is part of the primary itself.

Q Yes, as a matter of fact, that is probably a helpful point. I think maybe we could establish that when I am talking about the reactor coolant system, let's assume from now on that I am

talking about that part of the system other than the pressurizer. And when we talk about the pressurizer, we will talk about the pressurizer. O. K.? But you are right. My question does refer to that portion of the system outside the pressurizer.

A Well, the importance was that the plant was designed to have the primary in a liquid state, and that the heat removal provided by the reactor coolant in cooling the reactor was much more efficient in a liquid state than it would be in a steam environment.

Q And what did you understand were the possible adverse consequences of reducing the coolant capability of the water in the reactor coolant system?

A The result would be overheating to the extent that you reduce the coolant.

Q Overheating of the core?

A That being your primary heat source, yes.

Q And what did you understand was bad about overheating the core?

A The reactor core is designed to operate within certain thermal limits and to exceed these limits would be adverse to maintaining the reactor core in a desired mode.

Q Well, did you understand that overheating of the core could produce damage to the core?

A Severe overheating could lead to damage of the core, yes. I believe that.

Q Did you understand that damage to the core could result in the release of radioactive material into the coolant?

A If the fuel cladding was damaged to a degree that the isotopes and gaseous products from the fission process would be released into the reactor coolant system, yes.

Q Putting it simply, you did understand that one possible consequence of overheating the core was causing damage which could produce a release of radioactive material into the coolant?

A In a severe case, yes.

Q Under normal operations, Mr. Zewe, what was the pressure -- I guess we have already established that the primary system pressure was 2155 psig.

A Yes.

Q And I think we have talked about the temperatures in the hot leg and temperatures in the cold leg. But what was the temperature in the pressurizer under normal operations?

A 648 degrees.

Q Is it correct that under normal operations the reactor coolant system pressure of 2155 was the same throughout the entire reactor coolant system, including the pressurizer?

A No, that is not correct.

Q Well, in what way is that not correct?

A Throughout the reactor coolant system you had pressure drops in the water traveling through the steam generator and also traveling through the reactor core and through the system piping itself, and you had a pressure increase afforded by the reactor coolant pumps themselves. So if you would look at the loop at any particular point, the pressure would not always be constant.

Q You had an instrument, didn't you, in the control room, that reflected reactor coolant system pressure?

A Yes, I did.

Q And at what point in the system did you understand that was measuring the pressure?

A In the hot leg.

Q And that is 2155 under normal operations?

A Yes.

Q And is the pressure in the pressurizer under normal operations 2155?

A Yes.

Q So that in simple terms, under normal operations the pressure was the same in the pressurizer and the hot leg, but the termperature in the pressurizer was higher than that in the hot leg?

A Yes.

Q Why did you understand that it was important that the temperature in the pressurizer be higher than the temperature in the hot leg?

MR. KLINGSBERG: You have skipped a question. You always ask "Why did you think it was important," but you never established first that he thought it was important. Maybe he did.

MR. FISKE: I will be happy to ask the question. I guess maybe I assume the answer to that.

Q Did you understand, Mr. Zewe, when you were running this reactor in March of 1979 that it was important to keep the temperature in the pressurizer above the temperature in the hot leg?

A Yes, I did.

Q Why did you understand that was important?

A In order to maintain primary system pressure control within the pressurizer.

Q O. K. But why were the relative temperatures important in order to be able to maintain that kind of control?

A Saturation conditions exist in the pressurizer and if I could maintain those saturation conditions above the rest of the RCS, then I can maintain pressure control within the pressurizer.

Q And what did you understand would happen if temperature in the hot leg exceeded -- equaled or exceeded -- temperature in the pressurizer?

A I don't recall considering that the hot legs would ever get hotter than the pressurizer temperature during normal operation or otherwise.

Q Why did you think you might not be able to maintain pressure control if the temperature in the pressurizer did not stay above the temperature in the hot leg?

A Well, the system is designed for the pressurizer to run at a higher temperature than the RCS. So it was designed that way in order to be

able to control pressure in the pressurizer itself. Because we have a heater in the pressurizer, we have a spray valve to reduce pressure in the pressurizer or the heaters to raise pressure, and you always wanted to have the control of that parameter in the pressurizer itself.

Q Well, did you have an understanding that if the temperature in the hot leg equaled the temperature in the pressurizer, that you might then have saturation in the hot leg?

A I believe I realized that if the termperature in the hot leg reached the saturation temperature for the pressure that existed in the hot leg, that you would be at saturation, yes.

Q Were you familiar with a concept, before the accident, called "transferring the bubble"?

A Could you rephrase in what context you mean transferring the bubble?

Q Were you familiar with the phrase "transferring the bubble" or "popping the bubble"?

A Yes, I am, in terms of we used to add nitrogen into the pressurizer and form a nitrogen bubble in the pressurizer and then we would vent off the nitrogen and draw a steam bubble in the

pressurizer. From that sense.

Q No, I am talking about a concept of transferring a steam bubble from the pressurizer into the hot leg, or into the reactor coolant system itself.

A I see what you mean.

The only time that I can recall thinking about transferring the bubble from the pressurizer to the RCS is if for some reason I would lose level and pressure control in the pressurizer and result in draining of the pressurizer and then drawing the bubble in the reactor coolant itself in the hot leg.

Q That is a concept that you were aware of before the accident?

A I have heard that concept, yes.

Q Mr. Zewe, what I would like to do is show you an exhibit that has been marked previously, which is a section of the technical specifications for Unit 2, section 2.0, and then the caption is "Limiting Safety System Settings." This has been previously marked as B&W Exhibit 572 (handing document to the witness).

I take it, Mr. Zewe, that in the course of the training that is reflected on this Exhibit 736

that we went through before, you did receive training on the technical specifications for Unit 2?

A I did.

Q Directing your attention to page 2-1 of the technical specifications, at the top of the page it says, "2.1 Safety Limits." Right under that it says "Reactor Core." And then under 2.1.1, it says "The combination of the reactor coolant core outlet pressure and outlet temperature shall not exceed the safety limit shown in figure 2.1-1."

Do you see the reference, the section of the specification that I just read?

A Yes.

Q And then there is a figure 2.1-1, is there not?

A Yes.

Q Made part of this same specification?

A Yes.

Q And that figure contains, does it not, a range of pressure-temperature relationships within which you were supposed to stay during normal operations of the reactor?

A Yes.

Q At the top, it indicates "RCS Pressure

High Trip."

Do you see that?

A Yes.

Q Is it correct that if pressure reaches that level, no matter what the temperature is, there will be an automatic trip of the reactor?

MR. KLINGSBERG: You are talking about in relation to this 2.1?

MR. FISKE: Yes.

THE WITNESS: He was asking about that (indicating).

A That itself is not a safety limit. That RCS pressure high trip is actually a limiting safety system setting of the RCS. But if you do exceed that, regardless of the temperature, you will have a reactor trip.

Q All right, and there is also an automatic reactor trip on LOCAs; correct?

A That is correct.

Q And that is also a limiting safety setting?

A Limiting ststem safety setting, right.

Q And up at the right-hand side is the RCS pressure variable low trip; correct?

A That is correct.

Q And does that indicate various pressure-temperature relationships at which the reactor will trip?

A Yes, it does.

Q All right.

A I would like to point out that this figure, 2.1-1, as applied to the reactor core safety limit under 2.1.1, only is applicable in modes 1 and 2.

Q And what are modes 1 and 2, for the benefit of the uninitiated?

MR. KLINGSBERG: Off the record.

(Discussion off the record.)

A Mode 1 is power operation greater than five percent power. Mode 2 is a start-up mode which allows you to go up as high as five percent power.

Q O. K. But mode 1 is normal operations?

A Yes, it is.

Q Now, on the right-hand portion of this figure there is a line that is designated "Safety Limit."

Do you see that?

A Yes, I do.

Q And did you understand that that is the safety limit that is referred to in section 2.1.1?

A Yes, I did.

Q And this line indicates various pressure-temperature relationships, does it not?

A Yes, it does.

Q And did you understand that the reactor was supposed to be operated so that the pressure-temperature relationship stayed on the left-hand side of that line?

A Not only to the left hand of that line, but also to the left hand of the bounding curves of the high pressure, low pressure, variable lower pressure, and high temperature in the acceptable operation region.

Q Why did you understand that it was a safety problem if pressure-temperature relationships deteriorated to the right side of the safety limit line?

A Say that again, please.

MR. FISKE: Would you read it back.

(Question read.)

MR. KLINGSBERG: Again I think you skipped a question. The witness didn't say

it was a safety problem.

Q Can you answer the question, Mr. Zewe?

MR. KLINGSBERG: If you can.

A I believe I can, yes.

I believe that my understanding of exceeding that safety limit, as you put it, would be to prevent from overheating the cladding.

Q Why did you understand that the pressure at which the reactor coolant system was maintained had anything to do with whether the cladding was overheated or not?

A The overcladding -- or the heating of the cladding is related to departure from nuclear boiling, and that the pressure and temperature has a relationship in regard to departure from nuclear boiling.

Q What happens if the pressure-temperature relationship deteriorates to the point where there is a departure from nuclear boiling?

MR. KLINGSBERG: Again you are talking about and say what happens. You mean what was his understanding prior to March 1979?

MR. FISKE: Right.

A My understanding in a theoretical

sense was that once you left the efficient means of heat transfer afforded by nuclear boiling and departed from that into either film boiling or bulk boiling, you significantly reduced the heat transfer capability.

Q What is the difference, as you understood it, between film boiling and bulk boiling?

A My understanding at that time I believe was that the film boiling was the covering of a steam layer over a heat transfer surface area, and that the bulk boiling was a much larger layer of steam and it would lead to reduced heat transfer capability from that surface area.

Q Directing your attention, Mr. Zewe, to page B2-1 of this same part of the technical specifications --

A O. K.

Q -- this part of the technical specifications follows a note that says, "The summary statements contained in this section --"

A Where is that?

Q The preceding page. It says, "The summary statements contained in this section provide the bases for the specifications of section 2.0 and

are not considered a part of these technical specifications."

You were familiar with that before the accident?

A Yes, that the bases were included after the specs, yes.

Q And that the material on page B2-1 captioned "Safety Limits" provides the bases for the specification back under section 2.1.1 that we were talking about earlier; right?

A Yes.

Q Section 2.1 captioned "Safety Limits" has a section that says "Bases" and then it reads "2.1.1 and 2.1.2 Reactor Core." It reads, "The restrictions of this --"

A I was just referring back to what 2.1.2 was.

Q Let's start again. Back in the very beginning of this page 2-1, there is the paragraph captioned "Safety Limits Reactor Core" under section 2.1.1 that we read earlier. Correct?

A Yes.

Q What we are about to read now you understood was the basis for that section; correct?

A Correct.

Q That appears as B2-1 and reads, "The restrictions of this safety limit prevent overheating of the fuel cladding and possible cladding perforation which would result in the release of fission products to the reactor core."

Do you see that sentence?

A Yes, I do.

Q And you were familiar with that before the accident?

A Yes, I was.

Q Just so we can complete the loop, as they say, this reference to safety limit in 2.1 -- this reference to safety limit in the sentence that I just read refers to the line on the figure captioned "Safety Limit" which we referred to previously; right?

A Yes. The far right-hand line.

(At this time, 12:30 p.m., a luncheon recess was taken.)

AFTERNOON SECTION

2:05 p.m.

W I L L I A M H. Z E W E, resumed.

EXAMINATION (continued)

BY MR. FISKE:

Q Mr. Zewe, were you familiar, before the accident, with the heatup/cooldown curve which was a part of a number of the operating and emergency procedures at Met Ed, Unit 2?

A I was familiar with the heatup and cooldown curves which were contained in our procedure, yes.

Q Let me show you a document which has been marked before as B&W Exhibit 540.

Do you recognize that as the operating procedure for a unit cooldown?

A It looks familiar as the unit cooldown procedure as I recall, yes.

Q Directing your attention to page 3, at the bottom there is a paragraph 2.1.1 It says, "Reactor coolant temperature, pressure and cooldown rates shall be maintained within limits specified in figures 3.4-2 and 3.4-3 of TS3.4.9.1," and then there is a reference to figures that are attached.

Do you see that?

A Yes, I do.

Q Then turning to the back, the first figure is a heatup/cooldown curve; correct?

A Figure No. 1, yes.

Q Did you understand the effect of this particular paragraph of the procedure was that reactor coolant temperature and pressure had to be maintained within the limits specified on the curves in this figure?

A The limit and precaution did state it was to be maintained within the limits of that curve, yes.

Q Just looking at the figure, you see a number of different curves there.

MR. FISKE: Off the record.

(Discussion off the record.)

Q Are there curves on this figure called fuel pin compression curves?

A They are labeled, yes, the "minimum RC pressure to maintain compression force on the fuel."

Q Which curves? What number are they?

A Curve 2 and curve 3.

Q What did you understand was the difference

between curve 2 and curve 3?

A Forced flow versus natural circulation.

Q Curve 2 is forced flow?

A Curve 2 is natural circulation.

MR. FISKE: Off the record.

(Discussion off the record.)

Q On which side of the curve did you understand you were supposed to stay?

A Between curve 1 and curve 3.

Q I take it if you were in natural circulation you would be between curve 1 and curve 2?

A That is correct. During cooldown.

Q Yes.

What did you understand that the line represented by this curve represented?

MR. KLINGSBERG: Which curve are you talking about?

MR. FISKE: Let's take curve 2.

Q Well, let's take curve 3.

A What did I understand that curve to represent?

Q To represent, yes.

A It represented a temperature and pressure relationship to insure that we had RC pressure

applying a compressive force on the fuel cladding.

Q Is it correct that it was important to maintain a certain RCS pressure on the outside of the fuel cladding to compensate for pressure being exerted from the inside of the fuel cladding?

A Yes. Our fuel was pressurized. And this insured that the primary pressure pressing in on the clad would counteract the inside pressure of the pressurized fuel.

Q And why did you understand the temperature at any given level might have an effect on that pressure ratio? In other words, why did you understand that this curve represented a number of different pressure-temperature relationships rather than simply a straight line showing a constant pressure?

A I don't recall asking myself or having obtained that knowledge as to why there was a particular temperature, other than for a cooldown we always deal in a temperature-pressure relationship. But I felt that basically it just dealt in the pressure between the two.

Q What did you understand would happen if you allowed the pressure-temperature relationship

to deteriorate to the wrong side of the line?

A During a cooldown, again.

Q Yes.

A These curves do not apply during heatup. Only during a cooldown, the curves.

Q We are talking now about during a cooldown.

A It was my understanding that you could have some information of the cladding being repositioned by the pressure inside the fuel, the extent of which was determined on how far you would violate the curves or be on the wrong side of the curves; and that that determination would be made after the fact, so to speak.

Q Is it fair to say that you understood the further you went on the wrong side of the curve, the greater the risk was of distortion and possible damage to the fuel?

A I believe my understanding was, the further that you exceeded the limit, the more probability you had for greater damage, yes.

Q Did you receive training at B&W on compliance with this curve?

A I recall B&W training in relationship to

what they are for and how to use them, yes.

Q Do you remember being trained at B&W that if you found yourself on the wrong side of this curve, you should try to get back on the right side of the curve as quickly as possible?

A Yes.

Q Did anybody ever tell you exactly how far to the right of the curve you would have to go before there was a serious risk of damage to the fuel?

A No, I don't recall any discussions or any training, either by B&W down at Lynchburg or at any other place, that really addressed what exactly would happen or how far you could go or exactly how much these curves were conservative. And it was always as I recall that if you did have to violate them, that an evaluation then would be made to see if there was any problem that was caused by it. I do know that there were occasions that we would violate them knowingly. At the training in B&W, insomuch as if you would have an OTSG tube leak and in order to mitigate the circumstances of the primary to secondary leak we would purposely depressurize outside of curve 2 or curve 3 in order to handle that particular casualty. And we had to

address that on several occasions.

Q And how far to the right of the curve did you go on those occasions?

A Magnitude-wise I really don't recall exactly how far it was, but it was in excess of the limit.

Q It is fair to say, I guess, isn't it, Mr. Zewe, that unless there was a specific reason to be on the right side of the curve, you were supposed to be on the left; and if you got on the right-hand side, you were supposed to get back to the left as quickly as you could?

A Yes, I would say that.

Q Now, these other two or next two curves of 5 and 6, can you tell us what they are?

A Curve 5 is the minimum RC pressure for single pump in a loop net positive suction head. Curve 6 is minimum RC pressure for two pumps in a loop at positive suction head.

Q What does "net positive suction head" stand for or refer to?

A Net positive suction head is the total pressure felt as the suction of a centrifugal pump which is based on static pressure conditions of the

fluid at the pump suction and also the pressure of the fluid due to elevation at the suction to the centrifugal pump. And this was the needed suction pressure in order for that pump to operate within its design capability.

Q Which side of the line did you understand you were supposed to stay on?

A To the left of the line.

Q And again, why did you understand that this line was presented in the form of a curve reflecting various pressure-temperature relationships?

A Well, the pressure of a fluid at the suction of the pump had a relationship between its temperature and its pressure. What you were concerned about is possible cavitation or flashing of the fluid in pump suction, and that had a definite temperature-pressure relationship.

Q When you refer to "cavitation or flashing," is that the same thing as referring to the formation of steam?

A Basically, but it's not that simple. The cavitation really refers to reaching the saturation pressure of the fluid at the eye of the impeller and forming in this case steam, since the

water is fluid; and then once the steam bubbles in the water go toward the volute of the pump, the increased pressure there is the pressure increase which collapses the steam bubbles and it is really the collapsing of the steam bubbles and the filling of that void by the water which actually does the damage and concern to the pump itself.

Q So that the process that you described as cavitation ends with the collapse of the steam bubble. It starts with the formation of the bubble.

A Right, the real damage and concern is the collapsing end of it, not the formation of it. But you wouldn't have the collapsing if you didn't have the forming, right.

Q And the curves, curves 5 and 6, do they reflect pressure-temperature relationships at which there is a danger of the steam forming at the eye of the impeller?

THE WITNESS: Would you read that back? I was glancing down and missed the beginning of it.

(Question read.)

A It was my understanding that these

curves were conservative curves that I would reach before I would reduce the pressure in the suction of the pumps sufficiently enough to cause flashing in the eye of the impeller.

Q Did you have a mental line in your mind in or about March 1979 to the right of these curves at which saturation would actually occur at the eye of the impeller?

MR. KLINGSBERG: Now we are talking about --

MR. FISKE: 5 and 6.

MR. KLINGSBERG: -- flashing?

MR. FISKE: Yes.

MR. KLINGSBERG: O. K.

Q Do you understand the question, Mr. Zewe? We can read it again if you like.

A I believe I do, yes.

You asked if I had some mental line that I would say if I would cross this line I would definitely have flashing and saturation conditions for that pump.

Q Yes.

A I don't have any particular line limit in my mind. I was going to use the curves that we

had in our procedures and use them as my guide.

Q Mr. Zewe, you said earlier that curves 2 and 3, the fuel pin compression curves, did not apply during heatup; is that correct?

A That is my understanding, yes.

Q Did the net positive suction head curves apply during heatup?

A Yes, they did.

Q And isn't it correct, Mr. Zewe, that there were in effect on the day of the accident a number of different operating and emergency procedures covering both heatup and start-up of the plant and also covering shutdown and cooldown of the plant which had the heatup/cooldown curves as part of those procedures?

MR. KLINGSBERG: That is an awfully long, complicated question.

MR. FISKE: Yes.

MR. KLINGSBERG: Could we have that read.

Q I will make it a little simpler.

Isn't it correct that as of March 1979 this figure, the one we have just been looking at called "heatup/cooldown curve," was made a part of a number of different operating and emergency

procedures covering both the start-up and the shutdown of the plant?

A Not only those areas of shutdown and start-up. I am aware, and as I recall, there are other procedures which have that curve and graph included in the body of or appendices of those procedures that govern other than heatup -- other than start-up and cooldown, yes. Those exact procedures, without reviewing them I really don't know, but there are others.

Q Let me just run through a few specific procedures and see if you can tell us. And if you would like to see the procedure, we can show it to you, if you have any question.

Do you remember whether these --

A If I may just add something?

Q Sure.

A A lot of my knowledge now over the last three years has been in Unit 1. And I haven't held a license in Unit 2 in almost three years now. So an awful lot of these procedures, I'm afraid that I may confuse what is in the current Unit 1 procedures rather than what was in the Unit 2 procedures prior to March '79.

Q Well, let's just stop for a second.

Am I correct in understanding that everything you have told us up to now is based on an understanding you had of Unit 2 procedures before the accident?

A To the best of my ability, yes.

Q Let me just ask you about a number of specific procedures, and if you tell me that you would like to see the procedures to answer the question, I would be happy to show it to you.

A Very well.

Q I am referring first to procedures applicable to the start-up of the unit. I would like to ask you whether or not the figure that we have been talking about was a part of the unit heatup procedure.

A I feel certain in my mind, yes, it was.

Q O. K. Was it part of the unit start-up procedure?

MR. KLINGSBERG: Is there some reason why we shouln't show it to him?

MR. FISKE: No, not at all.

A I would not think it was necessary for the unit start-up procedure. Because the unit heatup

procedure ends at 525 and 2155 and you are already heated up. But it would not surprise me if in fact it was there.

Q And with respect to shutdown, was it part of the unit shutdown procedure?

A I would have to make the same comment as to start-up. I would not absolutely think it necessary to be in the shutdown procedure.

Q O. K. Well, let me show you at this point, Mr. Zewe, a copy of the unit start-up procedure and a copy of the unit shutdown procedure.

A Fine.

MR. FISKE: We will mark them as the next two exhibits, 737 for start-up, and 738 for shutdown.

(Copy of unit start-up procedure was marked as B&W Exhibit 737 for identification, as of this date.)

(Copy of unit shutdown procedure was marked as B&W Exhibit 738 for identification, as of this date.)

Q Would you like to look at those two documents, Mr. Zewe, and see if that helps refresh your recollection?

A Yes, I would. Thank you.

Yes, I agree now that they are in the unit start-up and the unit shutdown procedures.

Q In the procedure for decay heat removal via the once-through steam generator procedure?

A I would believe that it would be contained in there, yes.

Q And again, this is your understanding at the time of the accident?

A I would say yes.

Q When you said you would have expected it to have been there, why would you have expected it to have been there?

A Generally, any procedure that dealt with decay heat removal or a unit cooldown or heatup, I would expect to have heatup and cooldown curve as part of the enclosure. Those like start-up and shutdown, where you are not really changing pressure and temperature, they are included but I don't feel they are really necessary.

Q I think we just looked at the unit cooldown procedure a moment ago. Did you understand that the curves were part of the decay heat removal procedure?

MR. KLINGSBERG: It would be better if we showed him the procedure and then he can tell us if he knows.

MR. FISKE: Sure.

Q I show you a copy of the decay heat removal system procedure, which is marked Exhibit 539.

A It does not include the heatup and cooldown curve that appears in the other procedures.

Q Is there an expanded heatup/cooldown curve as part of the decay heat removal system procedure?

A Yes, there is.

A Do you have a copy of the decay heat removal through steam generator procedure in front of you?

MR. KLINGSBERG: What exhibit is that?

MR. FISKE: Exhibit 572.

A I do not. I have shutdown, start-up, unit cooldown and decay heat removal system.

Q You now have decay heat removal through steam generator procedure (handing document to the witness).

A I now have it.

Q I take it, Mr. Zewe, that you did receive training on the use of all of these procedures in the course of the training that you received at Met Ed?

A I did receive training on all of these procedures both at Met Ed and at B&W in Lynchburg, yes.

Q Now, looking at the decay heat removal through steam generator procedure, page 3, section 2.1.1 states that reactor coolant temperature, pressure and cooldown rate shall be maintained within the limits specified in figure 3.4.2 of TS3.4.9.1, and then there is a reference to a figure 1.5.2 attached. Correct?

A That is correct.

Q And the figure that is attached is the heatup/cooldown curve we have been discussing; right?

A Yes, it is.

Q Now, I would like to direct your attention to 2.1.7, which is on page 4. This reads, "During decay heat removal by natural circulation, maintain TH 30 degrees Fahrenheit below the saturation temperature corresponding to pressurizer

pressure in order to prevent boiling in the hot legs."

Do you see that?

A Yes, I do.

Q What did you understand was the purpose of that requirement?

A To insure that you had RCS pressure control in the pressurizer.

Q Did you understand that there was any particular reason applicable to decay heat removal by natural circulation, why it was important to maintain TH 30 degrees Fahrenheit below saturation?

A Again, for the same reason that I just stated, that it was important to maintain RCS pressure control by way of the pressurizer.

Q I think you said this morning, when we were discussing some of the ways the system works, that you understood it was always important to keep the temperature in the pressurizer above the temperature in the hot legs in order to maintain pressure control in the pressurizer; right?

A Correct.

Q I guess my question is, did you have any understanding as to whether there was any other reason for maintaining TH 30 degrees below the

saturation temperature that was particularly applicable to decay heat removal by natural circulation?

A Not anything other than maintaining the pressurizer hotter and maintaining the pressure control that you have afforded in the pressurizer itself. Only in that relationship.

Q During the course of the time that you went through training on this particular procedure, whether it was at Met Ed or B&W, or wherever, when this was being discussed, did you ever ask anyone why do we have this particular provision in this procedure, why do we have it stated in the decay heat removal by natural circulation procedure that we have to keep TH 30 degrees below saturation in order to prevent boiling in the hot legs?

A My recollection is that I do remember 30 or 35 degrees as being the number, but the reason was to maintain the pressurizer that amount of degrees above the RCS so that you maintain pressure.

Q So we can finish with this, is it correct that you had no understanding that there was any reason to keep TH 30 degrees below saturation applicable to decay heat removal by natural

circulation that wasn't also applicable to normal operations?

MR. KLINGSBERG: Can we have that again? There are several negatives in the question.

MR. FISKE: Sure, fair enough.

(Question read.)

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

The witness can answer, if he can. I find it rather confusing.

MR. FISKE: Well, I don't want to confuse Mr. Klingsberg or anyone else, so let me -- I am trying to make this as simple as I can. If you think it confusing, I would rather start again.

Q You have this provision that we hav just been talking about in the decay heat removal through the steam generator procedure. It specifically refers to decay heat removal by natural circulation and says that it is important to maintain the TH 30 degrees below the saturation temperature to prevent boiling in the hot legs; right?

A Yes, that is what it reads, yes.

Q My question is very simple. Did you understand that there was any reason why it was important to do that during decay heat removal by natural circulation that wasn't also applicable during normal operations?

A Either in normal operations or in decay heat removal by natural circulation, it was still important and desirable to maintain pressure control in the pressurizer itself.

Q That reason --

MR. KLINGSBERG: Did you finish your answer?

THE WITNESS: Yes.

Q That reason applies to both, normal operations and decay heat removal by natural circulation; right?

A Right, and the plant was designed for both. It was designed for natural circulation.

Q Did you understand that there was any reason to do this during decay heat removal by natural circulation in addition to the reason that was applicable to both conditions?

MR. KLINGSBERG: What is "this"?

MR. FISKE: Maintaining TH 30 degrees

below saturation.

A No, as long as you could keep the pressure control in the pressurizer, it didn't make any difference. And in here, all right, natural circulation implies that you have a loss of power. All right? Loss of power to your pressurizer heaters. All right? Which was the main way to maintain pressure control in the pressurizer. But you were still looking at the same fact, trying to maintain the pressure control in the pressurizer in either case.

Q Did you understand that it would be more difficult to achieve natural circulation if there was boiling in the hot legs?

A I don't recall receiving any training at Met Ed or B&W relating to natural circulation being a problem because of boiling in the hot legs. I don't recall any of that training and I don't recall thinking about if I had boiling would that disrupt natural circulation and to what degree; I don't recall having that knowledge before the accident.

Q So you had before the accident no concern, then, that the formation of steam in the

hot legs might make it more difficult to achieve natural circulation?

A My recollection is that the only time that I would have boiling in the hot legs is only if I would -- like during a LOCA where I would drain the pressurizer and completely lose level in pressure control, and I would then be on a high pressure injection mode of cooling, all right, feeding through the core and out the break and cooling it that way, and I would not rely on natural circulation cooling if I had boiling in the hot legs, and that is the only time that I could relate to having boiling in the hot legs is to have a LOCA and losing pressurizer level and then having the hot leg boil. So in this case trying to establish natural circulation and have boiling in the hot legs, I never really considered that, as I recall.

Q O. K.

A And also, as with -- any transient response training that I received never showed where I could have boiling and I would be concerned with looking for natural circulation, either. It was always either I had normal natural circulation or in that case of boiling I have already had a loss of

coolant and I was relying on the high pressure injection.

Q How did you understand that you were supposed to determine whether TH was 30 degrees Fahrenheit below the saturation temperature corresponding to pressurizer pressure?

MR. KLINGSBERG: This is getting back to 2.1.7?

MR. FISKE: Yes.

A By comparing the saturation pressures and temperatures in the pressurizer and in the RCS.

Q And how would you know what the saturation temperature and pressure was?

A By consulting steam tables I could compare what the saturation pressure would be for an existing temperature and vice versa. In actual training or practice, I do not recall actually doing that in any of my transient response. I don't remember pulling out the tables and verifying the two. Like I stated before, normally we either had it and didn't worry about it, that we already had natural circulation, or we had the leak where we were on high pressure injection.

Q But you were aware by the time of the

accident that you could determine whether you were at a saturation temperature by looking at the steam tables?

A I did have working knowledge of the steam tables and checking various pressures versus temperatures, yes.

Q Were you aware of the temperature in the steam generator during normal operations?

THE WITNESS: Would you repeat that, please?

(Question read.)

A Yes, I was.

Q And the pressure in the steam generator during normal operations?

A Yes, I was.

Q That is a saturation pressure-temperature relationship, is it not?

A The temperatures and pressures which are indicated in the control room at normal operation is really not saturation conditions. It is actually superheat conditions, which is the desired output of the once-through steam generator. So it is actually superheat which goes beyond saturation conditions.

Q And what were those temperatures and pressures?

A Steam generator pressure normally runs around 925 pounds, and the steam temperature varies but it runs in the neighborhood of 585 degrees, 590 degrees.

Q And you said that is superheat; right?

A Yes, it is.

Q Not just ordinary saturation?

A No, that is superheat. The B&W design is to provide and insure that we have at least a minimum amount of superheat out of the steam generator.

Q And for there to be simply saturation as opposed to superheat with temperature at 585, did you understand that pressure would have to be higher than 925 or lower than 925?

A To be at saturation?

Q Yes.

A Temperature would have to be lower.

Q Pardon me? I didn't hear the answer.

MR. KLINGSBERG: Let's have the question.

MR. FISKE: I think we might have crossed wires on that.

(Record read.)

MR. KLINGSBERG: There is a mixup because the question was about pressure and he answered about temperature.

THE WITNESS: Yes.

A So you are asking that in superheat conditions, is the temperature higher than for saturation conditions?

Q That is another way to put it.

A And I am saying yes, just to clarify.

Q O. K. And the other side of that equation is that pressure would have to be lower for superheat for the same temperature than it would be for saturation?

A Exactly right.

Q Now could you look again at the unit cooldown?

MR. KLINGSBERG: What exhibit is that?

MR. FISKE: Withdrawn. Before we do that --

Q Were you aware on the day of the accident what pressure would produce saturation as opposed to superheat at a temperature of 585 degrees?

A I don't want to end up like the last

thing, answering in the wrong terms.

THE WITNESS: Would you mind repeating that, please.

MR. FISKE: Just read it back.

(Question read.)

MR. KLINGSBERG: Are we still talking about the steam generator?

MR. FISKE: Yes.

A I would have to refer to the steam tables for the answer to that.

Q After a reactor trip, is there ordinarily a change in the steam generator temperature?

A Yes. It goes down.

Q Does it go down to somewhere in the vicinity of 550?

A Yes.

Q What is the saturation pressure for that temperature during post-trip conditions in the steam generator?

A Approximately 1,010 pounds.

Q Going back to the unit cooldown procedure, which I believe you have in front of you --

MR. KLINGSBERG: Which exhibit is that?

THE WITNESS: 540.

MR. KLINGSBERG: 540?

THE WITNESS: Yes.

Q -- there is a reference on page 14 at the bottom of the page to a spray adjustment.

Do you see that? After the word "note."

A Under 4.31, that note at the bottom?

Q Yes.

A O. K.

Q The note says that "This spray adjustment," that is, the one referred to in 4.31, "is to prevent pressurizer out-surge in the RC hot leg."

Do you see that?

A Yes, I do.

Q What did you understand -- again, based on your training before the accident -- was the reason to prevent pressurizer out-surge under the RC hot leg?

A I don't remember what my recollection was there about this step exactly now. I am trying very hard to remember what I thought then, but I don't know, I can't recall.

Q Have you got the decay heat removal system operating procedure in front of you over

there?

A Yes.

MR. WURTZ: B&W 539.

Q Directing your attention to page 5, Mr. Zewe, the top of the page, paragraph 4, it says, "Insure that RCS pressure is maintained above that shown on figure 2 to prevent the formation of a steam bubble at the highest point of the 36-inch reactor coolant piping."

Do you see that?

A Yes, I do.

Q And then directing your attention to figure 2, is there a curve on that figure which is captioned "Minimum Pressure to Prevent Boiling in Top of the 36-inch RC Pipe"?

A Yes, there is a curve labeled such.

Q O. K. Why did you understand that it was important to prevent the formation of a steam bubble at the highest point in the 36-inch reactor coolant piping in carrying out this procedure?

A I don't have a recollection of that curve.

Q Let me show you one more document, Mr. Zewe.

A O. K.

Q The pressurizer operation, which I don't believe has been marked before.

MR. FISKE: We will mark this as B&W 739.

(Pressurizer operation procedure was marked as B&W Exhibit 739 for identification, as of this date.)

Q You have in front of you, Mr. Zewe, pressurizer operation procedure?

Yes?

A Yes, I do.

Q Directing your attention to the back, figure 4, page 27 --

A I believe my figure 4 is on -- it is between page 25 and 26, figure 4. The numbers aren't that clear.

Q Look at page 27.

A Mine may not be in order.

MR. WURTZ: I think there is a 27 along it on the horizontal --

THE WITNESS: Oh, I'm sorry. I see that.

MR. WURTZ: Microfilm No. 1592.

THE WITNESS: Mine appears to be 25 to 27 and then to 26. They are just out of order.

Q You have now found page 27.

A Yes.

Q Do you see the fuel pin compression curves and the net positive suction head curves on that page?

A Yes.

Q Did you understand that in following the pressurizer operation procedure, it was important to comply with those curves?

A Yes.

Q I would like to direct your attention to paragraph 4.3.8.6, which is on page 22. And I direct your attention to the second paragraph, and particularly the note that says, "Also insure that approximately 45 psig is indicated on the hot leg indicator to prevent boiling at the top of both loop hot legs."

Do you see that?

A Yes, I do.

Q Why did you understand that it was important to prevent boiling at the top of both loop hot legs in carrying out this procedure?

A My recollection is of the 45 pounds, but I don't recall the reason behind the rest of the statement or why particularly that was bad at this

particular point. Just that we would follow the procedure for 45 pounds or 293 degrees in the pressurizer, again, to maintain pressure control within the pressurizer. I don't believe that I thought what if I did not maintain this. I don't recall that anyway.

(Recess taken.)

BY MR. FISKE:

Q Mr. Zewe, during the period of time before the accident, you had been employed at Met Ed as auxiliary operator and then as a shift foreman and then finally as a shift supervisor; right?

A Yes.

Q And that spanned both Units 1 and 2; right?

A Auxiliary operator, all of the working knowledge was actually for Unit 1. But as shift foreman, both units. And as shift supervisor, both units.

Q You letter to Mr. Collins states, in paragraph 4 on page 2, that your experience as shift supervisor included the writing and reviewing of operating procedures.

Do you see that?

A Yes, I do.

Q And it is correct, is it not, that you did participate in the preparation of operating procedures for Unit 1 and Unit 2?

A It is true that I was involved in the upgrading and rewriting of procedures that were in place and of draft procedures which were provided by B&W. Really in that sense, of reviewing it, making changes and having the changes approved for our plant operation and use.

Q The final decision on each procedure was made by the PORC, was it not?

A Actually made by the unit superintendent. He gets a recommendation from PORC, but he actually has the responsibility of approving it or not.

Q Well, just looking at one of these procedures that we have had before us, there is a form on the cover of the procedure, is there not, with a number of blanks indicating approval by various people?

A That is correct.

Q One of those blanks is the recommendation of the PORC that the procedure be approved; correct?

A That is true. They recommend approval.

But the actual approval before it is used is then made by the unit superintendent.

Q And when the procedure becomes final, it carries with it both the signature of the chairman of the PORC signifying the recommendation of approval and also the signature of the Unit 2 superintendent signifying approval; right?

A That is correct.

Q Certain procedures are designated operating procedures and there are other procedures that are designated emergency procedures; is that correct? For Unit 2.

A Yes, that is correct.

There are others besides those two, but those are two of the procedures in use, yes.

Q And did you have any role in the preparation of emergency procedures as well as in the preparation of operating procedures?

A I had a role insomuch as recommending changes, reviewing, and alike, as far as the emergency procedures went. I periodically reviewed them, recommended changes, trained on them.

Q Isn't it a fact, Mr. Zewe, that before any operating procedure or any emergency procedure

became final, the shift supervisors as well as others were provided with the draft procedures and given an opportunity to make whatever comments they wanted to make or whatever improvements they felt should be made in the procedure?

A Generally, that was the case, yes.

Q And it is correct, isn't it, Mr. Zewe, that you understood before the accident that these procedures were for the guidance of the operators in running the plant?

A Yes, they were.

Q Before the accident, did you believe that it was important that you and the operators that were working with you understood the procedures?

A Yes.

Q Did you understand that it was important that these procedures not be confusing or difficult to apply?

A It was my belief that the ease to understand and the ease of applying the procedure was a goal of the procedures, yes.

Q And did you understand that in the course of reviewing these operating and emergency procedures before they became final, that you were supposed to

report to someone if you felt that any of these procedures were confusing or difficult to apply?

A At any time when I reviewed a procedure for whatever reason, if I felt there was a need for a change, I would not hesitate to initiate that change.

Q Did you also understand that you had the same obligation at any time if you felt that any procedure was wrong?

A I believe my answer is the same, yes. If I felt that it was wrong, that I would initiate any changes that I felt were necessary and it would go through the approval chain to change the procedure itself.

Q And did you feel the same way if you felt that any procedure that you had reviewed was inadequate in any way?

A I think that question is parallel with the other ones, and my answer is yes.

Q Now, will you tell us on the day of the accident how many different emergency procedures there were that were in effect?

A Could you clarify that more? Do you mean how many we had access to? How many we should have

been using? Or which ones were actually used? Or --

Q No.

A I am not sure what you are asking.

Q On March 27, 1979 --

A March 27th?

Q -- how many emergency procedures were there in effect at Three Mile Island, Unit 2?

A Numbers, I am not sure. I would have to go through them and count one, two, three. I don't know sheer number-wise how many emergency procedures we had.

Q Was it less that 15?

MR. KLINGSBERG: Do you include abnormal procedures?

MR. FISKE: No, I am just talking about emergency procedures. The ones that were labeled "emergency procedures."

A I would really have to sit down and just add them up. So I really don't know. I would say 20, 25. I don't know exactly what the number is right now offhand.

Q And it's correct, is it not, Mr. Zewe, that in format the emergency procedures were divided into two general sections? One section that

described symptoms of a particular problem, and then a second section that described the actions that should be taken to deal with that problem?

A Well, it was actually broken up into more categories than just two. One is one that gave symptoms of it; then it gave immediate automatic actions, then manual actions, then follow-up actions.

Q And the manual actions and follow-up actions were things that the operator was supposed to do to solve the particular problem covered by that procedure; correct?

A He was supposed to use the manual actions and the follow-up actions as a guide and an aid in combatting the particular upset that he had, yes.

Q And the symptoms section of the procedure were a guide to the operator in determining what type of particular upset he had; correct?

A He would use those symptoms in their relationship to the plant parameters and his knowledge in order to determine which of the procedures he was into. Because many of the symptoms were overlapping and would be in various procedures, and there may also be a reason why he had a particular symptom for what was happening, or what he has done.

So it really was a tool that the operator used in making the overall evaluation in how to combat the particular upset or condition he had.

Q But going back to where we started, isn't it fair to say, as an overall general description of the procedures, that there was a symptom section used by the operators to help determine what the problem was, and then there was an action section of the procedure that helped the operator decide what to do to solve that problem once he had figured out what the problem was?

A They were used as part of the overall evaluation and action taken, yes. They were a part of that.

Q Did you ever state to anyone, at any time before the accident, that you felt that the procedures were not set up well enough so that you might have a problem in deciding during a transient which particular procedure to use?

A As I recall, I probably did, though I do not remember the circumstances or the individual conversations. But in effect, I was trying to relate, you know, that, yes, there is always a need for improving the procedures. This one could be

changed, be a little better for a particular event that I was thinking about or that actually happened.

So there is always that need for improvement. And we had a process there at the Island that we were continually reviewing and revising procedures. I think more in that light, that, yes, there is always a need for better procedures.

Q Well, did you ever express to anyone before the accident that this whole structure of the procedures was wrong because, during the course of a transient, operators might have difficulty trying to figure out which procedure they should be into?

A I don't recall making that statement, no, to anyone that I can recall.

Q Now, with respect to specific procedures, can you tell us now, Mr. Zewe, of any statement that you made to anyone before the accident concerning any emergency procedure which you said could be improved that had not been improved pursuant to your recommendation by the day of the accident?

Do you want to hear that question back?

A I think I understand what you are asking. I am just -- while you were asking, I was thinking

also.

MR. KLINGSBERG: Why don't we have the question back.

MR. FISKE: Nothing wrong with that.

(Question read.)

A I don't have any recollection of that, no.

Q Did you discuss the emergency procedures with the operators that were working with you on your shifts?

A Yes. Most of the training that we did on a shiftly basis, we used to make comments and bring ourselves up to date on current changes in the EP's and ask each other the EP's on shift. We used to do that quite regularly.

Q For some period of time before the accident, you had been working with Mr. Scheimann, Mr. Frederick and Mr. Faust?

A Quite sometime?

Q For some period of time, you had been working with those three men on a regular basis?

A Yes.

Q Can you tell us approximately how long before the accident that had gone on?

A I would have to refer to the records on

that, because I don't really know. I've had several shift foremen in Unit 2 over a three-year period, and I don't remember exactly when operators went between shifts.

Q Was it at least for several months that you had been working with Scheimann and Faust --

A I would say greater than four months or so.

Q And as of the morning of the accident, were you aware of any respect in which any one of the three of them considered any of the emergency procedures to be inadequate in any way?

A Not that I recall, no.

Q Mr. Frederick told us last week when he was here that it was part of his training that he was supposed to memorize the symptoms portions of the emergency procedures so that when a particular transient occurred, he would have all of those various symptoms in mind without actually having to go pull out the procedures.

I just wanted to ask you if that is in accordance with your understanding of the way things worked before the accident.

A We were required to know the symptoms

for the emergency procedures pretty much from memory, along with the immediate manual action.

Q And I take it, then, as a sort of a rule of thumb, that you made the decision during the course of a transient as to which particular procedure to pull out and start looking at, based on the symptoms that you saw?

A Are you asking that me as a shift supervisor or me as an operator or --

Q I am sorry. That was a fair question.

Just as part of your training and let's not get yet to what actually happened on the day of the accident. Just as part of your training, did you understand that the way it was supposed to work during a transient was that you would look for symptoms, apply those symptoms that you saw against this bank of symptoms that you had memorized, and based on that decide which particular procedure you would then pull out?

A We would use a combination of things in making our overall evaluation of what procedures to use. Those included from our memory the symptoms of the EP's plus we also had overhead alarms, computer alarms, and most important, our parameters displayed

on control room panels. So based on those and our training and experience, we could then make the determination and evaluation to follow a particular procedure to handle the upset.

Q Was one function of the symptoms that were listed in the emergency procedures to tell you which particular alarms that you should be looking for?

A There were various emergency procedures that actually listed alarm setpoints right in their symptoms.

Q Administrative procedure 1001, which has been marked B&W Exhibit 237, states in section 3.8.3, "Deviations from written procedures may not be made except in emergencies."

Do you have that in front of you (handing document to the witness)?

A I do recall that, yes.

Q Was it part of the training that was given to the operators at Met Ed that they should act in accordance with that particular administrative

(continued on following page)

procedure?

A Yes.

(Time noted: 4:00 p.m.)

William H. Zewe

Subscribed and sworn to before me

this day of 1982.

C E R T I F I C A T E

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

I, HARVEY B. KRAMER, a Notary Public within and for the State of New York, do hereby certify that the foregoing deposition of WILLIAM H. ZEWE was taken before me on Thursday, May 20, 1982;

That the said witness was duly sworn before the commencement of his testimony 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 parties herein 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 30th day of May, 1982.

Harvey B. Kramer

Harvey B. Kramer, CSR, RPR

I N D E X

WITNESS	PAGE
William H. Zewe	4

E X H I B I T S

B&W FOR IDENTIFICATION		
735	Letter from Mr. Zewe to Mr. Collins, dated July 5, 1977	35
736	Document bearing at the top the name William Zewe and underneath that, "Major Training Programs"	50
737	Copy of unit start-up procedure	88
738	Copy of unit shutdown procedure	88
739	Pressurizer operation procedure	105

* * *