UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

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GENERAL PUBLIC UTILITIES CORPORATION, :
JERSEY CENTRAL POWER & LIGHT COMPANY,
METROPOLITAN EDISON COMPANY and :
PENNSYLVANIA ELECTRIC COMPANY,
:
Plaintiffs, 80 CIV. 1683
: (R.O.)
-against-
:
THE BABCOCK & WILCOX COMPANY and
J. RAY McDERMOTT & CO., INC., :
:
Defendants. :

- -x

Continued deposition of GPU NUCLEAR CORPORATION by WILLIAM H. ZEWE, taken by Defendants, pursuant to adjournment, at the offices of Davis Polk & Wardwell, Esqs., One Chase Manhattan Plaza, New York, New York, on Friday, May 21, 1982 at 10:20 o'clock in the forenoon, before Harvey B. Kramer, R.P.R., a Certified Shorthand Reporter and Notary Public within and for the State of New York.

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WILLIAM H. ZEWE, having been previously duly sworn, resumed and was examined and testified further as follows:

EXAMINATION (continued)

BY MR. FISKE:

Q I guess you realize, Mr. Zewe, that you continue under oath.

A Yes.

Q And indeed, on every resumed day of the deposition.

A Yes, I understand.

Q I would like to show you a document that has been previously marked as B&W Exhibit 272. I ask you if you recognize that as the loss of reactor coolant/reactor coolant system pressure emergency procedure that was in effect at Unit 2 on the day of the accident.

A Yes, it looks like it is the one that was in effect that day.

Q You had had training on this procedure both at Met Ed and down at B&W; isn't that correct?

A Yes. I did.

Q Now, I would like to have you look at this for a minute. And if you want to look through

it quickly just to refresh your recollection on it, go ahead. Then I am going to ask some questions.

(Witness examining document)

Q Could I suggest this, Mr. Zewe? I know you have been looking at that now for a few minutes. I am going to be asking you questions about certain portions of it. I don't want to restrict your right to look at it as long as you want before I start asking the questions, but I would be willing to proceed and start asking questions on a certain area, and then if you wanted to stop at that point and study the procedure in that particular area before you answer, that's fine.

I am not going to ask you questions about every single paragraph in that procedure.

MR. MacDONALD: Maybe you can just skim through it.

A Give me another couple of minutes.

Q Certainly. I want to give you as much time as you want.

(Witness examining document)

A Okay.

Q Have you had enough time to look at it?

A I believe so, yes.

Q The procedure is in two parts, as I read it. Part A, captioned "Leak or Rupture Within Capability of System Operation," and then Part B is, "Leak or Rupture of Significant Size Such that Engineered Safety Features Systems Are Automatically Initiated."

Is that correct, that there are those two different sections?

A Yes.

Q What did you understand the phrase "Leak or Rupture Within Capability of System Operation" to mean?

MR. MacDONALD: You are talking about the understanding of the procedure before the TMI accident.

MR. FISKE: Yes.

A To me, it meant that you had a loss of coolant from the reactor coolant system that was within the normal makeup capability of the makeup system.

Q By that answer, do you mean that it would be a leak that could be handled without the use of high-pressure injection?

A That was my general understanding, yes.

Q Now directing your attention, Mr. Zewe, to Part B, which is captioned "Leak or Rupture of Significant Size Such that Engineered Safety Features Systems are Automatically Initiated," do you see that? It is on page 6.

A Yes.

Q "Engineered Safety Features Systems" includes HPI, does it not?

A Yes, it does.

Q Do you see under B there is a section called "Symptoms," 1.0?

A Yes.

Q And then there are under "Symptoms" eight separate paragraphs, are there not, setting forth different symptoms of a leak of the size described in Section B?

A Yes.

Q Am I correct, Mr. Zewe, that it was your understanding, based on your training, before the accident, that it was not necessary to have all eight of those symptoms in order to conclude that you had a leak of the size described in Section B?

A It was my training and understanding that I did not have to have every symptom listed,

but that I should use these in conjunction with my primary plant instrumentation, alarm systems, computer systems, and knowledge of the plant in order of formulating and making an evaluation of what course of action to take.

Q Did you have any understanding before the accident, Mr. Zewe, that there was any set number of these symptoms that you had to see before you could conclude that you had a leak of the size described in paragraph 8?

A As I recall, there were no set number. That you just used these in conjunction with the other things that I have mentioned, the parameters, the alarms, what you were doing at the particular time which may account for a few of these symptoms.

Q You mentioned that you would look at I think the alarm symptoms and also you would look at readings that you might obtain from the computer; didn't you just say that a few minutes ago?

A Yes, I did. From the console readings themselves, from the computers and from the various alarm systems overhead and on the computer, and also the light and status indication of the various components.

Q These eight paragraphs listed on page 6 under this heading "Symptoms" refer specifically to various alarms, do they not?

A Some of them refer to alarms and others just refer to parameters.

Q Right. So when you said that you would look for alarms, I take it that you would look for the alarms that are referred to in these symptoms.

A I would look at all the alarms that came in at any particular time and try to make a determination and evaluation based on all the alarms that I had, which may or may not include these particular alarms. They would certainly be included in that determination, yes.

Q Let's just make sure we are talking about the same thing. It is certainly true, isn't it, that in trying to determine whether or not you had a leak of the size described in paragraph B, you would look to see whether or not you had the type of alarms that are listed in these eight paragraphs under "Symptoms"; isn't that correct?

A I think that it would be more correct to say that when I received the alarms, I am not mind-set that I am looking for one particular group

of alarms in particular, because I am still going through the evaluation process of what I have, in order to determine what corrective action to apply in that particular case.

It is true that if I am looking for a r ture, I would dwell on these particular ones, but that isn't necessarily the case. Whatever alarms came up, that would be the preface. All right? The alarms, the instrumentation and how the plant was reacting, which would lead me into making a determination of what procedure to use. Not the reverse, I'm afraid.

I don't say, well, I have a particular event and I say, do I have alarms to support that event?

That isn't the case.

Maybe I am misconstruing what you are asking, but that's what I believed that you are asking: that the alarms will be first and then that will help me in the determination of what event. Not the opposite.

Q Well, just stay with that for a minute and then I will come back to something else --

A All right.

Q -- that arises from it. But just taking it from where you just left it off, it is true, is it not, that seeing any of the alarms that are listed in paragraphs 1.1 through 1.8 would be an indication, a symptom, of a break of the size described in paragraph B?

A They would only be a symptom in this particular case -- all right -- if that is the conclusion that I would draw from the evaluation that I would make. Because there are other events that have similar symptoms that may occur for a reason that I am well aware of, or a reason that I myself have caused from an action that I have taken.

So I would expect to have, say, low pressure if I have an overcooling event, or that I would expect to have low pressurizer level if I have a cooling event, or if I had any number of other reasons for various symptoms that are stated in this procedure.

So it is part of the overall evaluation. But it does not dictate that if I have these symptoms or any number of them, two, three, four, what have you, that it is just part of the evaluation process and it does not lock me into this procedure.

Because there are a lot of other things that are happening and action that is taken at any particular time which could lead to these, regardless of part B of the procedure.

Q I understand you are saying, with respect to symptoms 1.1 through 1.8, there might be events other than a leak of the size described in paragraph B that might produce some of those same symptoms. Right?

A Yes.

Q I understand that. But my question is, isn't it true that every alarm that is listed in paragraphs 1.1 through 1.8 is a symptom of a possible leak of the size described in paragraph B?

A That is possible, yes.

Q Now, are there alarms other than the ones that are listed in these symptoms that, if you saw them, would indicate to you that you might have a leak of the size described in paragraph B?

A Yes. Most definitely there would be a lot of other related alarms. Because if you did have a leak the size of section B here, you would have a reactor trip, you would have a turbine trip, and you would have the engineering safety features

actuation, and all of those components have their own alarms, have their own indicating lights, have their own status lights.

So there would be many, many more alarms and indications due to related things.

Q Apart from alarms that would come on anytime you had a turbine trip or anytime you had a reactor trip or anytime you had automatic ESFAS, are there any other alarms that would be an indication to you that you might have a possible loss of coolant accident of the size described in paragraph B?

A I can't think of any other ones that are not directly related to these eight, plus the other alarms which we talked about for the actuation of the components and the reactor trip, turbine trip and all the related events.

Q If I understand that answer right, you are saying you can't think of any other alarms in addition to the ones that you have mentioned up to now?

A Not at this time, no.

Q You mentioned also that you would look for readings off the computer. Do you remember that?

In helping you to determine whether or not you had a leak of the size described in paragraph B.

A I would use the computer to the extent where you could gain useful information, yes.

Q What kind of information would you attempt to get from the computer that would be helpful in determining whether or not you had a leak of the size described in paragraph B?

A In an event like this, which is a major event where there is a great number of alarms on the computer, I would basically use the computer utility typer more than the alarm printer to call out certain parameters in the course of the event, to check on other plant status which may not indicate properly in my estimation or for a further check of status of various components that I felt were warranted.

Q What kinds of information would you be able to get from the utility typer that would be helpful in telling you whether or not you had a loss of coolant accident?

A I am thinking more in terms of a generalized approach, that if something was abnormal, I could always use that as a further backup

indication, with no real specifics other than as the particular items came to mind that I felt that the computer could give further -- clarify some events further, then I would use it. But with no certain specifics. Because I have adequate console indication available to me, regardless of the status of the computer, that in most cases should be enough.

Q So I take it your testimony, Mr. Zewe, is that as you sit here right now, you can't think of any specific piece of information that you would obtain from the utility typer that would be helpful in determining whether or not you had a loss of coolant accident?

A I would use it more as a backup as the need arose, yes.

Q And by backup, you mean a backup to information that was appearing on the console?

A Yes.

Q The first one of the symptoms that's listed on page 6 is a rapid continuing decrease of reactor coolant pressure, and then there is reference under that to a low alarm at 2055 psig, a low-low alarm at 1700 psig, and safety injection actuation at 1640 psig.

Do you see that?

A Yes, I do.

Q Why did you understand that a drop in pressure activating those alarms and actuated safety injection at 1640 was a symptom of a loss of coolant accident?

A Well, it was my training and understanding, both at the island and at B&W, Lynchburg, during the transient response, that every time you had a loss of coolant accident, that pressure would be reduced, level would be reduced, and that if it got down low enough, you would actuate the engineering safety features system.

Q But in terms of the thermodynamics of the plant, what was it about a loss of coolant accident that would produce a drop in the pressure?

A Loss of reactor coolant system inventory.

Q And why did you understand that a loss of inventory would produce a drop in pressure?

A The reactor coolant system is full normally with an indicated level in the pressurizer of approximately 220 inches. And if you would drain out any water from the reactor coolant system, it

would reflect that level change in the pressurizer level. And since the pressurizer in itself is there to maintain inventory and to act as the pressure source for the reactor coolant system, if I would lose inventory, we would also lose pressure.

Q Is it your testimony that you understood that the only reason that pressure goes down in the course of a loss of coolant accident is because level in the pressurizer goes down?

A Level in the pressurizer going down is the indication of loss of inventory from the system, and that pressure will go down because you lose the capability of maintaining the pressure which is afforded by the pressurizer. So that when the pressurizer level goes down and empties, you would expect to lose pressure, yes.

Q Did you understand that if pressurizer level went down from 200 to 150 inches in the pressurizer, that the pressurizer would be incapable of maintaining pressure above the -- withdrawn -- incapable of maintaining pressure at the normal level?

A Prior to the accident, I don't recall thinking about that specifically, that if

pressurizer level went down by that amount, would it be sufficient or insufficient to maintain normal pressure. I don't believe that I thought about it in that sense.

Q Let me ask the question which I may have just asked a minute ago, but I am not quite sure of the answer.

Was it your understanding before the accident that the only reason that pressure goes down in a loss of coolant accident is because there may be a decrease in level in the pressurizer?

A It was my training and understanding from all the training that I had received, including -- the only transient response that I had ever received on LOCAs were at B&W, Lynchburg, and in every case where we had a LOCA, we had a loss of pressurizer level and they always accompanied each other, and I was never told to try to evaluate or correlate that a certain level reduction would or would not be able to hold the pressure or anything of that nature.

Q Was it your training, whether at B&W or Met Ed when you were trained on these various procedures, that in a loss of coolant accident, it is

a drop in pressurizer level which causes the drop in pressure?

MR. MacDONALD: We are talking about after a reactor trip?

MR. FISKE: Yes, we are talking about a loss of coolant accident.

Do you want to hear the question again?

THE WITNESS: Yes, please.

MR. FISKE: Could you read it back.

(Question read)

A My answer is basically the same, that all of the training, including the transient response training at Lynchburg, was that if I had a LOCA, I was going to lose level and I was going to lose pressure.

And I had a hole within the RCS somewhere and I was losing that inventory, which was the main cause for the pressure going down was the loss of inventory which was reflected directly and always in the pressurizer level.

Q I think I understand that you said that.

My question is what your understanding was as to what it is that causes the drop in pressure resulting from a loss of inventory. You

have said, if I can restate your testimony, that you understood that in a loss of coolant accident inventory escapes. So there is less inventory than there was before, and that as that happens, the pressurizer level tends to come down.

Now, what I am asking you is, why did you understand, by what process did you understand, a drop in inventory would produce a drop in pressure? More specifically, I am asking you, was it your understanding that the thing that produces the drop in pressure is a reduced pressurizer level?

A As I recall, my understanding was because of the loss of inventory caused by the loss in pressurizer level. And the pressure would always follow the pressurizer level down and they both trend in the same direction.

Q I think we may be confusing two things here, Mr. Zewe. One is, what is an indication of something, and what may be a cause of it.

And I think you have said several times that when you had a loss of inventory, you would have a loss of pressurizer -- a decrease in pressurizer level. And to that extent, the decrease in pressurizer level would be an indication that

there had been a loss of inventory.

What I am asking is, what did you understand caused the drop in pressure which resulted from a loss of inventory?

Do you understand what I am trying to find out?

A It seems like you are asking the very same thing over and over again, and my response is the same.

Q Okay. Well, if your testimony is that you understood that the drop in pressurizer level was what caused the drop in pressure, then we can go on.

A Right, the --

Q Okay.

A -- pressurizer maintained pressure, and if I would lose level, I would reduce the pressure, and they would both trend together; as I lost level, I would lose pressure.

Q In any of the training that you had or in just any of the understandings that you may have derived independent of your training during the entire time you have been operating nuclear reactors, did the thought ever cross your mind that in the

case of a loss of coolant accident, the drop in pressure might result simply from the fact that there was a hole in the system and that pressure would escape out the hole?

MR. MacDONALD: I object to the form.

A I think they are the same. That if I have a hole, I am going to lose inventory, and along with that I will have the reduction in pressure. But it is really the inventory there that I am losing. It is so related to pressure that you can't separate them in my mind.

Q In other words, was it your understanding prior to the accident that the reason that pressure goes down when you have a loss of coolant accident is somewhat comparable to the reason why pressure goes down in a tire when you get a hole in the tire?

MR. MacDONALD: I object to that.

You can answer if you can.

I don't quite understand.

A I don't believe it is that simple. Because in air pressure in a tire, you are not changing the state like you are in a reactor coolant system there where you are going from water to steam, where you are having a phase change. Even though in

the reactor that you are leaking steam instead of water out of the hole, it is still the fluid whether the fluid be steam or the fluid be water, it is still reactor coolant inventory that you are losing.

Q It is that inventory which when maintained at its full capacity sustains the pressure; correct?

A Strictly in relationship to the RCS. If I can maintain inventory in the pressurizer and maintain saturation conditions in the pressurizer to control RCS pressure, yes.

Q Going to item No. 1.2, under the "Symptoms," it says, "Rapid continuing decrease of pressurizer level, resulting in, No. 1, low alarm 200 inches, No. 2, low-low alarm, 80 inches."

You may have answered this question already, but why did you understand that a decrease in pressurizer level activating those two alarms was a symptom of a leak of the size described in paragraph B?

A It was my training and understanding, particularly at the B&W, Lynchburg, where we had the transient response training for accidents like the LOCA,that every time that you had a loss of

coolant, that you would rapidly lose pressurizer level and that you indeed would go below the alarm points of 200 inches and 80 inches, depending upon the break size, but that pressurizer level would always be rapid reduced.

Q Were you trained at B&W in Lynchburg on the consequences of a cooldown in terms of its impact on pressur and pressurizer level?

A At my training at B&W, Lynchburg, we did do cooldowns and we did follow the procedures in dealing with the normal change in pressurizer level due to a cooldown.

Q Well, putting it another way, did you learn in the course of your training at Met Ed or at B&W that you could have, following a reactor trip, a drop in reactor coolant system pressure and a drop in pressurizer level resulting from any cause other than a loss of coolant accident?

A As I believe I stated earlier, many of these symptoms listed here or in the A section could be attributed to other plant upsets which could reduce pressurizer level and could reduce reactor coolant system pressure. And there are a wide range of these upsets which would cause this to

happen.

Q And in the course of your training at B&W or Met Ed, did you ever learn that there was any upset, other than a LOCA, which would produce a drop in reactor coolant system pressure without also producing a drop in pressurizer level?

MR. KLINGSBERG: Can we have that back?

(Question read)

MR. MacDONALD: I am going to object to the form. I don't think there is any foundation. Any event other than a LOCA that would produce a drop --

MR. FISKE: I understand the objection and I will rephrase the question.

BY MR. FISKE:

Q Up to now, Mr. Zewe, we have been talking about loss of coolant accidents. Now, you just said in one of your last answers that you learned that there were, as you put it, a wide range of upsets which could produce a drop in reactor coolant system pressure other than a LOCA. Right?

MR. MacDONALD: I will object. I think it was more than that. And what his testimony is, it is.

A As I recall, I said drop in pressurizer level and reactor coolant system pressure.

Q Well, my question is directed at this group of upsets other than a LOCA. That is what I am asking you about.

Now, within that group of upsets, did anyone ever tell you before the accident that any one of those upsets could produce a drop in pressure without also producing a drop in pressurizer level?

A At this time I don't recall any of the upsets that I am going over in my mind where I would have a loss of reactor coolant system pressure and not an accompanying loss of reactor coolant pressurizer level.

Q The next symptom under section B is 1.3. "High radiation alarm in reactor building."

First of all, did you have any understanding before the accident as to which alarms were referred to in that particular symptom?

A We had a couple of different radiation alarms that monitored the reactor building, one of which monitored the reactor building atmosphere, and another one was near the dome of the reactor building, and we also had alarms that were on the

fuel handling bridges.

And it was my recollection that it is those alarms which we used in reference to this particular symptom.

Q What would you understand the reason was that a radiation alarm in the reactor building would be a symptom of a leak of the size described in paragraph B?

A Radiation instruments are designed to detect the presence of radioactive isotopes, and that the reactor coolant system, even though it's tried to be kept relatively low in activity, there is still enough present activity that if it is near where the monitor is located or that the monitor is monitoring that area, it should indicate that increase in radioactivity.

Q In other words, do I understand your testimony to be that there is enough radioactive material in the coolant so that if there is a substantial release of coolant into the building, that should activate a radiation alarm?

MR. MacDONALD: What do you mean by "substantial"? Do you want to quantify that?

MR. FISKE: I am not sure a definition

of "substantial" is crucial to my question.

MR. MacDONALD: The question stands.

MR. FISKE: Do you want to read it back to Mr. Zewe?

(Question read)

A Yes, it should. But I think that that's more of a broad sense, because the activity within the reactor coolant system itself changes from time to time. It actually starts out very, very low at the beginning of a life, and then toward the end of a life, you typically have a higher activity.

So depending on the magnitude of the leak and the amount of reactor coolant activity you have in the location and sensitivity of the instrument, this would really vary on how much you would see.

Q By "life," you mean life of the fuel?

A When I refer to life, I refer to from the beginning of one particular refueling cycle to its completion, to where you would refuel again.

Q Well, do I understand you to say then that a leak of exactly the same amount of water would produce more radiation near the end of the cycle than it would at the beginning of the cycle?

A Generally speaking, that was true. Because you have a certain small amount of failed fuel to begin with that the plant is designed for. And that as you run through a reactor core's cycle, you have upsets and you have crud bursts, you have some concentration of activity in a buildup of fission products.

So that, generally speaking at the end of that core cycle you would have a higher reactor coolant system activity, yes.

Q And it would follow from that, wouldn't it, that it would take a bigger leak to activate the alarms at the beginning of the cycle than it would near the end of the cycle?

A Magnitude here again depends on all those factors. What it is, all right? Where it is at. How close it is to the monitor. Its sensitivity for that particular isotopes and the activity, so all of those things combined.

Q I understand. I am saying, everything else being equal, it would take a bigger leak to activate the monitors in the beginning of the cycle than at the end of the cycle?

A Everything being equal, yes.

Q And you understood that the purpose of having 1.3 in this LOCA procedure was basically to tell you that seeing a radiation alarm in the reactor building would be helpful to you in determining whether or not you had a loss of coolant accident?

MR. MacDONALD: You are talking now about the alarms mentioned earlier when you went through this.

MR. FISKE: Yes.

A It would be helpful, yes.

Q Now, you mentioned certain specific alarms. One that measured the atmosphere, one near the dome and one near the fuel handling bridges.

Who was it that told you that those three alarms were the ones that you should be looking for in implementation of this symptom, 1.3?

A I don't recall who in particular, but throughout my training at Met Ed and B&W it was brought out to my understanding in training that you would use the radiation instruments that you had available in the reactor building.

Q Yes. Well, I would like to ask you this question specifically, Mr. Zewe. Did anyone at B&W tell you that in implementing section 1.3 of this

procedure, you should use only the three monitors that you have just described?

MR. MacDONALD: Are you asking whether he can recall a specific person?

MR. FISKE: No, I am not asking whether he can recall a specific person. I am asking whether anybody at B&W told him that in implementing section 1.3, he should only use the atmospheric monitor, the dome monitor and the monitor by the fuel handling bridges.

A As I recall, the instructors at B&W, Lynchburg were involved in helping to train us in the use of these procedures and I am sure that the subject of the dome monitor, 214 and 227, and the bridge monitors came up. I don't recall any discussion restricting us to just those, but those were the main ones in my estimation that concerned us in this portion of the procedure.

Q I know that that is what you have said earlier, that those were the three that you looked at. I am just trying to determine how it was that you were instructed that you should look at those three particular monitors, and I think you have answered the question, I believe, as far as B&W is

concerned.

MR. MacDONALD: Off the record.

(Recess taken)

BY MR. FISKE:

Q Mr. Zewe, where did you think you were in this fuel cycle at the time of the accident in March of 1979?

A I knew that we had approximately 100 effective full power days at that point.

Q And how many full power days are there in the life of or in an ordinary cycle?

A We can't consider this an ordinary cycle, because they are all a little bit different. The first cycle which Unit 2 was in was by far the longest fuel cycle, of somewhere over 420 effective full power days of operation.

(Continued on next page)

Q Was it your understanding on the day of the accident, in terms of where you were in the fuel cycle, that you could not have a leak or rupture of the size described in paragraph B without seeing one of the alarms that you referred to earlier, one of the radiation alarms that you referred to earlier?

THE WITNESS: Could you repeat that, please?

MR. FISKE: Let me rephrase the question.

Q Did you understand, based on everything that you knew up to the time of the accident, that you could have a loss of coolant accident going on without activating any of the three radiation alarms that you described earlier?

A Are you bounding in any way the magnitude of this loss of coolant accident?

Q I was referring to the loss of coolant accident as described in this paragraph B that we have been talking about.

THE WITNESS: Would you read that back, please?

(The last two questions were read by the reporter.)

A My recollection before the accident was

that if I had a leak of sufficient size to enter part B, that I would expect to see a radiation alarm even at this point in the core life.

Q Was it your understanding that you could have a leak as described in part A without activating any of those three radiation monitors?

A Yes, because this covers a pretty wide spectrum of smaller leaks. And at this time in core life, I believe I thought that it was possible to have a minor loss of reactor coolant inside the reactor building and not have these alarms, yes.

Q Do you know whether any effort was made by Met Ed to adjust the sensitivity of the radiation alarms as the fuel cycle went on, so that the sensitivity of the alarm would take into account the increasing radiation that existed in the fuel during its cycle?

A To my knowledge, such a program was not undertaken to change the sensitivity.

Q The next item or symptom, Mr. Zewe, is paragraph 1.4, "Reactor Building Ambient Temperature Alarm."

Do you see that?

A Page 6? Yes.

Q Again, was there a particular alarm that you understood that symptom referred to?

A We have temperature detectors inside the reactor building which would activate an annunciator alarm when it reached its actuation setpoint, yes.

Q And that is one particular alarm you are talking about?

A One particular alarm point, but it is representative of one of a group of indicators which, when they exceed their alarm point, would cause actuation of the alarm.

Q In other words, that particular alarm goes off any time any one of a number of different indicators activate it?

A That is correct.

Q What did you understand what the reason that high temperatures in the reactor building were a symptom of a rupture of the size described in paragraph B?

A Any loss of reactor coolant into the reactor building would release energy to the building and it would take the form of heat to raise the temperature of the building, and it was indicated by the temperature detectors themselves.

Q The next one is "Hi Reactor Building Sump Level."

Why did you understand that a high reactor building sump level was a symptom of a rupture of the size described in paragraph B?

A Loss of inventory from the RCS, wherever it occurred inside the building, would ultimately result in draining to the reactor building sump. So the increased reactor building sump level can be used to help determine that you have a leak or loss of coolant from the RCS.

Q The next item, 1.6, is "Hi Reactor Building pressure."

Why did you understand that high reactor building pressure was a symptom of a rupture of the size described in paragraph B?

A The loss of inventory from the reactor coolant system would go into the building, and it would result in raising the reactor building pressure.

Q I guess my question is why.

MR. KLINGSBERG: Why what?

Q Why would having coolant escape into the reactor building raise the pressure within the building?

A You are releasing energy to the building. The building is confined and closed up. So you are releasing this energy to the building itself. So the building will begin to pressurize.

Q The next item is a "Rapidly decreasing make-up tank level."

Why is that a symptom of a rupture of the size described in paragraph B?

A Loss of inventory from the reactor coolant system would be reflected in a loss of inventory by pressurizer level. There is an automatic level control valve that controls and maintains pressurizer level at or about 220 inches. This valve opens up as the pressurizer level goes down, and the makeup system then would take its water from the makeup tank through the makeup pump and in through the pressurizer level control valve to try and maintain and/or restore pressurizer level to correct the inventory problem that you have.

Q Is it a correct statement that symptom 1.7 really doesn't tell you anything that you wouldn't already know through symptom 1.2?

A Quite the contrary. The makeup tank level indication is very useful in determining what

the magnitude of makeup is, because the pressurizer level control valve is opening up on a varying setpoint, trying to maintain level. So pressurizer level going down, it would have gone down much more rapidly if the pressurizer makeup valve was not opened up.

But all of the inventory being transferred from the makeup to the RCS and into the pressurizer would be reflected directly from the makeup tank, so that I could get an accurate count of how much water was being transferred, which I could then relate to leak size in this case.

Q So what you are really saying is that 1.2 and 1.7 in a sense are cumulative, that 1.2 shows you how far the level has gone down, and then 1.7 tells you that it has gone down that far despite the fact that there has been increased makeup flow in a certain quantity; right?

A I am afraid you are not phrasing it right, despite the fact that that is a makeup.

Q I think that is a possibility.

A The total amount of the makeup that is required comes totally from the makeup tank during this period. So the total amount of inventory that you are replacing comes from the makeup tank. So

that should be the total amount.

From that, you still have to realize that if pressurizer level started out at 220 inches, you would then take that amount of inventory into account.

In that respect, yes.

But if you start out at 220, you can then rely on the makeup tank as long as the makeup valve was making up and maintaining 220 inches.

Q If I understand you correctly, what you are really saying is, whatever decrease in pressurizer level you see under 1.2, you could assume that that decrease would have been even greater had it not been for the increased makeup flow reflected by 1.7.

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

You are always saying "What you are really saying..." as though "as though you are a jerk, and I can really say it better than you." I don't want that.

I think if you have a fact question that you want to ask, you should ask the fact question and not answer in a way that suggests you are better at phrasing the answer than the

witness is, and I think that is very misleading.

MR. FISKE: I certainly didn't intend to suggest that I know more about this than Mr. Zewe. I think that would be a very improper assumption on my part.

I was just trying to put it in a way that made it clear to me. If you object to the introductory phrase in the question, I would be happy to rephrase it, because I did not intend anything along the lines of what you suggested.

BY MR. FISKE:

Q To satisfy Mr. Klingsberg, Mr. Zewe, let me put the question again.

Is it correct that the decrease in pressurizer level reflected in symptom 1.2 would have been even greater had it not been for the increased makeup flow reflected in paragraph 1.7?

A Yes, that is true. But 1.7 actually addresses makeup tank level and not flow. We have a separate makeup flow instrument.

Q O.K. I think this is clear enough so we can proceed.

A O.K.

Q Symptom 1.8 says, "Both core flood tanks levels & pressures are decreasing."

Would you tell us why you understood before the accident that that was a symptom of a rupture of the size described in section B?

A The core flood tanks are overpressurized with a pressure of nitrogen to 600 pounds, and they contain approximately 1030 cubic feet of water. And during the LOCA described here, if the inventory in the reactor coolant was such that it was reduced and the pressure went down to below 600 pounds, then the core flood tank check valves then would open up and the core flood tank would discharge its water in through the core flood nozzles and into the core, thus reducing their pressure and level as it did that.

Q Is it correct, Mr. Zewe, that certain of these symptoms that we have just been going through, 1.1 through 1.8 in this procedure, may also be symptoms of an OTSG tube rupture or a steam line break?

A Some of these would be overlapping and apply to those two cases. Not all of them.

Q Did you understand that the note under 1.8 was designed to help the operator distinguish between a loss of coolant, an OTSG tube rupture and

a steam line break?

A Yes. The information contained after that note were an aid in helping the operator make the determination between various actions.

Q And is it correct in a general sense that to the extent that the operator saw one or more of the symptoms listed in 1.0 through 1.8 which might be common to two or three of these different transients, that the note at the bottom was designed to help him determine which one of the three he had?

A He would certainly consider these items in his overall evaluation of the event, yes.

Q Now, the note says, "The operator may distinguish between a loss of coolant inside containment, an OTSG tube rupture and a steam line break by the following symptoms which are unique to the aforementioned accidents." And number 1 is "Loss of coolant inside reactor building - particulate, iodine gas monitor alarm on HP-R-227 'Reactor Building Air Sample.'"

Could you tell us why you understood that alarm was unique to a loss of coolant accident?

A You are asking me to compare that particular statement in relationship to a loss of

coolant accident versus the OTSG tube rupture and main steam line break?

Q Yes.

A As was mentioned earlier, I would expect that with the primary system activity and its location and the sensitivity of this instrument, that it would be able to help to determine that you did have a loss of coolant inside reactor building.

Q Did you understand that seeing that alarm was inconsistent with a tube rupture or a steam line break?

A Yes, it was inconsistent with the OTSG tube rupture or steam line break inside the reactor building provided there was no other related casualties.

Q Well, I am not sure I understand the significance of the last part of that answer.

What other casualties might make this particular alarm go off if you had a tube rupture or a steam line break?

A You could have a combination of accidents. One may be the first thing that happened which may lead to another one, or you could have two simultaneous problems.

Q But one of which would have to involve a loss of coolant from the primary system?

A Well, the OTSG tube rupture does result in a loss of coolant from the primary system.

Q In other words, you are saying if you had both a tube rupture and a steam line break, that could result in the release of coolant from the primary system sufficient to set off that alarm?

A Things of that nature, yes.

Q Number 2 says, "OTSG tube rupture." Then it refers to "Gas monitor alarm on VA-R-748."

Why did you understand that that alarm was unique to an OTSG tube rupture?

A VA-R-748 is the off gas monitor from the main condenser vacuum pumps. And under normal conditions, without the existence of an OTSG tube rupture, the condenser would not see any activity that would cause that gas monitor to alarm.

Q Then you would not expect to see that alarm in the case of a loss of coolant accident?

A I would not, unless it was a combination of accidents.

Q Number 3 says, "Steam break inside reactor building." And then it refers to two separate

symptoms. The first is "Low condensate storage tank level alarm - and or low hot well level alarm." Let's take the first one.

Why did you understand that a low condensate storage tank level alarm was a symptom unique to a steam line break inside the reactor?

A Water to feed the steam generator comes from the hot well with its normal makeup from the two condensate storage tanks.

If you had a steam break inside containment, you would lose pressure and level in the OTSG and the feed and condensate system or the emergency feed system would feed water into the steam generator, trying to maintain conditions within the steam generator.

This would result in excessive water coming from the storage tanks and from the hot well level.

Normally, you feed the steam generator, turn it into steam, and it goes through the turbine, gets exhaust back into the hot well. So that you have a closed cycle except for minor leakage and losses. In this case the steam is going into the building. It is not being recondensed in the turbine and brought

back to the hot well. So you end up reducing your inventory.

Q Would that also be true in the case of a steam line break outside the reactor building?

THE WITNESS: I am sorry. Would you read that back?

MR. FISKE: I will rephrase it.

Q Would what you have just said about the level of the condensate storage tank and the hot well in the case of a steam line break inside the reactor building also apply in the case of a steam line break outside the reactor building?

A Yes, it would. Any case where you would have the steam leaking to atmosphere where you do not return it to the hot well, you would have an increased usage of water and it would show up as a reduced level.

Q Paragraph 2 refers to the "Feedwater Latch System Actuation."

Could you tell us why you understood that that was a symptom unique to a steam line break?

A Unit 2 has a designed automatic actuation feedwater latch system whereby if the main steam pressure is reduced less than 600 pounds, then it automatically closes the feedwater valves from adding

more water to the steam generators so that you allow the steam generator to isolate itself so that you don't continually put in water and allow the steam to escape either inside containment or to atmosphere if it breaks outside.

Q Would that also apply to a steam break outside the building?

A Yes, it does.

Q Mr. Zewe, let me show you a document that has been marked as B&W Exhibit 418, which is a draft procedure for TMI-1, which was prepared by B&W and sent to Met Ed on the date reflected on this document, June 11, 1970.

Have you ever seen this document before?

A Not to my knowledge or my recollection.

(continued on next page)

Q I would ask you specifically, Mr. Zewe, whether in connection with any work that you did in helping to prepare or finalize procedures for TMI-1 you ever saw this draft procedure.

A Not that I can recall, no.

Q Let me direct your attention to the first page of this, and the paragraph 2, that says "Description."

I would just like to ask you to read, if you would, to yourself the first two paragraphs.

A Under "2. Description."

Q Yes.

A All right.

Q Have you read that?

A Yes.

Q I would just like to read to you the last sentence of the second paragraph, which says, "However, the operator should assume the cause of the symptoms described above is a system rupture or leak unless another cause can be immediately established."

Do you see that sentence?

A Yes, I do.

Q In the course of any training that you

received at Met Ed -- we will take that first -- did anyone at Met Ed ever tell you that in the case where you had a rapid decrease in pressure and you weren't sure what had caused it, that you should assume that the cause was a system rupture or leak unless another cause could be immediately established?

A I don't recall anyone ever making that statement or even implying here that pressure going down other than the sense of loss of pressure and loss of level which was practiced at B&W, Virginia during our transient training.

Q Just so I understand, is the answer to the question I just put "No"?

MR. KLINGSBERG: I think the question was answered. The answer was, he doesn't recall anybody ever saying it. I think that is a complete answer. You can answer a question like that yes, no, or I don't recall anyone. I think that is a perfectly adequate answer.

Q That is your answer, Mr. Zewe?

A Yes. I don't recall anyone during my training bringing up this sentence about that, no.

Q Whether or not they ever referred to that

particular sentence, did anyone at Met Ed ever express that concept to you?

A From my review of up above, it mentions pressure going down, and I cannot remember any case or any person instructing me or trying to train me that I should assume that there is a system leak, that pressure goes down, as it also addresses inventory and pressurizer level.

Q Did anybody at Met Ed ever tell you that if you saw -- that in a situation where you saw -- pressure dropping and pressurizer level dropping, that you should assume that that was because of a loss of coolant, unless you were able to immediately establish another cause?

THE WITNESS: Would you read that back, please?

(Question read)

A As I recall, my training was such that I would have to make an evaluation of how far pressurizer level was falling and how far pressure was dropping and how rapidly the pressurizer level was falling and how rapidly pressure was falling and what evolution was going on at that particular time.

But that certainly entered into the overall evaluation, that if I had an uncontrollable loss in pressurizer level and pressure, that it would point to a loss of inventory.

Q Let me show you a document which has been marked B&W 614, which is a copy of the Volume 2, Nuclear Power Plant Operations Manual, Nuclear Training Center, Lynchburg, Virginia, and it has on the cover "Fred Scheimann Limits and Precautions Emergency Procedures," and I can tell you that that is there because this was produced from Mr. Scheimann's file.

I would just like to direct you to the first page of this.

A May I ask what date is this document?

Q We will get the whole volume that this comes with if you want to see that before we ask any questions. That will be all right.

A I was just curious in knowing when this was from or what time period this document referred to or was available, those sort of questions.

Q I assume it is some time period during which Mr. Scheimann was in Lynchburg, but other than that, I can't give you the specific --

This has been marked B&W Exhibit 535. The whole volume has been marked B&W Exhibit 535. The whole volume was produced by Mr. Scheimann from his files.

It says on the first page that it was prepared January 16, 1975.

I can also tell you, Mr. Zewe, if it is helpful in answering the questions that are coming, that this is the basic simulator procedure that was used at B&W.

Now I would like to direct your attention to the first page, which says at the top, "Loss of Reactor Coolant/Reactor Coolant System Pressure." Then there is a paragraph that describes the purpose. Then there is a section that is referred to as "Description." Do you see that?

A Yes, I do.

Q What I would like to have you do is read the paragraph described "Purpose" and then also the paragraph described "Description."

A I have read it.

Q Now, "Description" says, "This procedure describes the action to be taken in the event of a sudden and rapid unexplained decrease in RC system

pressure and pressurizer level caused by a leak or rupture in the high-pressure envelope of the primary system.

"The initial symptoms could be caused by a malfunction of the makeup system or by a steam line rupture as well as by a loss of coolant from the RC system. The operators should assume the cause of the symptoms described above is an RC leak or rupture, unless another cause can be immediately established.

"This procedure applies to the RC system leak rates greater than 30 gpm."

My question, Mr. Zewe, is whether at any time you were in Lynchburg anyone in the B&W training department told you that in the case of a rapid decrease in pressure and pressurizer level you should assume that the cause was an RC leak or rupture unless another cause could be immediately established.

A I don't remember anyone from B&W making that statement. At the time frame of which this was, 1975, we were using our own Met Ed procedures and not the OFR unit procedures.

Q On any occasion when you were at B&W in

any of the times you went down there, did you ever see the B&W simulator procedure?

A Yes. We used typically the B&W procedures for the balance of plant electrical and for the main turbine, but by and large, all of the procedures that we used in operating and handling the casualties presented were all by our own procedures, which they either had or we brought along with us.

Q Is it your testimony that you never saw the B&W simulator procedure for loss of reactor coolant/reactor coolant system pressure on any of the occasions you were in Lynchburg?

A I don't recall using it or looking at it.

Q In the course of the training that you received at the Navy, at B&W, Met Ed, anytime up to the accident, did anybody ever tell you that in the case of a situation where you weren't really sure what was happening, you should follow the course of action which was designed to prevent the worst possible situation?

A What are you referring to as the worst possible situation?

Q The one that might cause the most damage

to the plant and the public.

A I recall in a general sense, yes, that you should always be prepared for the worst, but that you should try and evaluate what you have and take action based on what you have.

Q But were you taught that in evaluating which course of action to take, when confronted with a situation that could be attributable to two different causes, that you should assume that the cause was the one that if uncorrected would produce the most damage?

A As I recall, not in those terms. It was more in the terms of: look at what you have. Evaluate what you have. And determine the best course of action for what you have. And always in those terms. Look, evaluate, make a judgment, proceed in that direction.

Q And with one factor in that analysis taking the action which was the most conservative?

A Only if the conclusion that I reached from making the evaluation and determination -- I would take whatever action I felt was warranted at that particular time, whatever it may be.

Q Based on the training that you had up to

the day of the accident, were you aware of any upset, as you put it, which could cause a rapid drop in pressure which would produce more damage to the plant and the public than a loss of coolant accident?

THE WITNESS: Would you read that again, please?

(Question read)

A It has always been my understanding that the worst accident that you could have with the potential of the most damage would be a loss of coolant accident, but I cannot ever remember of solely linking a rapid reduction in pressure with a loss of coolant accident, regarding any of the indicated pressurizer level. It was always one used in conjunction with the other in determining the LOCA condition and --

Q And isn't it correct, based on your prior testimony, that that was also true with respect to your analysis of every other upset that you were aware of that could produce a drop in pressure?

A Yes, but a drop in pressure would be accompanied by a reduction in indicated pressurizer level, which is a reflection of inventory.

Q So that a drop in pressure at the same time you had a high pressurizer level was no more inconsistent with a LOCA than it was inconsistent with any of the other types of upsets that could have produced a drop in pressure?

MR. KLINGSBERG: Can we hear the question again?

MR. FISKE: Sure.

A I am afraid I don't understand it.

Q Do you want to hear it again or would you like me to rephrase it?

A I would like you to rephrase it, because I heard the words that you were saying, but it was hard for me to follow it.

Q Well, why don't I just withdraw it, because I think it is just a conclusion from other things you said anyway.

MR. KLINGSBERG: Can I have the witness' last answer, or the one before that?

(Record read)

Q Am I correct, Mr. Zewe, based upon the understanding that you had resulting from your training and experience up to the day of the accident, that a situation in which pressure was

dropping while pressurizer level stayed high was no more inconsistent with a loss of coolant accident than it was with any of the other types of upsets you were aware of which could produce a drop in pressure?

MR. KLINGSBERG: I object to the form. There are a lot of negatives and things. I think we ought to have it back.

MR. FISKE: Fine.

(Question read)

MR. KLINGSBERG: I object to the form.

A I am afraid that is the third time I have heard it, and I don't really understand what you mean by "is no more inconsistent." All right? Because that was totally inconsistent with anything else, when pressure went down and level did not go down.

Q When you say it was totally inconsistent, you mean that it was totally inconsistent with a LOCA and it was also totally inconsistent with any other kind of upset that could produce a drop in pressure?

A Yes. From my experience and training and transient response training in Virginia, it had

never been demonstrated nor did I ever see or have any discussion about that pressure would go down and pressurizer level would not go down.

Q And that, I take it, is true with respect to all the training that you received, whether at B&W or Met Ed?

A Well, you must understand that the training on transient response and the action to reduce pressure and changes in pressurizer level was done almost solely at B&W, Lynchburg.

Q You are talking about the simulator.

A The simulator there, yes.

Q How about training that you had had at Met Ed based on real, actual live transients that had occurred at TMI-2? Did you have any such training?

A We did have training and review of all transients that occurred there in training at the island, but it was more of a classroom type training on, here is the curves, here is what we think they mean, but the actual transient response and observation in looking at the transient and trying to combat a transient and its explanation and all the things surrounding it in a transient learning

respect were all done at B&W, Lynchburg.

Q But in terms of sort of looking back at past history of transients that had occurred so that you would know what types of conditions occur in a plant in different types of transients, there were a number of transients that had occurred at TMI-2 where such past history was available; isn't that correct?

MR. KLINGSBERG: I object to the form of the question on the ground that it seems to me there were two or three predicates at the beginning which are not necessarily related to the question at the end.

If there is a single answer that would encompass everything, it would create confusion.

MR. FISKE: I will stick with the question.

MR. KLINGSBERG: Read it back.

(Question read)

A There was past history available of the Unit 2 upsets or transients. And I reviewed most of, if not all of the information that was available. Whether I gained a great deal of knowledge from that

in knowing exactly what transpired or how to use that, I really couldn't say.

Q Based on what you learned at B&W, together with what you learned at Met Ed in a review of Met Ed transients, isn't it correct that as of the day of the accident, a drop in pressure with a high pressurizer level was totally inconsistent with any kind of upset that you were aware of which would produce a drop in pressure?

A That is true. Pressure and level would always trend together.

MR. FISKE: This is probably as good a time as any to break for lunch.

(Lunch recess taken at 12:50 p.m.)

AFTERNOON SESSION

2:00 p.m.

WILLIAM H. ZEWE resumed and testified further as follows:

EXAMINATION (continued)

BY MR. FISKE:

Q Mr. Zewe, turning once again to the LOCA procedure that we had been looking at before lunch, referring to section B, it is correct, is it not, that HPI comes on automatically when pressure drops to 1640 psig?

A Yes.

Q Now, in addition to the high-pressure injection pumps, there are also low-pressure injection pumps; right?

A Yes, there are.

Q In the course of a transient which produced a continuing drop in pressure, was there a point in time at which the system was designed so that the low-pressure injection pumps would start putting water into the system?

A The system was designed like that, yes.

Q Can you tell us approximately what the pressure was at which the low-pressure injection

pumps would start bringing water into the system?

A Approximately 200 pounds RCS pressure.

Q So do I understand that if the pressure started to drop and got to 1640, HPI would come on; and if it got down as low as 200, the low-pressure injection pumps would start putting water into that system?

A That is correct.

Q What did you understand was the rate at which the high-pressure injection system would put water into the system when it came on automatically?

A Full system design, assuming two makeup pumps available, would be a thousand gallons a minute total flow.

Q And how many legs are there?

A That would be divided into four legs.

Q Now, looking at this section of the LOCA procedure, part B, you see after "Symptoms," the next section is "Immediate Action"?

A Page 7. Yes.

Q Right. And section 2.1 refers to automatic action, and then 2.2 refers to manual action. Right?

A That is correct.

Q One of the items of automatic action is that safety injection is initiated at 1600 psig RCS pressure or 4 psig reactor building pressure?

A Yes.

Q The next section after the "Immediate Action" section is a section called "Follow-up Action," which appears at page 9 under 3.0.

A Yes.

Q Am I correct in understanding that section of this procedure as --

A "That section" referring to follow-up action?

Q Yes.

A Okay.

Q Is it correct there is nothing in that part of the procedure which allows throttling back high-pressure injection below a rate which would produce 250 gallons per minute per leg until the point comes where pressure has gone down to the point where the low-pressure injection starts putting water in?

MR. KLINGSBERG: Objection to the reference to the word "allows."

MR. FISKE: I will rephrase that question.

Q Is there anything in this section captioned "Follow-up Action" which provides for the reduction in HPI flow below 250 gallons per minute per leg until the time is reached when the pressure has gone down low enough so that the low-pressure injection system starts putting water in?

A I would like to take a few minutes --

Q Sure.

A -- and read through the follow-up actions.

(Witness examining document)

(Mr. Glassman entered the deposition room)

THE WITNESS: Could you repeat the question, please?

(Question read)

A In my review of the procedure, I don't see any other place where it allows you to do that, but there is one point I would like to make, which is that in the use of these procedures there are other governing things that also come into play, namely, technical specifications. And we do have a technical specification based on high pressurizer level.

And depending on what mode you are in at the particular time, the 885 inches is still applicable as a high pressurizer level. And it was my training and understanding that I would throttle high-pressure injection based on not exceeding 885 inches.

Q Did you have some understanding, Mr. Zewe, that if there was a conflict between technical specifications and procedures, that you were supposed to follow the technical specifications in every case?

A My training and experience taught me to always follow, if I could, the limiting case. If the procedure was more limiting, follow the procedure; and always not to violate the tech spec.

Q You mean if the tech spec was more limiting, you would follow the tech spec?

A In most instances -- and I cannot think of many examples of this, but the procedures should always be more limiting than the spec so that you do not exceed the technical specifications.

Q What do you mean by "more limiting"?

A Well, if you had a procedure, for instance, that asked you to take one course of

action which would cause you to violate a technical specification, you would not just arbitrarily do that. You would try to stay within the confines of your tech specs.

Normally all of our procedures were written such as they were within the bounds of a technical specification so that, if you followed those, that you would not reach your technical specification limit.

Q Did you understand that you had the discretion, in the course of a transient, to violate the tech spec if you thought that that was necessary in order to prevent a serious accident?

A Prior to the accident, as I recall, I was aware that I could deviate from procedures in order to take emergency action which I deemed were appropriate in a particular event that was ongoing.

But I don't believe that I thought that in terms of exceeding a technical specification in order to carry out an evolution at the plant. I really didn't think in terms of violating tech specs, but I knew that I could go beyond a procedural requirement.

Q In other words, your testimony is that

up until the day of the accident, the thought had not occurred to you whether or not you would be allowed to exceed a technical specification in order to prevent a serious accident?

MR. KLINGSBERG: I don't think that was the testimony. I object to the question.

MR. FISKE: I thought his last answer was unclear enough so that I would like to have an answer to the last question.

MR. KLINGSBERG: I don't mind if you ask the question and say "Is this correct" or "Is this a fact," but I don't think it is fair to characterize the prior answers.

MR. FISKE: All right, then I will just rephrase the question.

BY MR. FISKE:

Q Is it a fact, Mr. Zewe, that up until the day of the accident, the thought had not occurred to you at any time whether you would be allowed to violate a technical specification if that was necessary in order to prevent a serious accident?

A It is my recollection that I would have done whatever I thought was necessary in trying to control an event, but I had never thought in terms of

exceeding a technical specification in relationship to that. I always thought that any action that I could conceive of taking would still be within the bounds of the technical specification, but it may exceed an operating procedure.

Q Let me put it to you the other way, just so we are sure it is clear.

Is it correct that on the day of the accident, you did not have a positive understanding that you were not allowed to violate a tech spec if that was necessary in order to prevent a serious accident?

MR. KLINGSBERG: I am very confused by that. "That you could not have an understanding that you were not allowed --"

MR. FISKE: Yes.

MR. KLINGSBERG: I object to the question.

MR. FISKE: Read it again so Mr. Zewe can hear it and listen to it carefully and be sure he understands it.

(Question read)

MR. KLINGSBERG: I really have to ask you to rephrase that. If that were answered yes or no, it would defy anyone's attempt to figure

out what the answer meant.

BY MR. FISKE:

Q Is it correct, Mr. Zewe, that on the day of the accident, you did not have an understanding that you were not allowed to violate a tech spec, even if that was necessary to prevent a serious accident?

MR. KLINGSBERG: He has already testified to what his understanding was.

Q Well, is it correct you didn't have an understanding one way or the other on the day of the accident?

MR. KLINGSBERG: I think he testified.

A Let me say I felt on that day I would have taken any action that I felt I should take to combat any problem that arose, but I didn't link that with or restrict it by tech specs. I just didn't think in those terms. I always felt in my mind that whatever action I took would still be within the confines of the tech spec.

Q It may be easier to deal with this question later on.

A Okay.

Q Let's go back to part A, Mr. Zewe, of

this loss of reactor coolant/reactor coolant system pressure emergency procedure.

Part A refers to the leak or rupture within capability of system operation.

A Yes, it does.

Q On page 2, under "Manual Action," it refers, among other things, to a manual initiation of the safety injection system. Do you see that?

A 2.2.5?

Q Correct.

A Yes, it does say that and give criteria for when you would initiate safety injection manually.

Q Right. And then the next section is 3.0, "Follow-up Action." Do you see that?

A Yes.

Q Now, you did receive training on the use of this part of the procedure, both at Met Ed and at B&W?

A Yes, I did. I received training at Met Ed on the procedure and the practical application at B&W, Lynchburg.

Q Do you see the section that says "3.2, Safety Injection Manually Initiated"?

A Yes, I do.

Q The first item, 3.2.1, says, "Verify that the makeup pumps and decay heat removal pumps start satisfactorily." Right?

A Yes.

Q The next item, 3.2.1.1, says "Close MU-V12 and MU-V18." Right?

A Yes.

Q Which valves are those?

A MU-V12 is the valve between the makeup tank and the suction to the makeup pumps. MU-V18 is the isolation valve on the normal makeup line in the discharge of the makeup pumps.

Q Item 3.2.2 says, "Bypass the safety injection by depressing the group reset pushbuttons and throttle MU-V16A/B/C/D as necessary to maintain 220-inch pressurizer level and not exceed 250 GPM/HPI flow leg."

What did MU-V16A/B/C/D refer to?

A They are the high-pressure injection control valves for each of the four high-pressure injection legs.

Q And it is those valves that determine the rate of flow into each leg?

A They controlled the rate of flow in each leg.

Q Now going over to the next page, do you see where it says 3.2.5? It says "Caution. Continued operation depends upon the capability to maintain pressurizer level and RCS pressure above the 1640 psig safety injection actuation setpoint."

Do you see that sentence?

A Yes, I do.

Q And under that there are two paragraphs. No. 1 says, "If pressurizer level can be maintained above the low-level alarm point and the RCS pressure above the safety injection actuation point, then proceed to step 3.2.6." Is that correct?

A Yes.

Q And does 3.2.6 then describe the procedure for initiating plant shutdown and cooldown?

A If you are within those limits, then it has you go to a normal plant shutdown and cooldown procedure, yes.

Q So did you understand the meaning of this part of the procedure that if pressurizer level can be maintained above the low-level alarm point

and the pressure above the safety injection actuation point, then you can proceed to a shutdown and cooldown?

A Are you asking me if I understand what that says or --

Q Was it your understanding before the accident that that was the effect of that particular section of the procedure?

A Yes.

Q Again referring to your understanding before the accident, paragraph 2 in 3.2.5 says, "If pressurizer level cannot be maintained above the low-level alarm point and the RCS pressure above the safety injection actuation point, then the plant has suffered a major rupture and operation should continue according to part B."

Do you see that?

A Yes, I do.

Q And was it your understanding before the accident that if you could not maintain pressurizer level above the low-level alarm point and the pressure above the safety injection actuation point, then you had to go to part B of this procedure?

A Yes, that you had to be able to maintain pressurizer level above the low-alarm point and pressure above the high-pressure injection point.

Q Right, and unless you could do both those things, then you had to proceed to part B.

A My understanding before the accident was that they would never be other than the same, level and pressure would trend together, and all my training and experience on the use of this procedure always reflected level being as the most important thing and that they would be trending together.

I was taught that way and displayed that way and we trained that way at transient response at B&W, Lynchburg.

Q Right, and you did understand, pursuant to that training on this procedure, that unless both of them were above the low-level alarm point in the case of the pressurizer and the safety injection actuation point in case of pressure, then you had to go to part B?

MR. KLINGSBERG: He has already answered that. I will let him answer it again.

A Of course.

MR. FISKE: He just did.

MR. KLINGSBERG: What?

MR. FISKE: I thought he just did.

MR. KLINGSBERG: Did you say something?

THE WITNESS: I was about to say that my training did not stress, other than the sense that pressure and level were the same and they were always used in the same reference, and that the real key was pressurizer level, and that pressure would always trend with it.

So you never had to look at level and pressure; you looked at level and pressure. All right? They were always together, they always trended together, particularly in the rererence to a LOCA, which is the portion of the procedure that we are in, or a leak, no matter how big or how small.

BY MR. FISKE:

Q Are you telling us, Mr. Zewe, that in the course of your training at B&W,that they didn't tell you that it was important to maintain pressure above the actuation point for HPI?

A I am not saying that at all.

Q They never told you --

A Let me finish, a second.

Q All right. Sure.

A I am saying that we are referring here to a leak which is within the capability, now, of the makeup system. And any reference that was implied or taught or actually demonstrated always dealt with pressurizer level as being the key, and that reactor coolant system pressure would follow the pressurizer level trend.

And in this case you are dealing with a reduced inventory which is a reflector of pressurizer level. The pressure would also go down as the pressurizer level went down. That is what my training and understanding was and actual transient response training.

Q Nobody ever told you at B&W that you didn't have to pay any attention to pressure, just watch the pressurizer level, did they?

A Here again, they always used them together. They did not single out and say, "Don't believe pressure, only believe level." But "Believe your level and pressure. Believe the indication," and that they would trend together.

Q What did you understand was the function that high-pressure injection played in the course

of a loss of coolant accident?

A To replace the lost inventory in the reactor coolant system and to restore pressurizer level.

Q Did you understand that high-pressure injection had any function to play in a depressurization transient which was not a loss of coolant accident?

A It was my training and understanding that every depressurization transient fell into the type that pressurizer level would also be affected, and that it again would restore the inventory and indication of coolant inventory as indicated by the pressurizer.

Q Did you understand that high-pressure injection had, as one of its purposes, increasing pressure in the reactor coolant system?

A I did have an understanding that if the high-pressure injection system was initiated and if the break size -- if you are referring to a LOCA -- that you could add more inventory to the reactor coolant system than what was coming out the break, you indeed would restore inventory and level and then you would indeed recover pressure.

Q I would like to show you, Mr. Zewe, a copy of the Unit 2 emergency procedure 2202-1.5, Pressurizer System Failure, which has been previously marked B&W Exhibit 305.

Do you have that in front of you?

A Yes, I do.

Q Would you like to take a minute to look at it?

A Yes.

Q Have you had a chance to look at this, Mr. Zewe?

A Yes. Yes, I have.

Q Directing your attention to the first part of this section A, it refers to a leaking pilot-operated electromatic relief valve. I would like to start with A.1, Symptoms.

No. 1 says, "Relief valve discharge line temperature exceeding the normal 130 degrees Fahrenheit, alarm 200 degrees Fahrenheit."

What instrument did you understand measured the relief valve discharge line temperature?

A Thermocouple that was attached to the discharge piping.

Q Did you understand that there was a

thermocouple for each of the code safeties as well?

A Yes.

Q Did you know the location of those thermocouples prior to the accident?

A General location only.

Q Why did you understand that a temperature at the thermocouple for the PORV exceeding 130 degrees was a symptom of a leaking PORV?

THE WITNESS: Read that again, please.

(Question read)

A The discharge line thermocouple should read ambient temperature conditions on that relief line. And if you have any leakage from the valve, you would have an increase in temperature on that line that would be sensed by the thermocouple.

Q The manual action prescribed in section A.2 for a leaking pilot-operated electromatic relief valve is to close the electromatic relief isolation valve; isn't that correct?

A That is the manual action that is stated here in the procedure.

It was my further understanding that the reasons for closing this would be twofold, one being that we would close it if the leakage past the

valve would exceed any of our operating limits. This would allow us to isolate that leakage.

The other reason was that if we would check to see or to try to differentiate if one of the code valves, RC-V1A or 1B or the RC-V2 was leaking and to narrow it down to see if it was RCR-V2 or the codes, we could close the valve and then make a determination if it was leakage from a code valve or from the RCR-V2. And if it was not --

Q Well, let's just --

A And if it was not, and even if it was verified that RC-V2 was leaking, we would then reopen up the block valve. Because as long as we could stay within our cofines of our procedures, we would still continue to operate.

So this manual action, even though it says "Close the valve," it does not infer that we may close it, that we could not reopen it up again.

Q Mr. Zewe, taking those one at a time, you referred to leakage within operating limits?

A Yes, I did.

Q And by that, do you mean that under the tech specs you did not have to shut the plant down unless there was leakage that exceeded a certain

amount?

A That is right. The plant did have specifications that we could continue to operate as long as we were within certain leakage limits.

Q And they specified that if you exceeded those leakage limits, then you had to shut the plant down; right?

A Right, you had to reduce less than that leakage, and if you could not do that within a certain time frame, then you would need to shut down.

Q And what was the amount of the leakage that you were allowed before you had to shut down?

A Leakage specs vary. All right? It deals with unidentified leakage and identified leakage and controlled leakage and steam generator tube leakage.

The one that would apply in this case, since we know that it is leaks from the code valve or the PORV, that we could then -- it is identified, so the leakage spec would be ten gallons a minute.

Q So is it your testimony that so long as the leakage from the pilot-operated relief valve was less than ten gallons per minute, you did not have to close the block valve?

A That is not what I said.

MR. KLINGSBERG: I object. That was not his testimony.

Q I thought the first thing you said was that you didn't feel you had to close the electromatic relief isolation valve as long as the leakage was within operating limits.

A That is true. But we make a further determination -- all right -- that is made by the plant staff. All right? We wouldn't always go right up to our limit before we would take action.

We use that as the bounding end point. Anything greater than ten, you would need to take action. All right? Which would require you to get within the limits within four hours or to be in hot standby within the next six hours and cold shutdown within the next 30 hours. I am referencing page 4 under "Follow-up Action." C.3, 1, where it talks about RC system identified leakage. Since I don't have the tech specs here, I am referring to that.

Q That is in the section of the procedures that refers to a leaking code relief valve; isn't that correct?

A Correct, but it identified the leakage

spec that I feel was focused upon at this point.

Q What rate of leakage in terms of gallons per minute did you feel that you had to have before this section A of the procedure became applicable?

A Something less than ten gallons a minute, without further qualification there. All right? Because I knew that the system was designed to handle leakage up to our limits, because we had designed the cooling system for the reactor coolant drain tank based with that in mind.

As long as the leakage was not an operational problem, we could make that determination that somewhere before we would exceed our upper limit, that we would take some action.

Q Is it your testimony that you didn't understand before the accident that there was any reason to stop leaking through the pilot-operated relief valve other than possibly allowing a leak rate in excess of operating limits?

MR. KLINGSBERG: Objection to the question. "Is that your testimony?" I didn't think that was his testimony.

MR. FISKE: That is what I am trying to find out. I am not suggesting it has been up

to now.

MR. KLINGSBERG: I have a problem with that.

Do you want the question read?

THE WITNESS: No.

A I answered the previous question based on the amount of leakage from the valve in relationship to my limit.

There are other considerations that are made that go into determining how much leakage you can in fact live with or is desirable from a plant standpoint. That is one of them: total leakage.

Q What was the number of gallons per minute that you felt, before the accident, was permissible before you had to close the block valve?

A As I have stated before, I don't recall having a set number, other than not to exceed our limits. I knew that there was some leakage from one of the three valves or a combination thereof, and management was aware of that also. And we were monitoring it day by day. And I really didn't have an upper limit other than that I would not exceed the upper limit spec.

Q What was the rate of leakage that

existed prior to the accident?

A I don't recall the exact rate of leakage that we had calculated from the valve on the day of the accident. I don't recall the exact figure.

Q Well, is it your testimony, Mr. Zewe, that someone at Met Ed determined what the amount of the leakage was and then made a judgment that that amount of leakage did not require closing the block valve, even if the leak was from the PORV?

A That day of the accident I was aware of what the calculated leakage was. At this time, however, I don't remember that number, but I knew it that day.

Q Were you one of the ones at Met Ed that reached that conclusion on that day?

A That conclusion? Could you --

Q The conclusion that the rate of leakage on March 28, 1979 was not high enough to require you to close the block valve, even if the leakage was coming from the PORV.

A That was my judgment.

Q Who else to your knowledge participated in that decision?

A That particular day?

Q Yes. That is a good day to pick.

A I don't recall having much of a discussion about it or taking a vote. It was my responsibility and my decision.

(Continued on next page)

Q I want to go back to a question that I had asked you before.

Were you aware prior to the accident of any other reason why it might be important to prevent leaking through the pilot operated relief valve?

MR. LINGSBERG: Other than what?

Q Other than preventing a leak rate in excess of operating limits.

A Yes.

Q What was that reason?

A One reason was that any leakage past a valve will, over time, erode the valve seat.

Q What are the consequences of eroding the valve seat?

A The valve would not be leak-tight.

Another reason would be that we would have abnormal boron concentration differences between the pressurizer and the reactor coolant system.

And her reason would be the capacity of the reactor coolant drain tank to handle the fluid and to keep it cool and to transfer it to an RC bleed tank so that we could reuse that water.

Q And you were aware of all those reasons

on the morning of the accident?

A Yes, I was.

Q Were you also aware, before the accident, that leakage through a valve could increase the potential for the valve failing?

A What do you mean by "valve failing"?

Q I mean by "failing" a situation where the valve had not worked the way it was supposed to, including the possibility that once it opened it might stick open.

MR. KLINGSBERG: That is very confusing.

A Are you asking me this only in relationship to leaking through the pilot operated relief valve?

Q No, I am asking you, weren't you aware before the accident that one of the reasons to prevent leaking through a valve is to prevent -- is the possibility that leaking through the valve may increase the possibility that the valve will fail?

A No. As I stated earlier, a valve that leaks through, you could have and you will have erosion of the seat. All right? Whereby the valve will not be leak-tight when it is closed. But I did not mean to infer that that would cause the valve to fail to close or to subsequently fail open.

It will not be as leak-tight as it would be without the valve seat eroded. But it does not infer that its operating mechanism would not work or that it would fail in any position. It would not be leak-tight.

And in my own mind, a valve that is not leak-tight indeed has failed to a varying degree, that it does not isolate completely. That it leaks high.

That is why I asked to clarify. Valve failure to you and to me may be different.

Q Maybe I can move this along by showing you some testimony that you gave before representatives of the Senate Committee on the Environment and Public Works, the so-called Hart Committee. I am referring particularly to testimony that you gave on November 15, 1979 at pages 33 and 34.

MR. FISKE: I guess you had better mark it since it has not been marked, as the next B&W exhibit.

(Testimony of Mr. Zewe before the Hart Committee on November 15, 1979 marked B&W Exhibit No. 740 for identification as of this date.)

Q What I want to read to you starts at the middle of 33 and goes to the bottom of 34, but if you want to read any more before I start doing that, you are perfectly free to do so.

A Give me a minute then.

Q Sure.

A (Witness examining document.)

O.K.

Q Starting at page 33, question by Mr. Recktenwald starting at the top actually, line 3.

"Mr. Recktenwald: Now, prior to the accident, were you aware that one of the relief valves on the pressurizer was leaking?

"Mr. Zewe: Yes, I was.

"Mr. Recktenwald: And how long had that condition existed?

"Mr. Zewe: Couple of minutes at least."

Let me stop there.

Were you asked those questions, Mr. Zewe, and did you give those answers to Mr. Recktenwald?

A I was asked there how long that condition had existed. My answer is incorrect. It should be a couple of "months" at least, not "minutes."

MR. KLINGSBERG: It may not be your answer is incorrect. It might be a typographical error.

THE WITNESS: I just meant my answer as appears here is incorrect. To my recollection at all, I would never have said a couple of "minutes."

Q Anyhow, the fact is that it was a couple of months?

A That is what should appear there, as I recall now.

Q Continuing with the questions, "Mr. Recktenwald: And at that time, were you aware of the possibility that leakage through a valve could indicate or could increase the potential for that valve failing?

"Mr. Zewe: Yes.

"Mr. Recktenwald: And did you ever, yourself, think about the potential for one of those valves failing, or -- first, let me ask that.

"Mr. Zewe: Did I ever think about potential for the valve failing?

"Mr. Recktenwald: As a result of that leakage.

"Mr. Zewe: I believe it crossed my mind, yes."

Were you asked those questions and did you give those answers?

A I remember the general line of questions and answers, yes.

Q Is it your testimony that when you referred to the potential for the valve failing in those answers, you were referring only to the possible erosion of the valve seal?

A As I recall, that is exactly what I was referring to.

Q Let me continue, Mr. Zewe, with a question and answer on the next page, page 34.

"Mr. Recktenwald: But you don't recall anyone ever explicitly saying to you, be [illegible] or be aware that one of these valves might [illegible].

"Mr. Zewe: I think that it's generically expected that if you do have leakage that the possibility exists, but not specifically with those particular valves, no."

Were you asked that question and did you give that answer to Mr. Recktenwald?

A As I recall, that is accurate for what I had said, yes.

Q Did you have any reason to believe, on the day of the accident, that leakage through the pilot operated relief valve would have any less of an effect in possibly causing that valve to stick than leakage through valves generically would have?

THE WITNESS: Read that back again.

(Question read back.)

MR. KLINGSBERG: By "generically" you mean other kinds of valves would have?

MR. FISKE: I am referring to the answer Mr. Zewe gave to Mr. Recktenwald where he said, "I think it is generically expected that if you do have leakage that the possibility exists."

THE WITNESS: Now I have lost it.

Would you repeat it again? I am sorry. I lost my concentration.

(Question read again.)

A As I recall, we may have here went back and forth between failing and sticking and leakage.

As I remember now, my thoughts were that

the valve certainly would fail due to leakage, based on leak-tightness. Not that the valve would fail open or would stick in any particular position.

I don't remember thinking about how the operator itself in controlling the opening or closing of the valve is affected by the steam going past the valve seat.

Q It is correct that you told Mr. Recktenwald back in November 1979 that it is generically expected that if you have leakage, that the possibility exists that a valve might stick?

A Here again, I see the words, but I don't have a very accurate recollection of exactly what I was trying to convey to him. All right?

And as I look now, that's what I thought that I was trying to convey, and I am afraid that's as far as I can remember.

Q Was there anything about the pilot operated relief valve that made a generic expectation that leakage might cause valves to stick inapplicable to the pilot operated relief valve?

A Not that I can recall.

I remember thinking about the leakage that we experienced in Unit 1 during the first

refueling cycle in Unit 1. And we operated throughout that cycle with one of the valves leaking by. And again there I don't remember the concern for a valve to stick or to fail open because of that, thinking more it would erode the seat and that the leakage would only get worse.

(Recess taken.)

BY MR. FISKE:

Q It is correct, isn't it, Mr. Zewe, that for a period of several weeks before the accident you had been seeing temperatures on the thermocouples for all three of the pressurizer relief valves up in the range of 190 degrees?

A Yes.

Q Is it correct also, Mr. Zewe, that prior to the accident you really did not have any reason to believe that the leaking was coming from one of these valves any more than another?

A As I recall, I knew that one of the code safety valves -- I believe it was the B valve -- had a little bit higher temperature. And I leaned in that direction, thinking that possibly it might be a code safety valve more so than the A valve or the PORV, but not with any

conclusive -- if you understand what I am trying to convey here.

Q Right.

A I thought it might be that one more because it was the highest, but nothing conclusive about that. It very well could have been any of them.

Q You were not aware prior to the accident of any investigation that had been made that had determined that the leak was not coming from the PORV; isn't that correct?

A I was unaware of any conclusions from any group saying that conclusively it was not coming from there. That is true. I was not aware of anything like that.

Q Did you realize that it might have been helpful, in determining whether or not a leak was coming from the PORV, to close the block valve?

THE WITNESS: Read that back again, please.

(Question read back.)

A Operationally, no. Because I did not think at the time, nor do I now, that it was prudent for us to close the block valve. I felt

that the operable PORV to perform its intended function was valuable, and that closing the block valve and proving that it was the valve that leaked, I felt that we wouldn't gain that much from it and that I would re-open it again anyway.

But from the standpoint of future repair work on the valve, it may have been helpful to say for sure which of the valves it was. But it was my understanding then that we were preparing at the next outage to work on either of the PORV or one of the code safety valves themselves.

Q Was it your understanding before the accident that it wasn't important to try to find out whether there was a leak through the PORV?

A As I stated, operationally I don't believe it made a lot of difference. And knowing that they were preparing to work on either the PORV or a leaky code safety, I didn't feel that it made a great deal of difference.

Q Going back to your testimony before the representatives of Senator Hart's committee, I would like to refer you to an answer. to a question and answer at the bottom of page 34, top of page 35. Question by Mr. Rectenwald: "Now,

is it correct that if you'd isolated the block valve on the PORV you could have told whether it was a PORV that was leaking?

"Mr. Zewe: Yes."

Were you asked that question and did you give that answer?

A Yes, I did.

Q How long would you have had to leave the block valve closed in order to be able to determine whether the leak was coming from the PORV?

A As I recall, I did not have any particular time frame in mind to determine accurately if that was it or not based on the leakage that we were experiencing. So I really didn't know how long we would have to keep the block shut. I didn't think of it in time frame.

But as I read further here, it brings to mind some other thoughts that I had about closing the block valve itself for a period of time and the concern that maybe the block valve would fail shut, stick shut.

Q Maybe we will get to that in a minute.

A All right.

Q Sticking with the subject we are on right now, how did you think that closing the block valve would help you determine whether the PORV was leaking?

A If in fact it isolated the leak that we suspected from one of the three valves, we should be able to determine that by doing a leak rate calculation and possibly also by observing the drain tank temperature and level and the discharge line from the tailpipe thermocouples.

Q One way you could tell would be if you closed the block valve and the leak rate decreased or stopped entirely; that would indicate that the leak had been coming through the PORV, wouldn't it, in whole or in part?

A It would be a pretty positive indication of that, yes.

Q And how long do you think you would have had to have the block valve closed in order to be able to make that kind of determination from the leak rate calculations?

A As I recall, the leak rate procedure at that time required that we have a one-hour time limit in determining the leak rate.

Q What does that mean?

A That means that whenever you instituted the leak rate, that you would take data at time zero, and in one hour later it would compare the data at that one-hour point in making its computer calculation on what your actual identified or your unidentified leakage was.

Q Didn't you understand that you could have done one of those calculations with the block valve open and then close the block valve and have done another one of those calculations?

A That's what I am saying, yes.

Q And reach the determination, within a matter of a few hours after closing the block valve, whether or not there was a leak through the PORV?

A I don't disagree with that, no. It would take that long.

Q Now let me go ahead and read the rest of the testimony that you referred to a moment ago, Mr. Zewe, picking up again with a question and answer on the bottom of 34 and continuing on into page 35.

"Mr. Recktenwald: Now, is it correct that if you'd isolated the block valve on PORV you

could have told whether it was a PORV that was leaking?

"Mr. Zewe: Yes.

"Mr. Recktenwald: And why wasn't that done prior to the March 28 accident?

"Mr. Zewe: Well, the temperatures that we monitored every day on the discharge pipes of all three of the relief valves were inconclusive where, which one was the leaky valve, and it was accepted generally, I think, that we really did not have any reason to believe that it was more one valve than another valve. That the one code valve had been consistently, at least a few degrees higher than the other valves.

"So, I don't know why we didn't isolate it, and just count it from that point. I really can't say that the logic wasn't there to do that, just to eliminate it.

"Mr. Recktenwald: Could you have done this on a shift yourself?

"Mr. Zewe: Yes, very easily.

"Mr. Recktenwald; Was there any concern that if you did that, the isolation valve might stick?

"Mr. Zewe: Yes, there was, but that wouldn't have prohibited us from doing it if we thought that it was a problem, but the concern always is in a high-temperature fluid system in a high-termperature atmosphere that the valve could remain shut and we would lose the inability of having that relief valve.

"We have had other valves on the pressurizer that were motor operated isolation valves similar to that one that have had failure modes in that direction."

Were you asked those questions and did you give those answers to Mr. Recktenwald?

A Yes, I did.

Q And it is correct, is it not, then, Mr. Zewe, that any concern about possible sticking of the block valve would not have prohibited you from closing it if you thought that there was a problem?

A Absolutely. Like I stated earlier, that I would have taken whatever action I felt was warranted.

Q Have you ever had a situation before in your experience where the block valve for the PORV

had been closed and it stuck shut?

A My recollection is that there has been problems with the block valve for the PORV sticking shut and also other isolation valves on the pressurizer, particularly on the spray line, for another one that comes to mind.

Q Let's just talk about the block valve for the moment specifically.

Were there specific instances in which the block valve had been closed and then it stuck shut?

A As I recall, there were.

Q On Unit 2?

A I cannot accurately recall whether they were on Unit 1 and 2, just Unit 2 or Unit 1, but at Three Mile Island.

MR. FISKE: I would like to hear the answer.

(Answer read back.)

(Continued on next page.)

Q As you sit here today, can you recall any instance in which the block valve stuck shut on Unit 2?

A I have to give the very same answer right now. I want to say yes, there was on Unit 2, but I can't recall exactly when it was.

Q How frequently in the course of the operation of Unit 2 would the block valve have been shut?

MR. KLINGSBERG: When you are saying "shut," you mean --

Q Just to make my question clear, Mr. Zewe, under what circumstances in the operation of Unit 2 would you close the block valve?

A We have as part of our heat-up procedure -- as I remember, we had it then also -- was that we would periodically cycle block valves on the pressurizer at certain heatup temperatures in order to insure that they were still moving freely on the heatup.

Q This would be during the testing of it?

A This was during any heatup, whether to return to normal operation, for testing or whatever. It was a portion during the normal heatup

procedure.

Q Were there any other circumstances in the operation of Unit 2 where you would close the block valve?

A For testing.

Q Pardon me? Is that an answer?

A For testing.

Q For testing what?

A Periodically we do planned maintenance on our valve operators. After the regular maintenance would be done or even if the valve itself had been worked upon as part of its surveillance, we would then cycle the valve, check the running current on the motor, make sure that the limit switches were accurate or the indication, make sure that everything was as it should be after the surveillance or planned maintenance was completed.

Q What action was taken at TMI-2 in any case where the block valve shut and remained shut or stuck shut? Just go on operating?

MR. KLINGSBERG: That assumes that there was such a situation.

Q Well, let me broaden it to include any situation that you can recall in which the block

valve shut and then stuck shut. What action was taken at that point to deal with that situation?

A If the block valve had been shut for whatever reason and had failed shut through its control from the control room, we would have a couple of different courses of action.

One would be to have an operator go in on top of the pressurizer and manually crack the valve off of its seat and then allow the remote operator to operate the valve.

If in fact we could not do that, we would then shut down the plant or remain shut down if it was found to be stuck in that condition, and then somehow repair the valve and return it to an operable status.

Q Do you remember any case where the plant had to be shut down because of a block valve that was stuck shut that could not be manually cracked open?

A I do remember -- just that block valve you are referring to.

Q Yes.

A I can't recall again, like I stated before, with much certainty. But I believe that the

time I am thinking about we were at hot shutdown conditions and we did not need to shut down the plant and then cold down, but we did stop from bringing the plant up to power, and then stop and repair the valve.

Q This is TMI-2?

A TMI-2, yes, as I recall.

Q And the valve that we are talking about is the block valve for the PORV?

A RC-V2 in Unit 2.

Q What records in the ordinary course of business would be created at Met Ed to reflect the fact that the plant had to be shut down in order to repair a stuck-shut block valve?

A I would think that the shift foreman's log and the control room operator's log would reflect that.

Q Can you give us your best recollection as to the approximate date of this incident?

A I'm sorry. I can't, no.

Q Would you expect that the shift foreman's log and the control room operator's log would reflect any instance in which the block valve had been shut and stuck shut?

THE WITNESS: Would you read that back?

Q Let me put the question again.

You said before that one of the purposes of the shift foreman's log and the control room operator's log was for the shift foreman and the control room operator to record any incident that occurred during their shift that they considered significant.

I am asking you, would you expect that if there had been a block valve which was closed and then stuck shut during a shift, that that kind of information would be reflected in those two logs?

A I thought I answered to that effect previous. You had asked me where I thought the record would be if this in fact happened, and I mentioned that it should be reflected in the control room operator's log and the shift foreman's log.

Q I just wanted to make sure we were on the same wave length. Because the question that I had asked you that you answered referred to the incident where the plant had been shut down because the block valve had been stuck shut. My question is broader.

A I see.

Q Whether you would expect the control room operator's log and the shift foreman's log to record any instance in which the block valve closed and then stuck shut.

A I would expect it to be there also.

Q And would you expect the control room operator's log and the shift foreman's log to reflect any incident in which any of the motor-operated isolation valves which you referred to in your Hart testimony stuck shut?

A Are you referring to the Hart testimony that talked about generically or --

Q It was the last sentence of the testimony that we went over a moment ago. It said, "We have had other valves on the pressurizer that were motor-operated isolation valves similar to that one that have had failure modes in that direction."

And I assume by that answer you were referring to other motor-operated isolation valves that had stuck shut. Is that correct?

A That is correct, and I would expect that to be reflected in the control room operator's and the shift foreman's log also.

Q Can you identify for us the particular motor-operated isolation valves that you were referring to in that answer?

A The two that come to mind are RC-V3 and RC-V1.

Q Have they got names?

A Yes, sir. RC-V3 is the isolation valve for the spray valve. RC-V1 is the spray valve.

Q Referring again to the pressurizer system failure procedure, section C, page 4, do you have that in front of you?

A Yes, I do.

Q Under the paragraph that says, "C.3, "Follow-up Action," paragraph 3 reads, "Place code relief discharge line temperatures on analog trend recorder." Do you see that?

A Yes.

Q What is an analog trend recorder?

A We have the availability on the plant computer in the control room to trend up to four points. There are four analog trend recorders that are available on the computer. We could then trend any particular point that we would like to, and it has to be an analog point, that it would then read

out and record on strip chart paper the particular point of interest.

Q On the morning of the accident, were the code relief discharge line temperatures on an analog trend recorder?

A They were not.

Q Had they been placed on an analog trend recorder anytime after it was determined that the temperatures had been up in the 190-degree range?

A Anytime that they were?

Q Did you know of any time in the weeks, several weeks before the accident during which the temperatures were up in the 190-degree range, when the code relief discharge line temperatures were placed on an analog trend recorder?

A I don't recall if they were or not.

Q From where, Mr. Zewe, did you get the understanding that even though you had the symptoms of a leaking pilot-operated relief valve described in the procedure --

A What page are you on now?

Q 1.

A Okay.

Q -- you didn't have to close the block

valve unless the leakage reached some particular level?

THE WITNESS: May I have the first part of that back, please?

(Question read)

MR. KLINGSBERG: Excuse me. Are you implying in your question that there has been previous testimony to that effect or are you asking if he had such an understanding and if so --

MR. FISKE: I will back up a little bit if you like.

BY MR. FISKE:

Q You testified earlier, didn't you, Mr. Zewe, that on the day of the accident, it was your understanding that even if there was a leak through the pilot-operated relief valve, it was not necessary to close the block valve unless the leakage reached some specified level in terms of gallons per minute; isn't that correct?

A Or if there was another evaluation along with that to determine that to reach the conclusion, yes.

Q I didn't hear the second part of your

answer.

A I believe I said before that there were other things that we considered, not just the maximum amount of leakage. That was one part of it. There were other things that we had considered. All right?

Remember, I said that we could go up to a certain amount of leakage, at which we would take action.

Q Yes. That's right.

A All right.

Q That's the testimony I was referring to.

A Okay.

Q Now, there is nothing in the pressurizer system failure procedure which says that you do not have to close the electromatic relief isolation valve unless the leakage reaches a certain level, is there?

A There is not.

Q My question is, from where did you get the understanding that you did not have to apply the action specified in this procedure unless the leakage reached a certain level?

MR. KLINGSBERG: He has testified now

twice, once a few minutes ago and one before, that there were other things which were evaluated besides the leakage rate. And you keep limiting it to the leakage rate.

Q Are the other things that you felt should be evaluated contained in this procedure, Mr. Zewe?

A Yes. I mentioned before that we do take into account the differential boron concentration, which is listed in the procedure here, and that the failability of the RC drain tank to handle the leakage and to pump the leakage from the drain tank back to a bleed tank so that we could put it back to the makeup tank and not create a water problem.

Q Is there anything in this procedure that refers to the capability of the drain tank?

A A.1, 2 lists that the "RC drain tank pressure above normal --" It does indicate there that it has some reference to the RC drain tank, but that is the only place.

Q And that indicates that if you see pressure above normal in the drain tank, that is a symptom of a leaking PORV; correct?

A Could be a symptom.

Q Yes.

A Yes. So what is your question then?

Q I think you answered it before.

A Oh.

Q Is the reference to boron concentration symptom A.1, 4?

A It does mention that, yes.

Q And that indicates that boric acid concentration continually increasing in the pressurizer is an indication of a leaking PORV; correct?

A Yes, it is.

Q And did you see an increase in boric acid concentration in the pressurizer before the accident?

A Yes, we did.

Q Let me ask the question again.

From where did you get the understanding that even though you had symptoms indicating a leaking pilot-operated relief valve as specified in this procedure, you could take into account the level of the leakage in making a decision whether or not you had to close the block valve?

A As I recall, I obtained that

understanding, one, from plant management; two, from our operational experience in cycle 1, Unit 1, with the leaking relief valve; and also from my understanding and operation of Unit 2.

Q From whom in plant management did you obtain that understanding?

A The supervisor of operations.

Q That was Mr. Floyd?

A Mr. Floyd.

Q Anyone else?

A I could only assume, though not directly, that other management people were involved in that knowledge and agreement.

Q Going to section B of this procedure, Mr. Zewe, that refers to an inoperative pilot-operated electromatic relief valve; correct?

A Yes, that is correct.

Q At the top of the page it says, "B.1. Symptoms." Do you see that?

A Yes.

Q No. 2 says, "RC system pressure is below 2205 psig and RC-R2 fails to close."

Is 2205 psig the pressure at which the PORV was supposed to close?

A Yes.

Q Going to paragraph 3, "RC-R2 discharge line temperature is above the 200-degree Fahrenheit alarm," did you understand that to be a symptom of an open PORV?

A I understood that to be a symptom of an open PORV, but there were also other things that could cause that alarm to be greater than a hundred degrees. If the valve had lifted and had shut or if one of the code safety valves had lifted or shut or if the valve began to leak a lot, I would expect to have the alarm.

Q There is a reference to "Computer Point (402)." What does that refer to?

A That is the actual analog point on the computer. That is the point that is assigned in the computer that you could ask for that would print up the RC-R2 discharge line temperature.

Q Was it possible to put that particular temperature on a multipoint recorder?

A It was not. You may be confused between a multipoint recorder and an analog recorder.

Q That suggestion has just been made to me

on our side of the table.

You said before, Mr. Zewe, when we were talking about section C of this same procedure and the part of it that talks about placing the code relief discharge line temperatures on an analog trend recorder, did you understand before the accident that it was possible to put the RC-R2 discharge line temperature on that kind of an analog trend recorder?

A Yes.

Q Paragraph 4 says, "The RC drain tank pressure and temperature are above normal on the control room rad waste disposal control panel 8A." Do you see that?

A Yes.

Q I take it that also is a symptom of a PORV which has failed to close?

A It would be one of the symptoms if the valve would fail to close along with if the valve had cycled or if one of the code relief valves had cycled.

Q You were familiar with the layout of the control room in Unit 1 as well as Unit 2?

A Yes, I was.

Q Was there a difference in the location of the instrumentation for drain tank pressure and temperature between the Unit 1 control room and the Unit 2 control room?

A Yes.

Q Was the drain tank pressure and temperature in the Unit 1 control room more accessible to the operators than the same information in the Unit 2 control room?

A Would you define "more accessible"?

Q Well, withdrawn. I will put it differently.

Did you have any view prior to the accident that the operators were any better able to determine drain tank pressure and temperature at Unit 1 than they were at Unit 2?

THE WITNESS: Would you read that back, please?

(Question read)

A Yes. Unit 1 had a level recorder as part of its instrumentation for the RC drain tank. Unit 2 only had a level instrument.

Q Was there any other respect in which you felt that the operators at Unit 1 might be better

able to determine drain tank pressure and temperature than the operators of Unit 2?

A The RC drain tank panel in Unit 1 was directly behind and to the right of the operator.

In Unit 2, it was a panel that was facing the west wall of the control room and the operator would have to walk around behind the panel in order to look at the instruments.

In Unit 1 he would just turn around and walk toward the panel and view the instruments. It was a little closer at hand.

Q Was there any other respect prior to the accident in which you felt that the operators of Unit 1 might be able to more easily determine drain tank temperature and pressure than the operators at Unit 2?

A The alarm indicating lights for the RC drain tank were located at the same location as the level instruments and pressure instruments, and they were closer and more visible to the operator at the console in Unit 1.

In Unit 2 they would need to walk back to the panel and observe the alarms there.

Q In other words, the alarms were in the

same place in each case as the instruments?

A Yes.

Q But both were closer to the operators at Unit 1 than Unit 2?

A Yes.

Q Any other respects in which it might have been easier, in which you felt it was easier for the Unit 1 operators to determine temperature and pressure than the Unit 2 operators?

A Not that I can remember, no.

Q Did you ever express to anyone at Met Ed, at any time before the accident, any of the thoughts that you just expressed here?

A Anytime prior to the accident?

Q Yes.

A I remember making overall general comments about the layout of the control room. I had been more familiar with Unit 1 than Unit 2 at that stage when the Unit 2 control room was being put together and I remember making general comments about the layout, and some things I thought were better in Unit 1. Some things I thought would be better in Unit 2. But I don't remember exactly who that was or what the actual things were, other

than this, that, and the other thing.

Q Let's take them one at a time.

Did you ever tell anyone at Met Ed before the accident that you felt that the Unit 2 control room should have a level recorder for the drain tank?

A I don't recall ever making that.

Q Did you ever tell anyone at Met Ed at any time before the accident that you felt that the instruments and the alarms indicating drain tank pressure and temperature should be closer to the operators than in fact they were?

A Not that I can recall.

Q When you refer to a level recorder, what did you mean by "level"?

A RC drain tank.

Q The level of the water in the drain tank?

A Yes, the RC drain tank level recorder that is in the Unit 1 control room.

Q What is the difference between a level recorder and a level instrument?

A A level recorder has a pen-and-ink recorder on chart paper and actually records what the level is so that you could go back and review

where it has been over some time frame.

An instrument just reads out what the present level is at that particular time you are reading it, and if it changes from the last five minutes to the next five minutes, all that you can do is just read what it reads at that point in time.

(Continued on next page)

Q From your post-accident analysis of what happened on March 28, 1979, do you believe it would have been helpful to have had a level recorder at Unit 2?

MR. LINGSBERG: Hold it. Can we have the question?

(Question read back.)

MR. KLINGSBERG: You are not asking him for his recollection of something.

You are asking him to now give an opinion?

MR. FISKE: Yes.

MR. KLINGSBERG: Can we go off the record for a second?

(Discussion off the record.)

MR. FISKE: We had better put on the record that following colloquy off the record. I have agreed that the question will not be pressed at this time.

BY MR. FISKE:

Q Mr. Zewe, is there any difference between the way drain tank pressure and temperature were reflected in the control room on Unit 1 and Unit 2?

A They are both indicated in each unit

by a temperature and pressure indicator.

Q The same kind of indicator?

A I can recall Unit 1 exactly. It is a pointer-type indicator for temperature and the other for pressure.

Unit 2 is very similar, but I don't recall exactly.

Q What was your understanding on the day of the accident as to your capability of obtaining information concerning reactor coolant drain tank pressure over a period of time?

A Before the accident, you are asking this.

Q Yes, or on the day of the accident.

A As I recall, I don't believe thinking about the problem of needing to determine the pressure changeover, over a period of time.

Q Then let's divorce it for the moment from the day of the accident and just ask for your general understanding of the control room and so forth.

What understanding did you have prior to the accident as to the capability of the computer and the instrumentation that were available

to you to give you information as to the drain tank pressure over a period of time?

MR. KLINGSBERG: I thought he answered that. But he can answer again.

MR. FISKE: No, I don't think he answered that.

A It was my understanding that I could use the computer to print up what the value was of the pressure in the RC drain tank.

Q At any particular point in time?

A As I remember, yes, at any particular point in time.

Q Was there a mechanism by which you could obtain what the pressures were over a moving period of time, like the analog trend recorder, for example?

A As I recall, I should be able to use the analog trend recorder for that purpose also.

Q Did you have an understanding, prior to the accident, as to capability of the instrumentation and the computer to give you drain tank temperatures over a period of time?

A As I recall, I had the same capability for drain tank temperature as I had for drain tank

pressure.

Q And did you have that same capability with respect to drain tank level?

A I believe I did.

(Time noted: 4:40 p.m.)

WILLIAM H. ZEWE

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

CERTIFICATE

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

I, HARVEY B. KRAMER, RPR, CSR, a Notary Public of the State of New York, do hereby certify that the continued deposition of WILLIAM H. ZEWE was taken before me on May 21, 1982 consisting of pages 122 through 246;

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

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

IN WITNESS WHEREOF, I have hereunto set my hand this 6th day of June, 1982.

Harvey B. Kramer

HARVEY B. KRAMER, RPR, CSR

I N D E X

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