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PRESIDENT'S COMMISSION ON THE :

ACCIDENT AT THREE MILE ISLAND :

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CONTINUED DEPOSITION of METROPOLITAN EDISON COMPANY by EDWARD R. FREDERICK, held at Three Mile Island Nuclear Generation Station, Harrisburg, Pennsylvania, on the 24th day of July 1979, commencing at 8:30 a.m., before Stanley Rudbarg, Certified Shorthand Reporter and Notary Public of the State of New York.

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CERTIFIED SHORTHAND REPORTERS
FIVE BEEKMAN STREET
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E D W A R D R . F R E D E R I C K , having been previously sworn, resumed and testified further, as follows:

MR. ROCKWELL: The record should reflect that we are continuing, once again, the deposition of Mr. Frederick.

DIRECT EXAMINATION (Continued)

BY MR. ROCKWELL:

Q Mr. Frederick, you brought in with you today two documents that we referred to in your previous testimony. One, if I identify it correctly, is a memorandum dated May 10, 1978, from J. R. Floyd to a variety of personnel here on-site, and the second is a memorandum dated June 8, 1978, from Floyd to shift supervisors. Why don't we mark these now as exhibits.

(Above-described documents were marked Frederick Deposition Exhibits 14 and 15 for identification, respectively.)

Q With reference to what we have now marked as Exhibit 14, this appears to be, and am I correct in quickly summarizing it, as being a note requiring the various operating and supervisory personnel to review a revision to Emergency Procedure 2202-1.3, to be sure they are familiar with it?

A Yes. It also outlines the actions that personnel have to a designated small break LOCA response.

Q Could you explain to me what the relevance of the second page is to the first page. I am not clear.

A On the operating memo book, each memo that is

circulated has as an attachment a list of all the previous memos. That should be in the book.

Q Document control procedure?

A Well, it is actually just automatically updating the index of the book. The latest one has a list of everything that should be there.

Q I may have asked you this, but do you know whether there is a historical file of the memo books in the control room; once a book is filled up and it is moved and put in an historical file and a new bock is started, do you know?

A No. I know all the memos back in 1978 are still up there.

Q In more than one book?

A It is all in one book.

Q Have you ever had occasion when you wanted to go back and say, "Well, I think I remember something in the spring of '77," and go back and hunt for it in some sort of historical file?

A No.

Q Moving on to Deposition Exhibit No. 15, why don't you explain this. You know it better than I.

A This is a drill procedure and signoff sheet. Every month, Floyd mails this to the supervisor on

duty on the shift, and I guess they pick at random to try not to get the same shift each month.

He is supposed to run the drill on small break LOCA response, so that first he conducts a briefing of all the personnel that are going to be involved, and he lists the names of the people that he briefed.

Then he runs the drill by using the designated people in accordance with this little summary right here, and they actually walk through the procedure and go to the equipment and simulate operating it and trying to stay within the time guidelines that are listed here.

If they can complete all the tasks within the required time, then they sign off as successfully completed.

If they don't complete it quickly enough, they have another briefing and run the drill again, trying to speed it up until they can meet all the requirements of the drill.

When they finally meet it, they sign it and send it down, and it is filed in a drawer as being a successful drill for that month.

Q Do you know of any other documents which relate to this change or this addition to the small

break LOCA procedure, in addition to the small break LOCA drill, in the spring of '78, to the operating procedures?

We have covered an initial memorandum from Floyd requiring people to review or revise the emergency procedure. We have covered the revised emergency procedure itself. I have covered this drill.

Is there anything else you are aware of that refers to that change?

A Only the document that we used to record who these people are each day. That is about it.

Q Nothing else substantively, in terms of explaining the reasons behind this concern about a very narrowly defined small break LOCA; nothing like that you are aware of?

A No.

Q Did you ever feel in your training that a problem might potentially arise where you had no procedure, you just had no procedure to apply to a set of facts that you were presented with? Was that ever a matter discussed in your training; what do you do when everything goes wrong and you don't have a procedure?

A The only time that I can specifically remember is

during my certification at the B&W simulator, when they instituted a casualty that was not covered by the emergency procedures down there, and I had to respond to it and try to keep the plant in safe condition until I identified what the problem was and get to normal cooldown.

Q What did you do in that kind of situation? What did you do that time?

A It was a loss of circulating water pumps to the system, and the result was gradual loss of condenser vacuum, which degrades the turbine efficiency, and you begin to lose electrical output. The power output of the reactor stays the same or increases slightly. The power output of the turbine begins to decrease because of the efficiency mismatch. Those are the symptoms that I saw.

But there is no procedure for loss of vacuum or degraded output of electricity or anything like that. So what I had to do was identify the problem. What they wanted me to do was analyze the effect of the circulating water system being degraded, trace it through the circuit and determine how it was affecting it. Once I solved that problem, then they permitted me to restart the circulating water pumps and to recover the plant.

But it was, like I say, an emergency that wasn't covered by the procedure. It was imposed on me to see how I would reason through a problem not covered by the procedures.

Q Was there much attention or any attention given to that in the training generally, in the sense that as a control room operator, you may run into a situation where you don't have an emergency procedure, and you will not be able to follow a procedure?

A Yes. That is the underlying reason for the detailed study of all the systems. If you just had to memorize procedures and use them to react to symptoms, then there wouldn't be any need to understand how the system worked, other than how to present it on the control panel.

The whole idea is to have a sufficiently detailed knowledge so in the event something occurs that is completely foreign, you can use your knowledge of the intricacy of the system to figure out what is going on.

Q How would that be done in training specifically? How would that issue of dealing with a situation not covered by procedures be addressed in the training program?

A I don't know that that is specifically addressed. I am just saying that the basic concept is to know as much as you can in case you get in a situation where you don't know exactly what is going on.

Q So what you are saying is that the general study, the general familiarization, the general effort to understand how the systems work is designed, in your view, to equip you for that eventuality?

A Yes.

Q But there is no specific discussion in terms of what you do in a situation where you have no procedure?

A No, because I think that would be difficult if not close to impossible to try and envision, or to list the number of situations for which there are no procedures, and try to tell an operator, "This is one time when you won't have a procedure, and you should get ready for that."

If we identify a situation like that, we should write a procedure. The concept is that we have to do the safety analysis and what ever studies they put in the design of the plant, they have tried to come up with a set of circumstances that they consider would be likely emergencies, and they write procedures in

accordance with that, and they give you enough training to equip you to react to anything that might be abnormal.

Q Did anyone in your training, or in the day-to-day work with your supervisors, ever tell you, "Look, some day you will have a transient. You are going to have an emergency which isn't accounted for"; in other words, was there ever a time when they told you to accept that possibility?

A I believe so.

(Continued on Page 324.)

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Q In what way; how was it made known?

A Like I say, I don't specifically remember anyone ever telling me, although I do remember having a feeling that it was possible to be in a situation that wasn't covered by a procedure. It didn't really occur to me that we would be in a situation that wasn't covered by the safety analysis, in other words, a situation that included so many failures and abnormal readings that it was not covered by the basic safety analysis instruction.

Q Did anyone ever take you through the safety analysis and explain to you how it had been arrived at in the sense of saying, "Look, the safety analysis makes certain assumptions"?

A Yes.

Q And if those assumptions are correct, then our safety analysis will serve you well?

A Yes.

Q If those assumptions are incorrect, someday we may find ourselves in a situation where it doesn't serve us, and you as control room operators may someday be faced with the situation that none of us had predicted; was that kind of discussion ever raised?

A No. The third part of that was not discussed.

2.2

The safety analysis was discussed as having so many conservatisms installed in it and so many conservative assumptions made that it was considered impossible to go out of the bounds of those basic ground rules.

Q Did anyone ever challenge that assumption, namely the assumption that the safety analysis was the be-all and end-all, in terms of defining the potential emergencies and potential accidents?

A Well, it is difficult for operators to challenge the computer programmers and engineers that are throwing stuff down on you. You can ask as many questions as you want, and they always seem to have an answer. But I know the safety analysis group. That is their job. They are questioning the analysis and revising their programs all the time. You see the results of that, but it is going to be difficult to get on top of a situation like that.

Q Let me ask you this. Did any engineer or anybody of the management hierarchy here ever stand up and say, "Look, you know, we have got a lot of engineers out there doing a lot of work, and they work hard at it, but they are all human, and they probably missed something, and there is probably something in there that will happen someday that isn't accounted for"; did

anybody give you that appreciation that it was not a bible?

A Not that I recall. I don't remember any discussion of that.

Q We were talking a moment ago, and you said that there had been no discussion of what specifically you do in a particular situation not covered by a procedure. In fact, you went on to add if you found a situation that wasn't covered by a procedure, there were particular things you should do, and you would write a procedure. Is that a fair statement?

A Yes.

Q That is what happened in the case of the small break LOCA?

A Yes.

Q Was there ever any discussion about what analytical process, setting aside specific steps, what analytical process your control operator would use in a situation where you didn't have a procedure? In other words, how do you approach the question of solving the problem, not that you do specifically, but how do you approach it in an analytical sense?

A I don't remember being taught basic thought process or analytical process in arriving at a solution

to a problem.

What they do is they basically throw you in the water and see if you can swim. They give you a casualty several times until you identify it. They give you just a certain number of unknowns, and you have to keep asking questions or looking for more information until you figure it out. You have to develop the quickest you know how to do it.

Q Did they ever test you by throwing in casualties that weren't accounte for in the SAR?

A In what?

Q In the SAR, Safety Analysis Report, FSAR?

A I don't think so.

Q For instance, did they ever throw in a total loss of feed water?

A No.

Q And do you personally or do other operators operators belief that that never could happen ever; would that be the atmosphere?

A When you started talking about "never could happen" and "possible," everyone would always qualify it as saying, "The probabilities are so low that we can assume that it isn't possible, but there is always that last little inch that you wouldn't have, as far as

declaring it impossible."

However, when it came to analyzing it at best, you would spend more time on something that was more probable and gives more significant consequences than something that was nearly impossible.

You would cite a few consequences that perhaps you would try and turn it around, but you didn't spend as much time discussing it because you figured it was impossible or near impossible.

Q Did you ever have situations where you thought, "Okay, we spend all our time usually on the things that are probable because we want you to be equipped for things that are more likely to happen, but today we are going to throw all of the improbable things at you and then start giving you casualties that have nothing to do with anything you have been trained on, nothing to do with anything that is in safety analysis, multiple failures," did they ever do that?

A No. It would be hard to say that training like that is valid.

Q It would be hard to say it is not valid too?

A Now, today, yes. But a year ago you couldn't have a man in a simulator with so many thousands of hours a day in cost and try to train him to operate a nuclear

power plant based on the things that are not in accordance with the safety analysis and not based on approved procedures. That is not exactly valid training.

For one thing, the NRC requires that you respond to anything with valid operating procedures or emergency procedures, or within the bounds of the technical specifications.

If you start throwing those rules away, you are not giving an operator the type of training you are supposed to get.

For one thing, in a basic course like that, where an operator, this may be the first time on a control panel, you can't start confusing him with things that most people consider impossible.

You first have to get him through a basic response to a reactor trip, which may take a half day in itself. You know, you have a limited time to get a working knowledge of the plant, and then throw him back in the real world and then some more on-the-job training, and then come back and do it again.

It may take a year to get an operator up to where he feels comfortable on the panel. It is a rather intimidating room. You have to feel confident in that atmosphere.

So I don't believe that would have been valid training, what you are suggesting.

Right now it is only valid for operators that I consider have a good year of experience and seniority because they must be able to understand all the rules that are changing because they have a working knowledge of the basic rules.

Q When you use the word "valid" in that context, I take it you draw its meaning from essentially your definitions rated down in the technical specifications in the FSAR. In other words, when you say "valid training," valid training relates to those kinds of things that are accounted for and anticipated?

A Yes.

Q In the underlying particular analysis?

A Yes. The operator has to be able to respond to expected casualties befcre he can be taught to respond to something that is unexpected.

Q But even before the accident, I appreciate your point that you can teach somebody who is totally raw the most sophisticated casualties; that might be difficult.

A Yes.

Q But, even before the accident, you said they

could have taught more senior operators or operators with more experience, with the confidence that you described, more sophisticated reviews, drills that weren't accounted for in the underlying particular analysis, right?

A If the training materials you have are developed to the point where you can do that, yes. Before the accident, they were not.

Q I mean conceptually -- let us set aside whether you have it written down in the training guide; conceptually you do have?

A Yes. In other words, there were discussions about what would you do if, going all kinds of ways, but there was no way of verifying whether your answer was correct. Even now, if someone had postulated the TMI 2 accident, it is unlikely they would come up with the same end point that we had because of the number of variables. You have to assume, you know, quite a few things that follow the same path that we did.

If you were sitting in a classroom with three or four senior operators and you postulated an accident like that and tried to talk through it, since it is not covered in the analysis anywhere and there are no procedures to follow, it is unlikely that you would

come up with an end point that could be verifiable. That is why the training may not be significant to begin with.

(Continued on following page.)

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Q What do you mean by that?

A Well, if you are discussing it on the basis of trying to come up with what do you do if this happened to you, then you are going to have some kind of guideline or feedback from an authoritative source to tell you whether or not you are right or wrong in your decisions.

Q Let us take an example. Before March 28, a loss of main and auxiliary feed was not accounted for, right?

A Right.

Q Let us say that three or four experienced control room operators were having a session, and someone said, "Look, it never happened, and we don't think it will ever happen, but let us assume for an exercise that the main feed goes out and the auxiliary feed does not come on-line for whatever reason. What are you going to do? What would your analysis be?"

A I think the main part of this conversation would probably be tied up with calculating the amount of heat buildup in the reactor coolant system, the result of relief valves opening, and whether or not the heat generated in the core is greater or less than the relief capability of the valves; what effect high

pressure injection has on increasing the pressure in the system, that sort of thing.

We can probably be tied up with a lot of calculations that may or may not be within the capability of the operators to come up with a valid answer.

Q Do you think if that question had been tossed out among a number of senior operators, they would have come up with substantially different answers before the 28th, before everyone was focusing on the issue?

A Like I say, most of them would have, and I am speaking for myself, I probably would have focused in on the high pressure transient in the reactor coolant system and how it would be terminated.

Q If you lost all feed, what is the fundamental problem you are faced with?

A There is no heat sink, no removal of heat from the reactor coolant system.

Q So what do you have?

A Heat causes increased pressure in the reactor coolant system and would start lifting relief valves.

I had never before the accident considered the relief valve as a heat sink, which it is now being considered as being used for.

I would have only considered it as a decrease in pressure. I would still have to assume the heat was going to be retained in the system. I would be faced with trying to figure out when the core damage would occur due to increased pressure and high temperature.

You have to assume you will not get your heat sink back. I guess you will not get feedwater back in the line for some time.

Q Obviously there are a variety of different scenarios you can postulate.

A Yes. But again, the fact that the relief valve sticks open changes the scenario because you change from a high pressure problem to a low pressure problem. That is where you start getting core damage.

Q Have you done any of that kind of analytical game playing, if you will, or postulating, since the accident, taking accidents which are not really anticipated and putting people through the mental exercise of thinking through at least what implications proceed to flow from the postulated circumstances?

A Most of the game playing we would do was with emergencies that were not readily identifiable, but they were a basis for an emergency procedure.

Q Are you talking about since the accident?

A No, before the accident. If we were discussing, saying, doing an emergency procedure review, one of us might pose a set of symptoms on the other operator, and there would be a few from the emergency procedure that should key into the procedure. There were a few of the symptoms that really didn't mean very much but probably would be present at the same time, and we would have to go through the thought process of picking out whatever procedure you were working on. That is about the extent of the type of game playing we would do.

Q Since the accident, have you done game playing, in the sense that we are using that term, beyond the limits of the tech spec or FSAR, to try to go into uncharted areas, to see how people respond analytically?

A I haven't had much time to do much since the accident. I spend a lot of time in rooms like this. As a matter of fact, I haven't been on shift very much.

Q Would it be fair to assume that the safety analysis of the tech specs don't take into account human error in the course of handling a particular situation?

A Mostly safety analysis assumes no operator action at all. It assumes that the plant survives the casualty with no operator action or that operator action is delayed

for a long time.

Q It just assumes the plant is going along with whatever automatic systems are there?

A Yes, it assumes failure of single trains, high-pressure injection or feedwater, but usually those assumptions are made in the beginning. Like I showed you in the safety analysis, as a general consideration from the beginning of the safety analysis, they tell you how many failures they might assume. It is always half of the redundant system. That is why we have two of each or four of each or three of each or whatever. They assume so many failures, and you still have one left. They never assume a complete failure of an emergency system.

Q Did you ever hear anyone ask them why they didn't make that last assumption, which would really put them in trouble?

A Well, I am not sure that the analysis, way back wherever it started, didn't make that assumption, then see that that was so undesirable that they had to work to do everything they could to separate the two systems so they were completely unrelated, to really decrease the probability that they could fail exactly at the same time, which is what they do: They physically

separate the electrical power sources. All the cables are separate. The piping is physically removed from the other systems. Everything is as identical by manufacture, with the same specifications, so you have two mirror systems but which are completely separated from each other.

I think that is a good concept if you are trying to build in reliability.

Q Did you ever hear anybody raise the question, either instructors or engineers or trainees, anybody, "You know, we go down the road, and you tell us how you would counter this failure or the failure or another train, until you have one left, but you never bring us down the road to where we have none left"? Did you ever hear anybody challenge that and say, "What is the logic behind that?"

A Well, I just explained the logic behind that. That is how we arrived at an understanding of that logic, in other words, the separation criteria for emergency systems is the basis for being able to make that assumption. You always will have one left.

(Continued on Page 338.)

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4.1

Q Have you noticed, since the accident, any change in the way people approach the safety analysis report and the technical specifications, do you notice, for instance, that people are more willing to say, "Well, obviously the safety analysis report is a pretty careful document but that may be a definite account for everything"?

A I don't remember anyone saying that, yet, like I say, I haven't been exposed to many deckshifts where you can sit back and talk about that sort of thing since March.

Q Have you noticed any general change in the attitude with respect to what is possible and what is not possible?

A Yes. In the training that I just took down at Lynchburg, it is quite a bit different from what they were doing, yes. There are many more conservatisms, and the basic approach to each emergency has changed.

Q Is that a pervasive change in approach or is the change just with respect to the particular incident that occurred here?

A The changes that have been made in actions that an operator is allowed to take, just a change in how you can react to a simple emergency like a small steam

4.2

leak or an inadvertent reactor trip, you have the same new actions to take as you did on a huge LOCA. In other words, there are new prerequisites for bypassing high pressure injection which has to be considered before you can bypass HPI, whereas before, even during an inadvertent reactor trip, you might bypass high pressure injection.

Q So you have new procedures there?

A Yes. You have new procedures and new concepts that have to be examined before you can take action. They have new setpoints on the equipment, like the setpoint on the electromatic relief valve has been raised above the code safeties now, so that now, during even something as simple as a runback is going to trip a reactor whereas before you would never have a runback that would trip a reactor.

Q Are those changes embodied in the emergency procedure?

A Yes. They are working on it. They even changed the format of the procedure to include a paragraph entitled "Objectives of Emergency Procedure," so that when you are in the procedure you have right in front of you what it is that you are trying to prevent happening.

4.3

Q What do you mean exactly?

A A concept -- I have only seen two of them, I really couldn't remember what they said.

The idea is to alert the operator to what limiting conditions for operation or safety limit is that you are trying to avoid by taking these actions.

Q You said you had only seen a couple. Do you remember which two you saw?

A I didn't mean to imply there are only two; there are several dozen. I don't remember what they said. I haven't had an opportunity to study them. I have read them. I don't remember what they said.

Q But the rewriting relates primarily to the statement of the underlying objective?

A That is one of the significant changes you notice right away, but many of the procedural steps have been changed too.

Q Do you know who is doing that rewriting, what organization? Is it Met Ed or B&W?

A I am sure Met Ed is involved in it, probably PORC, but I don't know who all the consultants are.

MR. ROCKWELL: Allen, could we have a set of those procedures which have been rewritten to include a statement of the underlying objective?

Now it may be that there has been quite a few and we will not need all of them, but maybe you can pull together a list and we can go over it quickly and indicate the ones which we would like to have.

MR. YUSPEH: Sure.

MR. ROCKWELL: Thank you.

Q You gave some testimony before the Wall Committee which I am sure you recollect, and you indicated that -- if you want to look at this as we are attacking that, feel free to ask. I am just trying to recapitulate where you were in the discussion with them. You indicated that there was a high sump level, off scale high.

A Yes.

Q And you indicated that that was unusual -- the fact that the sump pump was running was not unusual but the fact that the sump level was off scale high was unusual. Does that sound accurate to you?

A Yes.

Q And then you indicated that, "Gee, I told him to turn off," meaning the sump pump, "because the source of the water was now obviously not sweat in the walls. We were getting water out of the drain tank.

So rather than transfer that water out of the building, I told him to stop it." And then the discussion goes on and you indicate that, I think the reasoning behind your stopping it was the concern about possible radiation in the water and the water being pulled out of the building. Does that sound accurate to you?

A That is probably the underlying reason. I believe I stated somewhere in one of these testimonies that I was more concerned with overflowing the tanks in the auxilliary building which were already indicating high level prior to the accident.

Q High water levels?

A High water levels. The radiation would be a problem, but I was probably more concerned with overflowing in the auxilliary building.

Q Do you remember when that sump pump was turned off, where in the sequence?

A It was when the operator called me from the auxilliary building. I don't remember what time it was.

Q Would 38 minutes sound roughly accurate to you?

A I guess. Really, I still have no concept of how much time was going by. When I was first asked that question, I believe I said it was an hour

to an hour and a half. First when they asked me how long it was to ES actuation, I said 20 minutes.

Q It appears, looking at the basic sequence of events, that it was done around 38 minutes.

A Okay.

Q When you realized that you were getting water, that you were getting level in your sump tank that was off scale high and you indicated in your Udall testimony you realized that it must have been coming from the drain tank to achieve those levels, did your mind turn at that point to the reasons for why you were getting water in the drain tank and what that suggested about the general condition of the plant?

A I don't recall what I was thinking. All I can say is somewhere around that time I did go back and looked the drain tank indicators, like I said. Through the recorders, I saw there was low pressure in it. I don't remember whether the pump was running or not, but when I saw the low pressure, I wasn't really sure what it was indicating to me. Bill Zewe and I discussed it, but I don't remember what conclusion we came to at that time.

Q Once the rupture disc goes, will the tank still stay full of water? Is the rupture disc on top so that there would be an overflow?

4.7

A I believe it is on the top, yes.

Q So the water indication in the quench tank or drain tank would remain high even after the rupture disc blows, even though the pressure would be low?

A I guess the water level was high. I don't remember what it was reading.

Q Did either you or Bill Zewe trace the fact that you had an unusually high or off scale high level in the sump back to the fact that it must have been coming through the drain tank back to the point of where that was coming from and is it a break?

A Obviously not.

(Continued on following page.)

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Q When you throttled the high-pressure injection, you have indicated repeatedly in other testimony that you have given that the reason that you did that was because of your concern about the pressurizer level, your concern about going solid; is that correct?

A Yes.

Q And that continued to be your analysis, correct?

A As to why I throttled, yes.

Q When you throttled it back, that is, the high-pressure injection, I take it that you indicated that you had been looking at and you had considered in the action that you took, not only pressurizer level, but reactor coolant pressure and temperature that you were aware of all three indications at the time you made the decision to throttle?

A I don't specifically remember looking up temperature, though I may have.

Q But you were aware of pressure?

A Yes.

Q And pressure was enough to tell you that you had very dramatically conflicting indicators?

A Yes. As the pressurizer approached solid

conditions, I realized that the pressure was not reacting as I expected it to. What I was afraid of is after it went off-scale high, it may suddenly increase very rapidly.

Q What I wanted to ask you was this: When you essentially were there looking at those two factors, pressurizer level and reactor coolant pressure, and saw they were in conflict and then made the decision to essentially rely on and believe your pressurizer level indication, what factors went into that decision? Did you entertain as a possibility at that point the fact that you should ignore pressurizer level and focus on the reactor system pressure?

A No, I did not.

Q Can you explain to me what you brought into that control room that day, in terms of your training and thinking, that led you so surely to acting on the basis of pressurizer level?

A All I can say is I didn't make the assumption that there was a steam void somewhere else, one, because I didn't know that the emergency steam system wasn't operating, and we had no heat sink, and two, because I had never considered the possibility of a steam void before forcing the pressurizer level to

go solid.

Q What did the low reactor coolant pressure suggest to you at the time, or did it suggest anything to you? Obviously high pressurizer level was suggesting something fairly specific to you, namely, that you might be approaching solid conditions. That is on the one hand. On the other hand, you had low reactor coolant pressure. Was that suggesting anything else to you at that time?

A No.

Q It was just an anomaly that didn't fit the pattern that you expected?

A Yes.

Q But it did not suggest, based on your training and experience and understanding, any conditions or any particular consequences down the road, at least as you stood there in the heat of the emergency?

A No. It was confusing. We had pressurizer level going off-scale high. That was one initial -- while the pressure remained low. That was a confusing piece of information. Several minutes later, we discovered we had no emergency feedwater. That became confusing because the reactor coolant system pressure

was low. If we had no heat sink, why was the pressure low, and if we had no pressure, why was the pressurizer level high?

I mean those are 3 or 4 confusing indications that don't dictate any particular action.

Q So in terms of your own thought processes that morning, you were basically focusing, and the action you ultimately took based on pressurizer level was an action which was the only clear action that you saw that you could take; is that a fair way of putting it?

A Yes.

Q It did not appear to you that there was any clear action you could take based on your reading of reactor coolant pressure?

A Right. We were trying to find, through the basic searches, reasons for the failure or the initiating event that is causing all these indications. That was our basic mistake. We were looking for the problem, and we should have looked for the combination of failures.

At this time, we were just geared to the wrong type of detective work.

Q Did anyone ever suggest in the first several hours that you were dealing with a multiple rather than a single failure; did that possibility

come out in the discussion?

A I don't recall whether someone said, "This may be a whole package." That would be kind of a dumb thing to say anyway. It doesn't help.

Q We talked yesterday about your concern and the basis for your concern about going solid, and you indicated that your concern was essentially a high-pressure transient, a stressing of the system up to the level of 2750 pounds; is that correct?

A Yes.

Q That concern, I take it, necessarily involves a concern that the three valves at the top of the pressurizer may not open when they are needed?

A Another phase of our training, besides trying to stay away from safety limits, kind of doesn't allow you to rely on safety systems. In other words, you don't rely on the reactor protection system to trip the reactor; you don't rely on the emergency safeguard system to initiate at 1600 pounds, and you don't rely on the relief valves to lift at their setpoint, okay? You always watch to see that they are going to fail; you assume you may have to take some action. So in anticipating a rise in pressure, I naturally assumed that the relief valves may not work, and that is assuming

an awful lot of conservatism, but it is just that is what was in my head at the time, if they don't open, I am in trouble, so what do I do.

Q Is that kind of conservatism, that kind of analytical approach to the problem reflected specifically in your training?

A Yes.

Q Can you tell me, in other words, where would I go to find that kind of an analytical approach in the training? Would I go, for instance, and talk to Norm Elliott down at B&W or John Flint?

A I am sure he would express that same conservatism.

Q Would it be within, do you know, some of the materials they used in your training?

A I don't know. A lot of our training is oral examinations and memory work, you know. Much of what we receive is not written down, though it may be that concept is written in some kind of general objectives document. I don't know. Someone else might have it. I know that I have been exposed to that concept frequently; even back in the Navy, we had that same concept.

Q Do you know specifically whether you have been exposed to that concept at B&W?

A Yes.

Q Specifically?

A Yes.

Q When?

A All during the simulator training.

Q That eight week course?

A Yes, and whatever courses I was down there for.

Q Who was your primary instructor for the eight-week course in the summer, I believe, of 1976?

A We had three or four.

Q Do you remember any of their names?

A Carl Gossen, Gene Alden, Joe Klimek, Bill Street, Ibelieve John Lind was a newcomer at that time.

Q Was it basically two teaching?

A You mean were there usually two instructors at the same time?

Q Yes.

A No, it was usually instructor in the simulator and one instructor in the classroom, but not always the same instructor.

Q Do you know whether any materials that you might have received from that course you might still have in this batch of materials you have made available to us?

A I don't know that I could identify them as coming from that course.

Q And you weren't given any particular course book which was discrete of materials applicable to that simulator training; is that it?

A We were given course materials that applied to that course. One was a set of procedures for the simulator, a set of tech specs and limits and precautions, but I haven't retained them because they are out of date.

Let's go back through the materials you were given. You were given a set of procedures for the simulator?

A Yes. Well, it was kind of an intermingling of whatever procedures we had that we could use and the procedures from TMI and the procedures for the simulator.

Q Are those essentially the procedure books that you had used when you were training on the simulator; is that correct?

A Yes.

Q And then you indicated you were given a set of limits and precautions?

A Yes.

Q Do you remember Frederick Exhibit No. 2?

A I remember it. It would be the same document, yes.

Q Would the limits and precautions that you were given during the training have been a complete set of limits and precautions, as far as you know?

A Yes.

Q Could you tell me specifically whether they would have included the limits and precautions set out at Pages 17, 18 and 19 of Frederick Exhibit 2 relating to pressurizer, do you remember?

A Do I remember that those pages were included?

Q Yes.

A I would imagine that they were, yes. I may be able to come up with that. I just remembered I have an old box full of things in my basement.

Q I would appreciate it if you would check.

A I imagined you would.

Q Thank you.

Were the limits and precautions basically in final form that you remember at that time in the summer of 1976?

A I believe everything we received was stamped "draft" or "for information only" or "for training purposes," that sort of thing, because we were told that our procedures were still being written and still had to be polished up, and basically the form of the

thing would be in, but we could expect to see some revisions and changes in the future.

Q Did it seem to be relatively complete in terms of its breadth of coverage? Do you think there are very many subjects covered in the current limits of the courses that hadn't begun to be addressed back in the summer of 1976?

A No. I am fairly certain it is probably the same document that I had, probably word for word.

Q That was two sets of material we have covered now, the procedures for the simulator, the limits and precautions. You say there were other materials that you were given at that time?

A Yes. We were given a set of technical specifications to read.

Q A complete set of tech specs, 12 volumes?

A No, no, just the tech specs, not the FSAR.

Q The FSAR was the longer one, right.

Were you given your own set of tech specs?

A Yes.

Q That you could keep and take home with you?

A Yes. We had a lot of study to do out of the class, so they gave us those to read. We had to memorize them.

Q The tech specs, then, you brought home with

you after the course was over and kept as a personal reference?

A Yes. For some time I kept it up to date and revised it as all the amendments came in, but then as they became harder and harder to keep up with, I began to use the control copy that was in the control room instead.

Q And that was the TMI 2 tech spec, is that right, that they gave you, or was it --

A Yes, I think so. They are standardized tech specs. They are in a form -- this was supposed to be adapted by all the nuclear power plants eventually, all the B&W plants, so that although they are TMI 2 tech specs, I believe the only difference between ours and somebody else's are the actual numerical values that are in the specifications. I don't know for sure. That is the impression I got.

Q So the tech spec that you got was a standard tech spec?

A I am saying it may not correspond, number for number, with the control copy that exists now. I am sure the numbers have changed.

Q What about at the time, was it the same tech spec in the summer of 1976 as existed in the

control room here?

A I think so.

Q Was that given to you before you went down to B&W or after you got down there?

A I think we got it the first day we got down there.

Q Were there any other materials that you were given during that training?

A Besides the pencil and blank paper?

Q Yes.

A We were given an integrated control system logic diagram. I think I have a set of them over here. I am not sure those are the same ones.

Q So the record is clear, when you say "over here, you were referring to the table where the materials you brought in yesterday are sitting, right?

A Yes, sir.

I don't remember anything else right now.

(A brief recess was held.)

MR. YUSPEH: Ed, with regard to your earlier comment about the safety systems and the relief valve and the pressurizer and your indication that your training and your teaching, in that you should not necessarily rely on the safety system to operate properly, do you think

that that kind of training is conventional and appropriate in terms of operating a system of this kind?

THE WITNESS: Yes.

Q You made some comment about that being some kind of an unwritten law from Day One.

A Yes. See, you had asked me what I thought the source of that concept was. I am trying to explain that when I was an operator in the Navy and we had gone through years of training there and it always seemed to be reiterated throughout your training, but I don't ever remember seeing it written down. That is the only part I don't know, where to reference it to.

Q While you are mentioning the Navy, so I don't forget it, would you be willing to permit the Commission to obtain your Navy personnel record? It will require you to sign an authorization form permitting or allowing us to request your records. If we did that, we would make an extra set and forward you a complete set of them. But we asked Mr. Faust, and obviously the Commission's concern is to be able to have a complete picture of the training of the people involved in order to help analyze, in a sense, the adequacy of the training of the people who were there

dealing with the crisis at the time it occurred.

Would you be willing to do that?

A Yes, if I can get a copy of what you are looking at. I am not sure the service record jacket includes a description of the training.

Q I don't know either.

A The copy that I have doesn't, but if you receive records, I would like to see what you are looking at, yes.

Q We would make a definite commitment that whatever we obtained from you in response to the form that we would submit would be duplicated in its entirety, and a full copy would be sent to you immediately.

A Yes.

Q I am going back to pick up a subject that we have discussed before, the changes that were implemented in Emergency Procedure 2202-1.3 in connection with a loss of reactor coolant and the changes that were made in the spring of 1978 in terms of drilling for the small break LOCA and the creation of a small break LOCA operator.

Apparently that came about as a result of somebody's analysis that there was a small break that had not been fully analyzed, correct? Is that your

understanding?

A Yes.

Q Have you ever heard the name "Michelson" associated with that analysis, Tom Michelson, I believe, is his name?

A Since the accident I have, yes.

Q No, before the accident.

A No.

Q Had you heard anyone's name associated with that analysis?

A No.

Q Since the accident, have you become aware that someone here had received a copy of that Michelson analysis which triggered the changes that were made in the spring of 1978?

A No. I don't know what the source of the information was.

Q Today, do you have any understanding of what was behind the changes that Mr. Floyd was implementing in the two memoranda that we have marked as Exhibits 14 and 15?

A Well, today I know of the existence of the Michelson report and a letter from Mr. Knox, and that sort of thing, but I have not studied them .

One intent there was not to clutter up my mind with what I have learned since then because people keep asking me what I knew before the accident, so I am having a great deal of difficulty sorting what I used to know and what I know now. I am trying to remain objective.

Q You referred to a letter from Mr. Knox.

A I am not sure that is the right name.

Q That was a letter from what organization to what organization?

A I saw a drawing of the pressurizer having some manometer effect of the pressurizer. I don't know who did that.

Q I am showing you a drawing which has previously been marked and attached to the Dunn Deposition as Exhibit 38. Is that the drawing?

A Yes, that is the drawing.

Q Let me advise you that that drawing is attached to a memorandum written by a Mr. Thomas Novak in January of 1978. Had you heard reference to the Novak memorandum before today?

A Yes. That is what I was just referring to. I got the man's name wrong.

Q Had you heard reference to the Novak

memorandum and his analysis of the loop seal manometer effect before the 28th?

A No.

Q Have you learned since the 28th that anyone here was aware of that analysis before the 28th?

A No. The first time I heard that was in Washington during the President's Commission hearings in Washington.

Q And I think I covered this, but let me just make sure. Did you say that you, as of today, you know of no one here who knew about the Michelson analysis before the 28th?

A That's right.

Q Have you ever tied Mr. Floyd's memoranda, which we have marked as Deposition Exhibits 14 and 15, even since the accident up to today, to any source of information?

A No.

Q Do you know anybody who has, other than Mr. Floyd himself -- in other words, anybody who knows where Mr. Floyd got the information that led him to write these two memoranda, Nos. 14 and 15?

A No.

Q Have you ever heard of a man named Creswell up to the 28th?

A Not before the 28th, no.

Q You have heard of him since?

A I met him during an investigation with the NRC, yes.

Q What do you understand his connection with all of this is?

A He is an investigator.

Q Did he interview you?

A Yes.

Q He did?

A Yes.

Q One of the I&E interviews?

A Yes.

Q Have you ever heard his name in conjunction with any analysis of pressurizer level going high and RC pressure going low before the 28th?

A No.

Q And you had never heard of a Mr. Dunn before the 28th, is that correct, Bert Dunn, an engineer at Babcock & Wilcox?

A No. I don't think it would be unusual that I wouldn't have heard these people's names in conjunction with an analysis or something. People don't usually sign these things.

Q There is no suggestion that you should know about them. The question is simply did you, and I take it the answer is no, in each case?

A Yes.

Q When did you first realize on the 28th, you personally, that you were in a situation where you might or probably did have core uncovery?

A When did I realize that?

Q Yes, the first time.

A I don't know.

Q Was it in the morning?

A I don't know when I realized that. As I said, I have a great deal of problem recalling thought processes and things during the day, let alone times. It was just too confusing.

Q Let me try to take this time frame up with you. Were you aware at the time the block valves were closed that the PORV -- I should use the singular, the block valve -- were you aware that it was being closed when it was closed, or did you only discover that afterward?

A I think I was aware of it.

Q You are not sure?

A I seem to remember, but it could be just an

assumption through all these testimonies. I may have, I may not have been. I don't know.

Q Is it possible to separate the time from the beginning of the transient up to the closing of the block valve, and then ask the question did anyone seem to be aware during that period of the possibility that the core was uncovered?

A I don't remember it being expressed.

Q Have you ever had any training with respect to how long it would take radiation alarms in the containment to respond to water radiation from water being released into the containment by way of a small break? I don't mean a small break in the narrow sense which is defined in Emergency Procedure 2202; I just mean a small leak.

A During the training on radiation monitors, we do discuss response time of the monitor, but not the migration of radiation from its source to the monitor, so total response time is not something we discuss.

Q Did you have any sense in your own mind, any impression of what amount of time would be involved, say, from the time you ruptured a disc, for instance, on your quench tank and started spilling your primary coolant into the containment, how long

it would be from the time that occurred until the time you got a radiation alarm?

A I don't remember thinking about it or trying to figure it out.

Q Do you have an impression how long it would be?

A No.

Q Who is the keeper of the memo book that you have referred to in the control room? Under whose control is that book, Mr. Floyd's?

A By control, you mean?

Q Somebody has, ultimately, responsibility for seeing that the appropriate things are put in the book, to see it is kept up to date, to see it doesn't disappear, that sort of thing. Whose responsibility is that?

A I don't know. I would imagine it is Mr. Floyd's responsibility to write the memos, and the Operations Department secretary to put them in the book, but I don't know who audits it or even if it is audited. I don't know. I believe there are several copies of it, though, at least two.

Q Is there more than one copy in the control room?

A No.

Q Where is the other copy?

A According to this distribution list, there is one in the control room; there is another operations memo book somewhere; and there is a copy kept by Penny Shofield, whoever she is.

Q You don't know who she is?

A She is one of the clerical people.

Q You remember you referred yesterday to the fact that the steam generator was showing 10, 11, 12 inches of water, when in fact you learned later it was dry?

A Yes.

Q That was one of the conflicting symptoms we talked about?

A Conflicting when you look back on it. To us it indicated that there was water in the generator.

Q It wasn't conflicting at the time?

A It was not a conflicting indication, it was an erroneous indication.

Q Do you know what the hot leg temperature was at that point?

A No, I don't.

Q Do you remember whether you went to see

what the hot leg temperature was at that point?

A No, I don't.

Q How about the cold leg temperature?

A No. I was, since I don't know what time you are talking about, you are probably talking about 11 minutes, somewhere in there.

Q 11 inches of water.

A I was engaged in trying to find out whether the emergency actuation system was operating for part of the time, and part of the time I was responding to the increase in pressurizer level, and I suppose I was monitoring other things at the same time, trying to read the alarms, et cetera. Fred Scheimann somewhere along the line took the corner of the panel where pressurizer level, pressurizer temperature, RC temperatures are, and it was his job to call out those parameters so that we each wouldn't have to go over and look at it.

Again, there was a lot of communications involved here for any given drill.

Craig was trying to inform us what he was doing with feedwater. I was informing everybody what I was doing with high-pressure injection, and we were feeding back and forth to each other the parameters that were

involved, what we were doing. I don't know that I looked at the temperatures personally or I just listened to Fred saying, "It is coming down or going up," whatever it was.

Q If at that point you had an opportunity to look at the hot leg and cold leg temperatures and you had seen that they were identical, what would that have meant to you?

A You are saying they were identical at that 8 or 11-minute point, somewhere in there? It would mean that there was no heat transfer through the steam generators.

Q What would that mean, no heat transfer?

A There is no removal of heat from the primary system to the secondary system.

Q If you were at the control panel where you are working with HPI, manipulating HPI, can you see the reactor coolant temperature indications?

A It is only a few steps away. I would be perfectly willing to take you up and give you a 15-minute briefing on the control room. You might be able to see a lot more of this.

MR. ROCKWELL: Is that something that can be worked out on that short notice?

MR. YUSPEH: We can do it right now.

(Discussion held off the record.)

Q I asked you, I think, but I think we went over the records this morning, had you ever heard of a transient that occurred on September 24, 1977 at Davis Besse 1 in Toledo, Ohio, before the accident at Three Mile Island?

A Well, I can't recall that specific incident.

Q Had you ever heard of a transient which involved a failed open PORV -- I am describing that transient now, the one on the 24th -- a failed open PORV, temporary loss of all feedwater, and a departure, a situation where pressurizer level went high and reactor coolant pressure went low, and a termination of the high-pressure injection?

A No, I don't remember that discussion or having read that report or anything like that.

Q Do you remember having heard reference to any incident like that, whether or not you knew it was at Davis-Besse?

A No, I don't remember.

Q You indicated that in the memo book, there are certain LERs or all LERs?

A I said I thought there were some LERs or comments

about LER's in there, but I don't know for sure that there are.

Q So that in some cases -- I know that this is to the best of your recollection -- but in some cases it might be an actual LER, and in other cases, it might be someone's analysis of an LER or an analysis of a particular transient?

A Maybe not included in the memo book. You may receive instruction to read a given LER or attend a training session where they are going to discuss them or during a training week, you may be directed to read 20 or 30 of them, just to familiarize yourself with other problems, but if I said they were in the operating memo book, I was probably wrong because I had an opportunity to look through it this morning. I didn't see any there.

Q Is there a place where all LERs for plants with a B&W nuclear steam system are maintained?

A I don't know.

Q Are you familiar with the difference between an LER and an LER summary?

A No.

Q To the best of your knowledge, when you see one, what do you see, a summary, or do you see the

full LER, or would you be able to tell?

A I wouldn't be able to tell. I don't know the difference. Sometimes the instructor in training will spend some time in studying them, and then he summarizes them for you, whichever ones he thinks are important.

Q Had B&W gone through the procedure that we reviewed yesterday for identifying a failed open PORV during training at B&W?

A I don't know. I don't remember.

Q To the best of your recollection, you don't remember any word ever coming from B&W that they have had a failure history, failure with respect to failing open, of the PORV, and that that was something that operators should be particularly alert to?

A Like I said, it is hard to remember whether I knew that before or after the accident. It has been hammered pretty hard since the accident. I don't know whether I knew it before the accident.

Q You don't remember anything being brought to your attention about the PORV having some history of unreliability?

A I don't remember specifically that, no.

Q We have spent considerable time discussing the question of going solid and your understanding of

the implications of going solid, and your understanding of why you took the actions you took.

A Yes.

Q In focusing on pressurizer level.

Can you guide me to any materials from B&W which reflect those concerns, or is most of it the product of oral discussion?

A The problems with going solid were kind of brushed over in the simulator that I can remember because several times we would go solid by making mistakes with operating the integrated control system manually, but the simulation breaks down whenever the pressurizer goes solid, so whenever that happened, we would have to start over again because there was no way for the computer to understand what was happening. I suppose it wasn't programmed that way. So I suppose there should have been a conclusion made there that the plant can go solid, why aren't we analyzing this; but normally they wouldn't carry that any further. Normally I never did.

Q Did you get guidance at the B&W training program about why you should not go solid?

A That is what I am saying. It was brushed over, and it was emphasized that you shouldn't, but I am not

sure -- well, I really can't recall ever having been instructed on the results of going solid and how it would affect the pressurizer relief valves and how it would affect all of your operator indications. I don't think we ever discussed that. I do remember it being emphasized that you shouldn't go solid.

Q Just in the course of general training, it would be the statement that you should not go solid?

A Well, specifically in the transient that we would most of the times impose on ourselves where we did accidentally cause the pressurizer to go solid, we would be, like I say, the training would just break down at that point, and the emphasis was, "Don't do that."

The operators, I mean the trainers, would be saying -- "You are going solid. You are going solid. Turn it around." And you would go solid, and that would be the end of it.

Q Did they tell you why they were concerned in that informal exchange that you had in the simulator?

A Because the simulator couldn't simulate that condition.

Q I mean in the real world.

A That is how it came out.

Q Did they tell you why in the real world

they weren't concerned about going solid?

A No. Like I say, I don't remember that was being discussed.

Q The reasons that you had for not wanting to go solid were pulled out from the "Bases" in the tech specs. Do you ever remember them addressing the issues spelled out in the "Bases" and discussing them relating to the question of going solid?

A No, not really, no.

Q Setting aside the question of their not wanting you to go solid because it fouled up the simulation, do you remember any other discussion about going solid at Babcock & Wilcox?

A No.

Q Any other context?

A No.

Q Reaching way back to the first day of your deposition, I think we were on a line of inquiry in which you had pulled the steam table out of the drawer. Remember you were telling me that you had pulled the steam table out of the drawer because there happened to be one in the control room?

A Yes.

Q And you pulled it for reference?

A Yes.

Q Let's go back and pick up that line of inquiry. Why was it that you pulled the steam table out?

A I don't remember.

Q Why was it being referred to at that point?

A I think it was because we were approaching the net positive suction head limit for the reactor coolant pumps. We were trying to evaluate whether or not cavitation was taking place, and that is why we were getting the high vibration readings and the flow degradation.

Q So you were concerned that you were going to saturation and seeing some steam voids?

A At the suction pump, yes.

Q And you were referring to that table to see whether the data on your control board in comparison to the steam table would show that you were in saturation condition?

A Yes.

Q And what did you discover?

A We discovered that there was a possibility that that was causing the alarm conditions on the pumps. I believe that entered into our decision

to secure the reactor coolant pump.

Q So you found that you were either extremely close, or you were in fact in saturation?

A Yes. We were not discussing saturation conditions. We were discussing net positive suction, which, in effect, was the same thing.

Q Would that have been done before the first RC pump was secured?

A I don't know for sure whether it was while we were securing the first two and waiting for the second two or before the first; I don't know.

Q Well, assuming that the first securing was done at 73 minutes and the second was at 100 minutes, the discussion would have been somewhere along in that time frame?

A Yes, I think so.

Q Did anyone ever tie together the possibility that you were in saturation conditions or the fact that you were in saturation or near saturation and the observed level of pressurizer, connect those two?

A In what manner?

Q Well, in the manner that they ultimately worked, namely, that saturation conditions in the core

were the cause of the observed pressurizer level?

A No, I don't think so.

Q You referred on the first day to, I believe, some sort of a log or chart that you maintained for training that you were required to do for startups. I am losing my terminology.

A On the job training?

Q Yes.

A Yes.

Q Are your refresher courses which you take every six weeks recorded in that same record? Is there some, in other words, some record from your refresher courses of what you have done, what topics you have covered?

A The operators don't make any; the Training Department does.

Q Is there a pretty complete record in the Training Department of what you have covered?

A Yes.

Q When the transient initiated at around four o'clock on the 28th, you and Faust and Scheimann were in the control room, correct?

A No, Fred was not in the control room. Fred was in the turbine building basement.

Q Zewe was in the office in the back of the control room?

A Yes.

Q And Zewe comes out pretty quickly as the transient initiates, correct?

A Yes.

Q Zewe retains control in terms of giving direction until when? I am not so much interested in time, but in terms of who took over from him.

Maybe I should pose the question differently. Was it ever your perception that the decision-making authority changed from Zewe to someone else?

A Yes, later on in the day.

Q And give me just your best estimate as to when and to whom the authority passed.

A Well, for a brief time when Bill had to leave the room, Fred Scheimann, the foreman, was in charge, and I believe Bill came back and stayed the rest of the time. When all the senior company personnel started arriving and B&W ergineers and all that, I believe that caucus of engineers and supervisory personnel began making decisions, and Bill became -- he was still the supervisor, but he was reacting to the best analysis that was available through the engineers that were

caucusing.

In other words, we were basing our actions on the instructions we received from Bill, and Bill was basing his instructions on the analysis that he receives from that caucus. The instruction came from the supervisory people back in the office.

Q To your knowledge, before the 28th, had there been any established procedure for decision-making in the case of an emergency of this type -- of course nobody anticipated an emergency of this type?

A Yes, there is an emergency plan for structure of decision-making and who is in charge, depending on who is present. That is called the Three Mile Island Emergency Plan. You have a copy of it.

Q Did it appear to you that there was a single person who had ultimate responsibility in that control room after people started coming in for the decisions being made, and if so, who was that?

A You mean ultimate authority for both radiation emergency and the operation of the plant?

Q No, I am talking about the operation of the plant.

A I believe Gary Miller, after he had established his group in the back room there, did control the emergency in the plant and the radiation emergency.

Although he didn't perform all the jobs, he was to be informed of every major development in both emergencies. So I would have to say that he was the on-site person who was ultimately responsible in both emergencies.

Q Up to the time that he came, was someone taking ultimate personal responsibility for decisions that were being made, one person?

A I can only say that the only person I was taking instructions from was Bill Zewe.

Q Was the responsibility essentially assumed by a committee acting as a committee, or did it continue to be exercised by one individual consulting with a committee?

A I don't know. I didn't really analyze the chain of command that was present. I only responded to what Bill told me to do. We made a point of limiting our interface only to Bill so that we wouldn't have conflicting instructions or too many operations going on at the same time.

I believe Bill instructed us in that direction. He said, "Take orders from me, and that is it. Take orders from me, and that is it."

Q During the early hours of the transient, did you ever disagree with any instructions that you

were being given in terms of operating the plant?

A Well, there were several instructions or conclusions from these caucuses that I didn't agree with or couldn't justify in my own mind, but I wasn't in a position that I had an alternate solution that I considered would be better. In other words, if they say "Secure reactor coolant pump," and I say, "I don't think that is a good idea," but I don't have an alternative solution, I can't not do what they tell me to do. Although I felt uncomfortable with stopping the pumps, I saw no alternative at that time.

Q So you were uncomfortable about securing the reactor coolant pumps?

A Yes. There was at least one occasion where I wanted to manually initiate high-pressure injection and just let it blow into the system because I felt that we were not maintaining system pressure-temperature relationships properly, and we had actually limited control over the system, that we should put it back in automatic and let the design considerations put it back on a stable course.

At one time we did manually initiate high-pressure injection without the instructions from the caucus because information wasn't coming out fast

enough, and we decided -- by "we," I mean Bill Zewe, Craig and myself -- decided to initiate high-pressure injection.

Now, during the course of things, it was secured again later on, so I really don't remember all the decision-making processes, but I remember trying to do some thinking on my own, and several times it would come up in conflict with what they were going to do, but like I say, not having the objectivity that they had, I felt I couldn't countermand their orders unless I had some positive action to take that was different from theirs. Since I didn't know what to do, I had to rely on the engineers and senior people to come up with ideas that I didn't have.

Q What if you run into a situation where you, as an NRC-licensed operator in the control room; someone senior to you in terms of management from Met Ed comes in who does not have a license, and instructs you to do something which you disagree with -- let's take it out of the context, for the moment, of the 28th. What happens at that point?

A It happens fairly frequently that you will have a chemistry supervisor or a maintenance person that wants you to change one of the primaries or secure a

system or start up a system so they can have it tested or so they can fulfill whatever job they have to do for that day, and if you see there is no problem doing that, you can go ahead and do it. If you don't want to do it, you just tell them that you are not going to do it, and generally the authority of the control room is pretty well respected by the company personnel. There have been arguments that for instance a supervisor may come in and say, "We would like to secure this particular unit so we can draw a sample on it," or something like that,and you would say, "Well, the plant conditions don't warrant us doing that at this time," and they might go and get all irate and yell at the supervisor, but that is a thing that you try to get them away and let the plant supervisor determine whether we are going to alter plant conditions to do that job, and my decision to do it can be altered by the shift supervisor if he decided he wanted to do it. I would respect the orders of the shift supervisor to change a system condition, so long as I thought it was still within the safe boundaries of operation.

I have never been asked to do anything that was contrary to technical specifications by any member of supervision.

Q Did you ever have any kind of a conflict of that sort on the 28th, refusing to do something because you felt it was inappropriate?

A Like I said, the discussions that we had at the time, of securing the reactor coolant pumps and when I wanted to initiate high-pressure injection, there were arguments, and there were obvious disagreements at those points, but you don't argue and then become stubborn on the point that you are trying to maintain; you have to remain open to whatever information there is and go with what seems to be right, rather than what you want to do.

Q When you say there was an argument with respect to initiation of high-pressure injection, who was involved in that discussion or argument?

A I don't know.

Q Were you one of the people involved in the discussion?

A I don't even remember what time of the day it was or what the plant conditions were at the time. I remember that the four of us on the panel had not received information from the engineering group for some time, and we were not sure that the plant was in safe condition, and it was our group opinion that

we should initiate high-pressure injection, and just from what we could see on the panel, okay, so we wanted to get that proposal into the engineering group there, and it seemed too long before the answer came back, so we initiated it on our own. That constituted a disagreement, I guess, what you are talking about. We hadn't received instructions to do it, but we did it anyway because we felt it was moving in a safe direction, but later on they convinced either us or Bill, the argument came back; it seemed logical to secure it again, so we did.

Q You say there were four of you on the panel?

A I believe so. There were at least four of us.

Q Who?

A Craig Faust, myself, Fred Scheimann and Bill Zewe.

Q When was the shift finally changed that day on the 28th?

A The shift was augmented by extra people fairly soon, I think somewhere around 5:20 or 6:00.

Q Were you formally relieved at some point?

A In the afternoon, around 3:30 or 4:00, I was formally relieved, yes, but I had given up responsibilities for certain panels to other licensed operators during the day.

We had six or seven operators on the panel.

Q When new operators arrived that day, other than the four of you that had been there at the time of the transient, what was done when they arrived? Normally there would be a shift change, which has a formal procedure.

A Yes. We didn't do that. We assigned the incoming operators with specific duties or parameters to monitor, and they were to ensure that the systems were in full operating condition and monitor any changes, and relay them back to myself and Fred and the foreman, so that we could keep a closer watch on all the systems than just one or two people could do.

We had one man assigned to keeping a log, and that was his only duty. So we had as people came in, we would assign them specific responsibilities rather than turn over the shift as we normally do.

Q Were you involved in briefing people as they came in as to the current conditions of the plant as of the time of their arrival?

A No.

Q Who would have done that, or did anyone do that?

A I don't know that any individual was assigned

that responsibility. The operators that came in to take control of a given panel would ask enough questions to be able to tell what they were supposed to do.

A person who is coming in to monitor the electrical panel would be told to make sure all the breakers are closed and all the voltages were normal. He might not even be briefed any more than that.

A person coming in on the ventilation panel may be tasked with verifying that all the equipment was in the ES condition.

So that briefings were probably pretty short.

Q Have you ever had any contact with B&W design engineers in terms of discussion or training of plant operations, transients, that sort of thing?

A I think so, yes, down at B&W simulator, some of the instruction that discusses safety analysis and safeguard systems and RPS, they are B&W engineers.

Q Outside the context of those lectures and courses at B&W, have you had any contact with B&W engineers in terms of a discussion about how the plant works?

A Informal discussions on shift. There are occasionally, in terms of startup procedures, there were B&W engineers around, and occasionally we would

ask them a question or something like that. Yes. I don't remember any specifics.

Q During startup, were those people who were basically in residence here working during startup?

A Yes.

Q Have you ever had a B&W design engineer come in and just ask you and pump you about the system that he designed and ask you what your understanding of it is, and do you have a chance to ask him questions about how they designed it? Has that ever happened?

A I don't know. Sometimes the people you are talking to, you don't even know who they are.

Q Are you a member of the union?

A I was at the time.

Q You are not now?

A Right.

Q Is there any particular reason?

A I have a job as a training instructor. It is a non-union position.

Q What is the name of the union to which you belonged at the time of the accident?

A It is the International Brotherhood of Electrical Workers, Local 563.

Q Does Local 563 apply just to Three Mile

Island, or does it apply more broadly in this region?

A Members also of the Crawford Generating Station a little bit north of here. It is not a nuclear plant.

Q How long had you been a member of that union up until the time you left it just recently?

A Since I started working in Met Ed, 1973.

Q Did you have regular union meetings?

A Yes.

Q Did the union become involved at all in questions involving the operations, safety of the plant, generally, or did it confine itself primarily to very specific collective bargaining types of issues, to the best of your knowledge?

A It was mostly concerned with labor relations, and it did occasionally get involved in work-related safety problems, OSHA regulations, that sort of thing, but not nuclear plant safety analysis. I don't think they became involved in that.

Q What kind of OSHA concerns would they have?

A You know, hard hats, safety glasses, hard steel-toed shoes, proper attire at work, that sort of thing. They would be involved in problems where a man had broken a safety rule, or they may be involved in a condition where they felt that the company wasn't

providing proper safety equipment during a certain job or the right type of ladder or the right type of electrical insulating device, that sort of thing. They may have to go to the company and discuss a problem of that nature.

Q Did the union ever become involved with questions of radiation health before the accident?

A The union members that are health physics personnel -- they are union members, and they -- I don't know to what extent they were involved.

Q Let me put it this way: Was the subject of radiation health, the subject of radiation exposure to workers a matter of discussion between the union and the company, and a matter in which the union was expressing an overall position?

A There was a union position that a man, an individual person's exposure should be limited as much as possible.

Q What were they doing in that regard?

A The man was tasked with keeping track of his own exposure, and if he felt that the company was unduly exposing him to radiation, he could approach the company or the union and demand that he be taken out of that job for a while or spelled by somebody else to limit

his exposure.

Q Who tasked the individual with keeping track of his own exposure?

A As a general rule of thumb, I am not sure whether that is a company rule or whether the union adopted that from general health physics considerations. I don't know if it is written down anywhere.

Q There is no automatic procedure for giving people a written summary of their monthly, quarterly, annual exposure?

A The company does that.

Q They do?

A The company makes those records available for you to have any time you want.

Q No, the question is, is it automatically kicked out, whether you ask for it or not, on some periodic basis?

A I believe at that time it was published monthly, and whenever you entered a radiation area, you were required to review it. In other words, before you go into a radiation area, you have to establish that you don't have above your limit already or that this entry is going to bring you over your limit.

Q Did the union get involved at all in matters

of the amount and type of training?

A You mean did the union make demands on the company to increase the amount of training?

Q Yes, or did they recommend or say that training ought to be this way or that way? Did it get involved in the issue of training?

A I don't remember any instances where it did. It may have, but it has always been my impression that the company is rather strict on health physics training.

Q I am not talking about health physics, I am talking about training in a broad sense.

A They got involved in some discussions about training, yes. In other words, usually personal-type problems, if a man was having a problem with a course and the company was threatening to expel him from the course, the union would examine the case to see whether or not the man was being unjustly treated, something like that.

Q Let's take it out of that context in terms of a personal problem that may arise, and put it in the context of overall objectives and overall effectiveness and focus of training. Would the union ever get involved in those kinds of issues?

A I can remember that the union would be concerned about the scope of, for instance, an operator's training, you know, if they felt that an auxiliary operator C was being tested on or being required to study, say primary systems for which he would not, he is not really responsible for, then they would step in and question the training and say, "This man should not really be required to be responsible for this yet. That comes later on in his training," and I can remember discussions like that.

Q So do I have an accurate understanding that basically the union's involvement in training would be with respect to fairly specific questions that might arise with respect to a particular individual?

A Yes, or a particular group or point. They don't audit or supervise the content of the training unless they feel that this conflicts with the job classification or something like that.

Q I take it you have not seen any union involvement in the very broad sense of overall training objectives in the respect of if the training, for instance, is adequate in connection with the responsibilities, is there enough of the training, that sort

of thing, broad kind of policy considerations? Did you ever see union involvement at that level?

A I don't know. I don't remember any discussions like for instance the union coming forward and saying, "The training you are giving this control room operator is not sufficient to put him up for a license exam," something like that, because the training programs that Met Ed has are fairly thorough.

You really have to know something about what you are talking about to really challenge the training program. Like I say, I don't remember anything like that happening, although it may have.

Q Were there any broad policy-type concerns or discussions between the union and the company with respect to identifying and removing safety concerns?

A No. I suppose some of the paragraphs of the contract would be interpreted as the union instructing the union personnel to be conscientious in their job, that sort of thing like that, but that would probably be about it.

Q Did your training experience -- let's confine it to the training -- did your training specifically address whether the pressurizer level was a measure of water inventory in the core?

A That is the way I understood it. It must have come out in training somewhere.

Q Is it possible for you to trace back that understanding to some part of the training, specifically?

A No, I don't think so.

Q Is it your impression that that is the understanding of most of the operators?

A Yes, that the pressurizer level is the indication of reactor coolant system inventory, the amount of water in the system, yes.

Q Is it your understanding that it is the indication, putting the emphasis on the word "the"?

A It is not my understanding now, but it was then.

Q We are talking about your understanding before the accident.

A Yes, it was.

In other words, if you had a level of water in the pressurizer, you could assume the rest of the system was full up to that point.

Q Was that reflected in any of the written materials that were used in the training, or was that again one of those things that were really a subject of discussion but never written down?

A I don't remember having seen it written down.

It was just part of my training somewhere.

Q Can you distinguish whether that came from training at Met Ed or B&W, or whether it would have come fromt both?

A Probably both. The training is closely parallel in both.

Q Did you ever see any marked distinction or difference in approach in the training between B&W and Met Ed, or did they fit together in terms of an approach pattern and style quite closely?

A Pre ty much the same. They use the same reference material and the same system diagrams, that sort of thing. The lectures are pretty much the same.

Q After we are through, if anything in writing comes to mind which connects inventory in the core with pressurizer level, I would appreciate it if you would let us know. We would be interested to know whether that appears in the training materials.

A All right.

Q We went through, yesterday, conflicting indications, conflicting signals that you had on the 28th when we really probably shouldn't have called it a conflicting experience because you pointed out that, for instance, the indication of 10 inches of water in

the pressurizer wasn't conflicting --

MR. YUSPEH: In the steam generator.

MR. ROCKWELL: Yes.

Q -- in the steam generator, it wasn't a conflicting indication, it was a spurious one; it was wrong, correct?

A Yes.

Q Can you think of any other indications that either were conflicting, that you had two sources of information which did not agree with each other, which you normally would have expected to agree with each other, or a piece of information which in retrospect was simply wrong? Are there any other items we should add to that list which we made yesterday -- and I can go back and refresh your recollection, if you want.

A Yes, would you?

Q I had on my list pressurizer level high-reactor coolant pressure low; PORV position; indicated level in the OTSG; loss of coolant accident with no radiation alarms; and emergency feedwater operating, an indication on the control board that the emergency feedwater was operating when in fact there was no flow.

A I guess the indications on the reactor coolant

were not -- either not correct, or we weren't there when they were indicated correctly, one or the other. Like I say, when we went back, the pressure was low, it was probably indicating the correct pressure, but we missed the transient because we weren't watching. I can't really classify that as an incorrect indication or conflicting; it is just that the capability to monitor the transient didn't exist.

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Q Is there anything else that comes to mind?

A No, I think those are pretty significant right there.

Q I didn't say they were not significant.

A As far as picking out the big ones, that would probably be it. I don't recall any others.

Q Let me tell you again that if any others come to mind after we are through, and you probably will be reading over your transcript, we would appreciate your letting us know. We would be interested to know, to have as accurate and complete a picture as possible of either conflicting or spurious signals that you all were experiencing in the course of the transit.

A Okay.

Q Can you describe to me in broad outline at

least initially what you do on a typical shift?

A Well, there are two or there were two operators on our shift, myself and Craig. Some of the shifts have three, so they have a different setup.

But in any given night you or either the operator were assigned responsibility for operating the plant or you are the operator assigned with taking logs and supervising the switching and tagging, and maintenance that was going on.

So, for instance, if you were the operator that was going to take the panel that night or operate the plant, you would enter the control room and make a tour, walk around and read some of the meters that you thought were important, and establish in your own mind what the status of the plant is.

You would review the log and probably just for that day since the last time you were there -- usually it involves just two or three pages that you were to see if any major evolutions or changes have taken place since you were last. Then you talk with the man who you are relieving. He should relate to you anything that is significant, either that is changing or is going to change during your shift, surveillance procedures he has completed.

Q Were these surveillance procedures, would they be in the log too?

A If they were tech spec surveillances, they should be logged, yes.

He should have a written list of any kind of abnormal or unusual or anything that you might think is noteworthy, which should be written and given to you at the time of shift relief, so you can look it over and see if there is anything that you don't understand about what is going on.

Whenever you are satisfied that you understand the status of the plant, then you relieve the operator and sign in the book as the operator on duty.

In the procedure for shift relief, it also includes a review of a large variety of documents, depending on when the last time was you read the procedure review book. If you read it the night before, you wouldn't bother reading it again before you relieve the guy. You might just take the time during the shift to see if there is anything new in it. You are supposed to keep up-to-date on revisions and procedures, new operating memos, new memos from any other superintendents, that you are supposed to have read that day, and check your mailbox to see what is new, training

material. I believe the procedure requires that you read those volumes before you relieve a man but, if you acknowledge the fact that you are going to review that stuff during the walk, so that having taken place, during the shift he is responsible for the operation of the plant. In the other case, where you are relieving the person who is taking logs and doing safety tags, the same type of turnover would probably not as extensive take place.

In other words, he will tell you that his set of logs is complete, that he didn't have any problem, or he would enumerate the problems he did have and point out any of the special readings or difficulties in obtaining readings because of out of service equipment and stuff like that.

He would also tell you what the major systems are he has tagged out for maintenance, and whether or not there are some tags leftover for you to handle on your shift or any outstanding jobs.

That man would probably also be involved with operator news, the man who might be doing the surveillance. He would have the paperwork that they need. He would turn over the status of those jobs.

So after the relief has taken place, you generally

go through the shift, maintaining the plant condition as existed when you took over, unless the supervisor comes out and tells you to change things for one reason or another. That is about it.

Q During the shift does the operator who has the control of the plant do any status checks to see whether particular instruments or switches whatever are in the position that they are supposed to be in?

A Yes.

Q Can you tell me about that.

A Well, when you have the responsibility for the panel, basically your whole job is to look at the panel and analyze the condition of the instruments, and through the indications that you could see determine whether the plant is operating normal or abnormally. That is basically what you are doing.

The specific valve lineups and conditions of components that either are running or non-running would be a matter of pretty quick scan of the panel, once you have gotten into the routine of doing it.

But the assumption is that if something is abnormal due to maintenarce or due to surveillance procedures or something like that, there will be a tag on that piece of equipment, explaining why it is not

in its normal position.

I guess what you should be looking for is an understanding how the out of service equipment affects the ability to operate the plant normally and to respond to emergency.

For instance, during the morning before the accident I was aware of a condition where the pressurizer systems were not on automatic. In other words, the heaters and spray were not on automatic. I was manually controlling them.

So I was aware of that abnormality, although there were no tags present, but it was annotated in the turnover and that is what I had to do to control that system.

So that was -- it may have been considered an abnormal condition, but at least it wasn't in my mind.

I had already in my head planned what I would do immediately if there were a reactor trip to that system -- in fact, it did later on. My first action was to put that system on automatic. So that is the type of thinking and planning that you do while you are analyzing the status of the plant.

Q Is there any leaking checklist or procedure where you are referring to some sort of a document and then do a status check on specified systems, valves or

whatever?

A Not for a normal shift, no. There are surveillance procedures that check system lineups at a given frequency, whether weekly or monthly or whatever, and the assumption is made if those surveillances are current and correct, that it is not necessary to do a valve-by-valve lineup in any given system.

Q Was there a surveillance procedure which would have picked up the 12 valves being closed that was performed?

A Yes. The surveillance procedure that they ran did stipulate that those valves had to be open. There was a mistake made in that procedure.

Q But, after that, was there any procedure for -- and maybe I am using the word "surveillance" incorrectly -- was there a procedure for checking the lineup of that valve, the 12 valveS,from the control room on a daily or on a 12-hourly basis?

A No.

Q And there is no reason it couldn't be done; it just was not the procedure at that time, is that correct?

A That's right. We were relying on the surveillance procedure lineup to be correct. That is right.

Q Am I accurate in understanding that there is no regular shift procedure for each shift where you pull out essentially a blank checklist and then you start walking around and start checking off that position of a certain number of valves or indicators or whatever there is a checklist for some system, but the emergency feedwater is not one of them; it was not one of them at the time?

A That's right.

Q How much of your time on shift is devoted to actually monitoring the systems that are there, assuming you are the one that is operating the plant, and how much of it is devoted to reviewing materials, whether it be the log or materials that all operators are supposed to review and check off on? Is it possible to give me any kind of very rough division of time?

A I think it would be hard to determine how much time you are actually looking at the panel. You are aware of changes in the system without having to constantly stare at the meters, in other words.

Q I don't mean --

A You don't have to scan.

Q You aren't physically scanning, but the

time devoted to essentially focusing on what is happening now.

A Yes.

Q In the plant, as opposed to focusing on catching up on reading or reveiwing a procedure that you may have to know some day.

A The manner in which you review those procedures is kind of built around how you are going to monitor the plant. In other words, you put your chair right up at the control panel, and you face the control panel, and every few sentences you look up and scan the panel. That is how you do it.

You don't take a book and go sit in the corner of the room and study it. You have to review material like that while you are monitoring the panel.

Any kind of heavy studying that you might want to get involved in, you would save for the night you are on switching and tagging, the other man on the shift, and get into hard studying where you don't have to monitor the panels.

So that there is certainly things you would read at the panel, and other things you would save for later on.

Q If you are on switching and tagging for a

particular shift, you come in and somebody tells you whatever changes have been made in switching and tagging since you were on the last shift or you look at the log and find out. What do you do then during the shift when you are on switching and tagging?

A Well, like I say, you have logs to keep.

Q And the logs are what?

A Well, there are technical specifications, surveillance lists associated with each limited condition.

In order to document these surveillances that have taken place, that operator has to take a tour of the control room, take readings, and perform tests to satisfy those requirements. He keeps track of them on a shift log, which he fills out once every hour.

He also has another set of readings, which just generally lists the conditions of the plant, by reading just about all the meters in the room, and between the computer printout that he draws from the computer and the manual readings that he takes, we get just about every reading in the control room once per shift.

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Q Would that have picked up the 12 valves is closed or is that the procedure which didn't include it?

A That didn't include it.

Q Do you know -- are you aware of why valves on the auxiliary feedwater would not be included on that log? Would that go back, for instance, to the way they are defined in the tech spec?

A Well, as I remember the way the feedwater is defined, it is not a safeguard system, and it is merely an operability requirement. In general it says the emergency feedwater system will be capable of performing its designed function in those modes, so that that general requirement includes that 12 valve be open, but it doesn't specifically include that as a check on the system.

We do perform a surveillance that verifies within the frequency specified in the tech spec that the system is operable. That is what we did a few days before the accident.

So I guess the feeling was we were fulfilling the requirement that the system would really work, but there wasn't any, I guess, checks and balances to insure if you made a mistake on the procedure, you would pick it up somewhere else. That is probably where the system fails.

Q I guess what I was wondering is the way in which a system does or does not get onto this

surveillance procedure, that the switching and tagging man does on a particular shift, does that really come out the way the particular system is defined in the tech spec? In other words, if it is defined as one kind of a system in a tech spec, it goes into the surveillance procedure, and if it is defined in another way, it doesn't. For instance, if the auxiliary feed had been defined as a safety system, is it your impression that then it would have been on that surveillance procedure?

A No, not necessarily. The high pressure injection system was a safeguard system. We do not do a valve lineup on that every shift.

Q I guess what I am driving at is you know what the logic is for saying that certain valve lineups are checked on a shift, every shift basis, and some are not? How are those distinctions made?

A I don't know. I suppose an inadequacy would have to be discovered, for instance, in a surveillance procedure that required that the particular valve would have to be checked every shift, which we did with some of the decay heat valves, which we would check that they are closed when the breakers are open. We discovered there were problems. Like now everybody

has realized that the 12 valves are a problem, and I am sure that is on everybody's surveillance list. That is how it happens. You learn through your mistakes, I guess.

But I don't believe it was specifically excluded. It just hadn't been considered as being a source of the problem.

Q Well, let me ask you this. Was the surveillance list that the switching and tagging man would refer to at every shift that was generated only by experiencing a problem with a particular system or were there some things on there, regardless of whether they were experiencing problems?

A Some things were on there regardless because they were mentioned in the tech specs.

Q And what kind of classification or level of importance do they have to have in the tech spec in order to get onto that list; do you know that?

A No, I don't. They were constantly being revised. They were being added to. There was a larger volume of things that you had to check. I guess we didn't catch that one soon enough.

Q Who would make those decisions as to what was going into the procedure that the switching and

tagging man follows on a shift basis?

A I don't know what the normal development is. It probably comes from LER's and safety analysis letters and things like that. But that is the same with any procedure. I could suggest a change if I wanted.

Q That probably then goes through PORC?

A Yes. The shift and daily log is not just a log sheet. It is a procedure.

Q Do you see any information flowing into Met Edison on a regular basis from B&W, information that you can identify as having come from B&W?

A No, I am not on that chain, I think. I see the results of that correspondence. That is about it.

Q Whether or not you see it on a regular basis, are you aware of any systematic communication from B&W to Met Ed with respect to the nuclear steam supply?

A Yes.

Q What form would that regular communication take?

A Well, there was a resident B&W engineer.

Q Lee Rogers?

A Lee Rogers, yes, but I saw Stan more than Lee.

Q What is Stan's last name?

A I think it is Maingi.

Q In what connection and in what context would you see Maingi?

A Well, I don't really know what his job is. He seemed to be rather knowledgeable in all aspects of the NSSS. If you asked him a question, he would answer it or be able to steer you toward a reference.

As far as questions about ICS response, questions you might have about how the system works, parameters and how they were arrived at and things like that. The only communications I was referring to is that if you asked, if you have a question about how the system works or any procedures or something like that, you could ask B&W and they would try to answer it.

You could either go to Stan or you could call down to the Training Department in Lynchburg, where we have a number up there, and just talk to the instructor.

Q Did you ever have occasion to do that, to make a call yourself down to the Training Department in Lynchburg?

A I don't believe I ever did, not before the accident. I know people that did it routinely and arguments and that sort of thing.

Q Other than the personal contact that you

have through someone like Stan Maingi, were you aware of any other regular exchanges of information coming from B&W?

A Well, I guess I wasn't involved in it, but I know that the operations supervisory people were, in the same way I was, asking questions and getting answers. I am sure they had some interchange through letters and other telephone communications, but I don't know who they were talking to or in what context they were discussing things.

Q What about channels of information from other vendors, other than B&W? Were you aware of any systematic channels of information, other than personal contacts?

A We had Westinghouse resident engineers. We had other vendors that supplied pumps or valves that would come in and out occasionally.

Q But again, other than the personal contact, were you aware of written channels of communication that were used on a regular basis?

A It was my impression that written communication would take place, but I suppose that was just an impression of mine. I don't have anything to verify that with.

Q How about information from other plants? Would that be primarily through LER's?

A Yes.

Q Any other sources of information, other than LER's that you know of?

A Personal contact.

Q Other than that?

A No.

Q Have you ever seen a publication, and I am just showing you one for an example, called "CURRENT EVENTS - POWER REACTORS," published by the NRC. Is that a familiar format to you?

A I don't remember having seen this type of document. I may have, but I don't recall it.

MR. ROCKWELL: Why don't we mark it.

MS. GOLDFRANK: I believe it has already been marked.

MR. YUSPEH: It was marked Porter Exhibit 2.

Q The document we have been referring to is Porter Exhibit 2. You are not familiar with the format?

A No, I don't think so. No, I am not.

Q Was there any liquor present in the control room on the 28th?

A Liquor, no.

Q Any alcoholic beverages?

A No.

Q Was there any present to your knowledge anywhere in the environs of the control room, whether or not specifically in the control room itself?

A No.

Q Have you ever known anyone to bring any alcoholic beverages into the control room before the 28th?

A No.

Q Had you ever known anyone to show up at work intoxicated, before the 28th?

A No, not personally. I have heard stories about people being drunk, but I don't remember anyone talking about people being drunk on-site, no, not on the job.

Q Are you aware of any operators who had second jobs on or before the 28th?

A Second jobs? Let me see.

Q Let us start with you. Did you have a second job?

A No.

Q Have you ever since you worked here?

A No. One guy, I don't know whether you would call it a job -- I think he repaired chairs and stuff like

that. Another guy worked on used TV sets, electronics. I am not sure that they were actually jobs. I don't recall anyone having an eight-hour job. Most people have -- for instance, there is a storekeeper who owns -- has a part interest in like a candy store, but I think his wife is there. You are asking me if someone had another job. Not that I know of specifically.

Q Before the 28th had you ever addressed in training or otherwise informally how you would handle a major transit or emergency where you would have a tremendous number of alarms in a short period of time and how you would sort out which alarms to pay attention to?

A Yes, we had discussed it. We did it that morning when the alarms came in. We realized there was such a large number, we decided not to acknowledge the alarms. We just let them flash until we had the opportunity to read as many as we could, in an effort to get more information. Once you push the button, you erase a lot of information. So we decided even before this accident not to push the button if we were confused about the alarms.

Q Does that mean the alarm keeps sounding?

A Yes, it does.

Q Do you have to work with a horn blowing all the time?

A Yes, to the point where it becomes meaningless to try and read several hundred, then you acknowledge them and try to work without them.

Q Had there been any discussion among the operators or between the operators and the Training Department of how better to deal with that kind of situation, the situation that existed in the control room?

A The alarm system itself is undergoing pretty thorough work. We had two engineers assigned to it full-time trying to update the alarm system and come up with a better way to display the alarms.

That work is in progress just prior to the accident. They hadn't come to the point where they were proposing changes.

The first phase of the job was to identify alarms that were either unnecessary or not working properly. That is what they were doing prior to the accident.

Q I take it one of the problems with not acknowledging the alarms is that if a new alarm comes on, the only indication is that one additional light starts to flash. Would that be correct?

A Yes.

Q And so one of the problems you have then is identifying the fact that a new, possibly significant, alarm has gone off?

A Right.

Q But, if I understand you correctly, you indicated that a basic decision had been made before this transient ever occurred. If you were in a situation where a lot of alarms were sounding, that none of them would be acknowledged, so that you would have a record of what alarms had sounded, so that you could attempt to assess things?

A I say this agreement was made between the four of us, Bill and Fred and myself and Craig, having been through other transients together, and this was one of the things we came up with as something to do.

#13 Q Had the four of you been together for quite some time?

A Yes, about a year, I think.

Q Is that typical that the company will try to create a shift and then allow that shift to work together over an extended period of time?

A Yes.

Q What technique did you use on the morning

of the 28th to try to sort out which were the significant alarms and which were alarms that you just had to bypass because of the pressure of time?

A Well, by knowing the positions of the important alarms, you know where to look for the ones that you feel might be most significant. In other words, the reactor coolant pressure alarm and high pressure injection actuation alarms all had the same location. The feedwater alarms are in another area. If you are trying to evaluate effects of the transient on, for instance, the feedwater system, then you would read the alarms associated with the feedwater system. It is all grouped in one area.

So what you are looking for is really a special alarm that you wouldn't have expected to see in a transient, and try to identify that as either the source or an abnormal result of the transient. In a loss of feedwater, you would expect to see the feedwater trip alarm, but you don't expect to see an alarm that says the feedwater regulating valve is stuck open. You wouldn't be looking for something like that.

Q Basically what you fall back on in that situation is your instinct, training and experience?

A Yes.

Q Rather than any set procedure?

A That is right. There are procedures written for response to any given alarm window.

Q You were in a situation where that was totally impossible?

A Yes.

Q Somebody told me that the minimum number of alarms they had ever seen in effect at any one time in the control room is 53.

A I don't know that 53 is correct, but it is probably a good guess.

Q On that order?

A Yes. That is one of the problems we were trying to correct with those engineers on full-time. They were trying to figure out why those alarms -- whether or not it was needed, and whether they should change the state of the alarm, so it was not needed. Those were the problems they were working on.

Q What is the analytical process you are given in training to use in sorting out which emergency procedures to go to? The hypothetical is you are faced with an emergency. You get certain information that comes to you or is available to you in your control room. How do you take that information and arrive at

a decision as to what emergency procedure to use -- and I am asking this as to how in your training you were told to go at it.

A Basically you try and assemble a list of symptoms and try and identify the emergency procedure which lists those symptoms as characteristics of that emergency.

What you need to work with is almost a complete memorization word for word of each emergency procedure and its symptoms, which is what training is centered around. You are required to memorize all of the emergency procedures.

Q Is that possible?

A Is that impossible?

Q Is it possible in your view?

A Yes, it is awkward, and is very difficult to maintain complete memorization. I mean, over a long period of time, all you can do is continue to review and r memorize.

It is particularly awkward when a revision comes, to have to forget something and replace it with a new piece of information.

To paraphrase that is certainly acceptable, but you have to maintain the original pure interpretation

in order to comply with the testing requirements. That has been a basis for all the training memorized symptoms and the immediate actions, and you try to analyze the system primary during an emergency and put them into a specific symptom pattern that fits a given emergency procedure.

Q You were in the control room on the 28th, and you obviously have been through a tremendous amount of review or analysis of what happened during, and you have looked back at your own training. A lot of people have asked you a lot of questions. What do you think the experience of this accident teaches with respect to how a utility can be prepared to deal with the kind of accident that occurred here on the 28th?

A Well, from what I have seen of the training, as a result of the accident, it is going to improve over what we had before. It will be a more generic approach to responding to an emergency, with more regard to a deeper understanding of the safety analysis and how ultimately that may be the only thing you have to fall back on in the absence of a procedure.

The fact that drills and questions are being thrown at operators for analysis, rather than response through memory is a big change in the training.

Like I said, we had to memorize emergency procedures and perform that response from memory in previous training.

Now the emergency procedure is used as a reference, and the response to the casualty is more analytical than a response from memory. I believe that is a safer approach.

Q What else do you think the accident teaches?

A I hope that it instills in the operator a more distrusting attitude towards finalities that the safety analysis presents.

I hope that it increases his questioning attitude as to whether or not the actions he is taking are complete, that is taking enough steps to verify he is moving toward a safe condition.

Q Do you think that "healthy skepticism of the safety analysis report" is at least being suggested in the training now?

A I don't know that it has come about in the training as yet. None of the instructors have got up and said, "Forget about the safety analysis. We want to look at it a different way."

But the operators seem to be exhibiting a more questioning attitude than they had before. I have been.

In other words, I read a procedure, and then I go back and read it again in the light of what would happen if this went wrong or this automatic action didn't occur, with more attention given to multiple failures, not assuming that the plant is safe, but that you will have to do it on your own.

The other operators I have spoken to all seem to have the same approach to the procedures and the information that they are receiving now.

I don't think it is something that the Training Department or the company can instill in the operators. It is something we are going to have to -- it is a personal thing you are going to have to adopt for yourself.

Q Are there other lessons that you think this accident teaches in terms of how to run a power plant like this at whatever level you want to select?

A Up to now I have been exercising the response to emergency in the plant. The biggest problem area I see out of this accident is, in retrospect, the emergency plan, the radiation emergency plan, and the communications were all in their infant stages. They were not as highly developed as they could be.

As we look back on it now, there are a lot of

changes that can be made, as far as communications and educating the public, the State agencies and all that sort of thing. That stands as an area that needs a lot of work.

Looking back on that, that is easy to say, but prior to the accident the TMI emergency plan was well rehearsed, and everyone was very familiar with it. It seemed that all the bases were covered.

That is, we knew we had to contact the State, which phones to use, who to talk to, how to document what it was then, and what to say that would alert them to any given condition of the plant. All that had been thought out ahead of time.

The fact that those communications resulted in undesirable events on the public is not something that we could have foreseen, and I don't think there is a lot of lessons to be learned from that part of the accident.

As far as when you notify people and how you say what you want to say so that they understand what you are talking about, you can't just pick up the phone and say, "We have a loss of coolant accident" because not everybody understands that.

We have to realize that you may be calling up at

4:00 o'clock in the morning and using words that the person on the other end of the phone doesn't understand. That is something we are going to have to plan against, I think.

The fact that we have had a loss of coolant accident established an awful lot of equipment is in itself a severe consequence of the accident, but the national and international events were not a result of what we did in the plant; they are a result of what the public thought was going on. I mean, nobody got hurt, but this accident affected more people's lives than the airplane crash recently.

Q Obviously the people here who lived through all of this are extremely aware of many of the things that you are talking about. One of the problems that the Commission has is how to translate what is learned here onto a national level, how do you teach the relevant lessons that are learned here to people elsewhere. Do you have any thoughts on that?

A I am new at the instructor business.

Q I understand. Well, I can put it in two ways. I would be interested in what you have to offer here, but also if after we are through you have any thoughts, we would be delighted to hear from you in any other

form through a letter or whatever. But to the extent that you have something you want to offer now, please go ahead.

A I found even during the accident that an awful lot of people were frightened by what was going on here -- my relatives and my family, even my wife who works on the Island was frightened. But if I was able to take the time to talk to them individually and explain what happened and exactly how we understood what was happening and what we expected to happen over the next few days, they seemed to become more calm, until I went back home and turned on the TV set and started listening to the media, which I feel was the greatest influence in the panic and the fear that the public felt.

There was a great deal of sensationalism. I wish that I had the opportunity to talk to a lot more people, to try and cut back some of their excitement and their panic. But I could only interface with a small amount of people.

After the accident was over, months later my neighbors came by and thanked me for taking the time to talk to them because they were beginning to realize that perhaps the evacuation was unnecessary, and the media had misrepresented what was going on. They

appreciated the fact that they had the opportunity to talk to me, so they wouldn't panic their entire family by having to displace them when it wasn't necessary.

And so I can't help but feel that if they had been approached with a more calm attitude, a lot of the repercussions that we are feeling from the accident might have been minimized. This is although we can't have a licensed reactor operator or a health physicist expert walk down the street explaining to people during an accident.

I mean, it is just not practical and you can't expect an engineer or a health physicist person who works at the plant like this to be able to communicate with the public on a mass media basis. He may not be accustomed to speaking to the public and it wouldn't come across.

But communications being the largest barrier, it is also the most difficult problem to solve. I know that Met Edison has gone through some extensive majors to try and educate the local population on what goes on here and what measures are taken to insure if this is a safe operation.

The construction of the observation center was based on that. That was built many years ago, maybe

five or six years ago, for the purpose of educating the public, but I am not sure that that many people are interested in being educated or wanted to take the time to attend a lecture or really attain some in-depth knowledge of what was going on.

It seems to be a very popular subject now, but then it wasn't.

#14 Q Let me take you back to the more specific kinds of things that you as a control room operator may have learned from the accident. How do you translate that to a lesson which can be taught on a national level, and I think it is not one thing obviously, but it is a lot of things.

A I really don't know. The technical things that I have learned from the accident would be difficult to transmit to the public.

Q When I say "the national level," I mean so other people in your position elsewhere would have it. Obviously one concern is how do you take what you as a control room operator learned and give other control room operators somewhere else the benefit of it.

A Well, I think the best way is to try to use the simulation. I really don't know if other vendors have simulators like B&W. I believe Westinghouse does.

But I think the hands-on operation in a similar accident would be one of the ways that I would chose first. Certainly a review of the sequence of events and a list of the errors that we made would be very important.

Q How much of an advantage do you think it would be to have a simulator that exactly duplicates the TMI control room and to have it here on-site and to spend time with it during each of your one-week refresher courses every six weeks?

A Well, there is no doubt that being able to simulate accidents of this sort in an identical control room, where you couldn't hurt anything, would be an advantage.

But being able to anticipate casualties that hadn't been considered is still the same problem. I think what I am saying is having an identical control room might teach you where the controls are and how to read them, the specific parameters in the same locations, but as far as developing an approach to an emergency of this sort, it wouldn't be necessary to have an identical simulator. B&W would suffice just as well.

You are trying to develop an analytical approach to an emergency, and it wouldn't be necessary to have

the exact same switches and buttons and gauges to respond to. If you have something that is very closely similar, that is close enough for what we are trying to do.

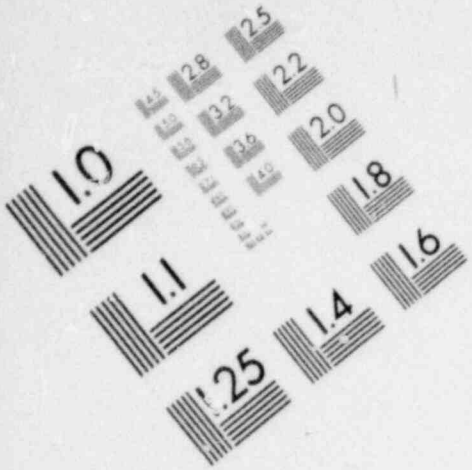
Q As an operator who was in that emergency room during the transient, what changes, if any, would you make in the control room design based on, I guess, during not only on that transient, but on your experience in that control room up to that time?

A Obviously a position indicator on the PORV that reveals actually whether the valve is open or shut is important. We need reactor coolant drain tank instrumentation in the operator's field, that is in his field of vision, in his normal operating area.

We need an alarm system that is designed to be useful during analyzing one of these problems. We need alarms that are meaningful. In other words, you need an alarm that tells you when you have lost a feed pump, but you don't need one that tells you that there is trouble in the turbine building elevator.

You need an alarm that tells you when high pressure injection is actuated. There are other alarms that I think are not significant.

Out of the 1200 or 1600 alarms that are displayed



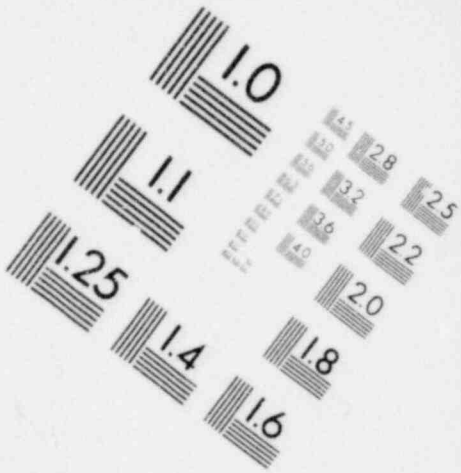
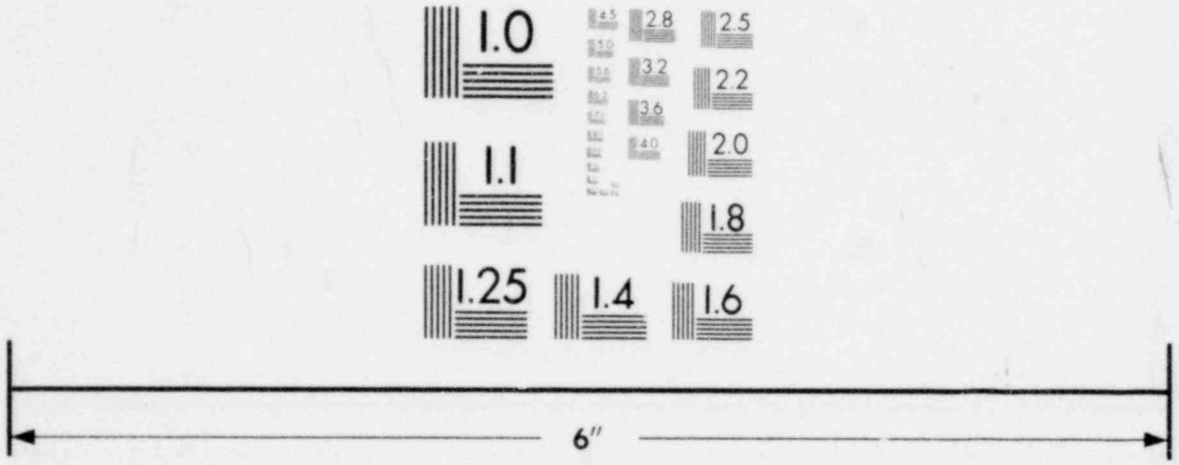
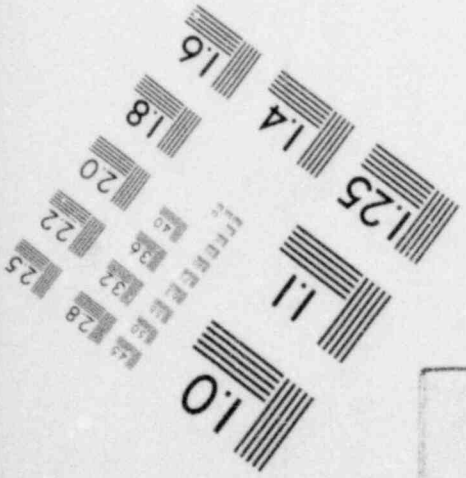
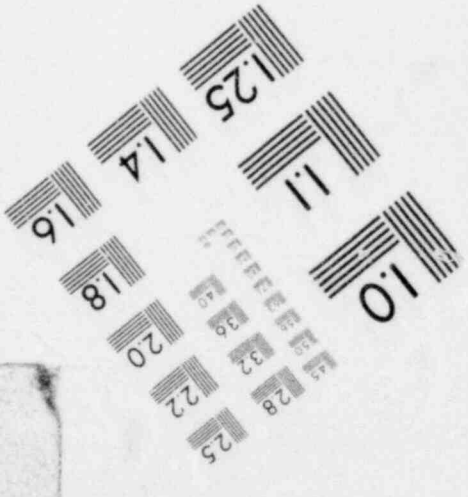


IMAGE EVALUATION
TEST TARGET (MT-3)



MICROCOPY RESOLUTION TEST CHART





up there, I am sure we could narrow that down to 100 or 200 without losing any vital indications. The need to acknowledge wouldn't be necessary.

Someone, I think Mr. Kennedy, proposed a meter or an alarm system that would reveal the saturation conditions in the reactor coolant system. I am not sure what type of system he had in mind. I suppose that would be a good idea if it were reliable.

I don't think that we -- I think we certainly need procedural changes. That is about it.

Q What other indication do you have of inventory in the core besides pressurizer level?

A Well, there really is no other readout on the panel that would tell you how much water is in the system.

Q Let me put the question a little differently. What other indication do you have to tell you that you have core covery?

A You don't have any direct indication of that. You could give any set of circumstances and you would probably figure out whether the core is covered by pressure and temperature relationships and that sort of thing and the ability of the secondary system to remove heat, whether you have flow to the core. But there is no way

of telling how much water is in the vessel.

During the weeks that followed the accident, that was one of our primary problems. That is why we eventually filled the system to a solid condition to verify through pressure-temperature relationships that the system was solid, and then maintain it solid from then on because it was the only way we could guarantee that there is water in the system.

Q Have you ever been involved in exercises where you simulate the transients from other plants, other than TMI 2, to see what effect they would have on TMI 2 if they occurred here? Obviously this would have been done with another B&W simulator.

A I think we have used as initial conditions some transients at other plants, yes.

Q Did you have any specific training to become an instructor?

A No. I am not really officially an instructor yet. I have to attend an instructor school. I don't know when that will be right now. The schedule is kind of up in the air. But I will attend an instructor school and I will be observed by qualified instructors until it has been demonstrated that I am effective as an instructor.

Q Where will that be?

A I think NUS.

Q What does "NUS" stand for?

MR. YUSPEH: NUS is a consulting firm that specializes among other things in consulting to the nuclear industry. That is the name of the corporation, "NUS."

Q How long a course is that, do you know?

A No, I don't know how long it is.

Q Are you teaching now as instructor?

A I was scheduled to this week. Along with that there is a general physics instructor and an NUS instructor that is supposed to sit in on my classes and audit what I do.

They review all the material that I prepare for the lecture and, as far as whether or not it complies with the objectives of the training and whether or not I covered it in sufficient depth and all that sort of thing, they determine that. I haven't given any lectures as of yet.

Q Will there be other training, other than the NUS course that you described, to prepare you to become an instructor? Has there been other training?

A Not that I know of, other than, you know, actually

doing the training under supervision.

Q I want to ask you if you have made any statements since the accident. I know you have. Let me define what I mean by "statements." That would be anything which you have reduced to writing yourself about the accident or things connected with the accident or anything which anybody else has reduced to writing, based on what you said. Obviously that would include transcripts of interviews, testimony, that sort of thing. It would include any written statements that you made or memorialized in any other way, for instance, if it were taped on a tape recording.

A Yes, there is all kinds of transcripts.

Q We can go through it now or would you prefer just to sit down and make a list and send it to us. We can do it on the record here first right now.

A A list of the different agencies that I have spoken to?

Q Yes. What we want you to do is come up with a list of statements that you have made, in other words, interviews that have been transcribed or recorded, and the written statements that you have made. We can do that here on the record. I know there are a lot. I am trying wondering. I don't care which way you do it.

A You mean the dates?

Q Your best estimate of the dates.

A I wouldn't be able to give you the dates. I can give you the names of the organizations though. That is about it.

Q What is more efficient, to do it right now on the record or for you to submit us a list?

A I don't know that I can compile a list. I don't know that I have in my possession all the transcripts and tapes and things that are referred to.

Q Let us try to go through it now. If I understand it correctly -- let me take it in chronological order to the best of my understanding.

A Okay.

Q You were interviewed on March 30, which would be two days after the accident, by Lorn & Reppert, and that was tape recorded and transcribed?

A Yes. Are you saying that is the first one?

Q I don't know. That is the first one I know of.

A There was one prior to that.

Q What was the one before that?

A I was interviewed by a Met Ed engineer in an attempt to debrief us immediately after the accident.

Q Who is that?

A Walter Marshall.

Q Did Mr. Marshall tape record the interview?

A No. He took notes on the first half of the interview, and then later on we were able to get a tape recorder and record some of it.

Q Have you ever seen his notes or transcript of the part of the interview that was tape recorded?

A Yes, but I don't know where that stuff is right now.

MR. ROCKWELL: I will direct this to your counsel because he may or may not have it, but could we have a copy of whatever notes or transcripts there was from that interview.

Q Was that on the 29th?

A I believe so.

Q And then we covered the one on the 30th, the interview conducted by Mr. Lorn and Mr. Reppert.

Our understanding is that there was another interview on the 6th of April with Van Witback. Do you recall that interview?

A Yes.

Q Was that the next interview that you had after the one on the 30th?

A No. There was some NRC interviews somewhere in there.

Q Okay. Tell me about the NRC interviews.

A I approached the company, Met Ed supervision, with the proposal to get together with some kind of a team to debrief us on the accident before our memories began to fade.

Somehow we got directed to a few NRC officials, who began to interview us. They interviewed the four of us as a group and then again individually.

Q Who were the officials involved in those interviews?

A Their name was Phil Madden, and I don't remember the other man's name, just two NRC officials.

Q And when you say "the four of us," that is Frederick, Faust, Simon and Zewe?

A Yes.

Q So for you personally there would have been two sessions, one group and one individually?

A Actually my individual session was coupled with Bill Zewe's -- we were there together -- and actually it was in the back seat of a car with a tape recorder going.

You see, the idea was that Bill and I had the fear

if they didn't get started soon, we would begin to forget things, which in fact did happen.

We approached the company to try and get someone to interview or debrief us formally, and the company was, I guess, incapable of doing that at the time because everything was happening.

Talking about the 29th and 30th, everything was pretty busy. So really they had to call in the NRC, and they asked if they had any people available. They came up with these two guys, and it was their intent to debrief us as well as they could, and then turn that information over to their I&E Division with the intent of giving us transcripts that the company could use.

#15 Q Did you ever get a transcript?

A I think so.

Q Or copies of tapes?

A I don't know if I got the tapes. I believe I got one or the other. I have not extensively reviewed all the transcripts and tapes that have been sent to me. I probably will now. It has been so long, but originally I tried purposely not to review them extensively, so that I wouldn't contaminate what I knew with what the other guys knew.

Q Could we have a copy, please, of any

transcripts that exist of either the group interview with the two NRC inspectors or the individual one that Mr. Frederick gave?

(There was discussion off the record.)

A I am not sure whether I received from NRC or whatever. It seems to me there should be a central place where all these transcripts are already amassed. Can't we get them for you?

Q Sure. I am really directing the question to counsel.

MR. YUSPEH: I will take care of it.

MR. ROCKWELL: We will be making requests all through the depositions, and they will coordinate. Then we have a record of an interview that was conducted by the President's Commission on May 10.

THE WITNESS: They came on-site to interview me. I don't know what motivated them to do it. I submitted a written statement of my comments, as far as some things I wanted to say about the accident. I submitted it to those people, and they said that they would attach it as an amendment or an addition to my second testimony. I didn't see it come back.

Q I don't see it here. That is the first I knew about it.

A I gave it to an elderly gentleman who they identified as the technical advisor. He said he would present it to the other two and expected to see that as an attachment. This is more than a bunch of personal comments and answers to some of the questions you asked. But I wrote it down because my memory was best then.

Reporters had asked me questions and I refused to answer. I wanted to give my answers to the questions to the official source, and I wrote them down. I don't know what happened to that document.

Q We will check on that. I take it you don't have a copy, is that it?

A I don't think I do.

Q We will check on that. If we can find it, we will send a copy to you. It should be around. I don't know why it is not here.

A If I do have a copy, and I may actually have one -- I am not concerned about my having it, but I want to know what happened to it.

Q We will check and get back to you.

(There was discussion off the record.)

Q Back on the record. Obviously you also

testified before the President's Commission on the 30th of May, and you testified before the Udall on the 11th of May with Mr. Faust. Do you recall any other interviews or public testimony which you had given since the accident?

A There have been many NRC interviews.

Q Since that first interview?

A Yes. There was one conducted down here in the trailer.

Q How many would you say over and above the ones that occurred immediately after the accident?

A Four or five at least.

Q Have you received the transcripts on all of those?

A I think so.

MR. ROCKWELL: We request copies of those transcripts as well, please.

Q Have there been any other interviews by any other organization, other than the ones we have now covered?

A We covered Met Ed and GPU and NRC and the President's Commission and the Udall committee. I think that is it.

(There was discussion off the record.)

THE WITNESS: Other than the debriefing I told you about in Met Ed in the first couple of hours in the first day, rather, there has been meetings between myself, the four of us actually, and investigating engineers to try and interpret -aphs and sequence documents and things like that, to try and get a clear picture of what happened. That has happened hundreds of times. It is not really a formal interview or anything that has been transcribed.

For instance, that document that you have there entitled, "Sequence of Events," we have had some input into that.

Q Other than that one thing which you wrote out on your own and gave to the President's Commission in May, have you written anything else?

A No.

Q Let me just identify a couple of things from the personal file you made available to us. There is one black notebook which has two white labels on it. The first is, "ICS Response Characteristics, Training Manual, Book No. 58" with your name on it. Is this the book that was put out by Babcock & Wilcox?

A Yes.

Q And it was supplied to you in the course of one of the training programs?

A I don't remember when I received it. I had to sign it out from the Training Department. I believe they received a shipment of those books, and they assigned one to each one of the operators by number, so that we could review it and maintain it as a reference.

Q So you think you got it from your Training Department?

A But they got it from B&W.

Q And do you know to the best of your recollection when you received this Book No. 58?

A Prior to the licensing in October of '77.

(There was discussion off the record.)

MR. ROCKWELL: I would like to mark some of these things. Do you have any objection to our marking the originals and xeroxing them and returning copies to you or would you prefer to xerox them and mark copies?

(There was discussion off the record.

The morning session recessed at 12:30 p.m.)

oOo

AFTERNOON SESSION

1:30 P.M. RESUMED

E D W A R D R. F R E D E R I C K, having been previously duly sworn, resumed the stand and testified further as follows:

DIRECT EXAMINATION (Continued)

BY MR. ROCKWELL:

Q Before we get to the subject of the letter from you to Mr. Seelinger, let me ask you about one document which has previously been marked Dunn Deposition Exhibit 35. It is a memorandum from a Mr. Walters at Babcock & Wilcox to a Mr. Kelly also at B&W. It refers to another memorandum that Mr. Kelly had written earlier. I think you may have had a chance to look at it briefly before we went back on the record, but if you haven't, and you would like to, let me ask you to take a quick look at it, so you have it in mind. Mr. Kelly's memorandum precedes Mr. Walters' response.

A I remember looking at these a few minutes ago.

Q If you want more time to take a look at it --

A Are you going to quiz me on this?

Q I am just interested in asking you about your views on Mr. Walters' comments. Take a quick moment to read t. Have you now had a chance to look

them over?

A Yes.

Q As you can see from looking at them, Mr. Walters is responding in his November 10, 1977 memorandum to Mr. Kelly's memorandum of November 1st. Mr. Walters says in the first paragraph, "In talking with training personnel and in the opinion of this writer, the operators at Toledo responded in the correct manner concerning how they had been trained and the reasons behind the training."

In order to make sure you have a clear understanding of what happened in Toledo, that he is referring to, that was a transient that occurred on September 24, 2977 in which a PORV failed to open. There was a temporary loss of all feed. Pressurizer level went high with reactor coolant pressure going low, and the operators terminated high pressure injection apparently focusing on pressurizer level alone.

Assuming those facts about the Davis-Besse transient, and then having in mind this first paragraph of Mr. Walters, would you agree with the conclusion that is expressed there?

A Yes.

Q That those operators responded in accordance

with their training, assuming their training was the same as yours?

A Yes. You have to make that assumption, yes.

Q Then he goes on to say, "My assumption in the training assumes first that RC pressure and pressurizer level will trend in the same direction."

Based on your training, is that what you would have assumed?

A Yes.

Q Then he goes on, "For small leak, they keep the high pressure system on up to a certain flow, to maintain pressurizer level."

Is that consistent with your training?

A Yes.

Q Let me advise you that Mr. Walters told us that in preparing that memorandum he talked to Mr. Goslow and Mr. Streeter, whose names you have mentioned earlier in the deposition.

Do you remember eve having any discussions with Mr. Goslow or Mr. Streeter on those subjects that you can pull out of your memory?

A No. They did discuss with me actual simulator transients and hypothetical transients during the training and during the testing that I went through with

them, but I don't remember this particular set of circumstances being discussed.

Q Do you know of anything in your own training that would be inconsistent, that is not consistent with the conclusions or the assumptions that Mr. Walters is making in the first and second paragraphs of this memorandum?

A Since the situations are so similar, I reacted in the same way that these operators did. I have to agree with his conclusion here that it was the training that we all received that caused us to take the actions in the two transients that were so closely parallel.

(There was discussion off the record.)

(Documents described below were marked Frederick Deposition Exhibits 16 through 19 for identification, respectively, this date.)

Q I refer you to Frederick Deposition Exhibit 16. This is produced to us for a review as a part of one of your files. Do I correctly identify it as a sequence of startup events. Let me modify that. Is it a sequence of events or a listing of events that occurred during the startup in February through May of 1978, and it is not your list?

A Yes, I didn't write it.

Q Who did write it, do you know?

A I don't remember who did write that. I don't even remember how I came across it. I am not even sure I read the whole thing. I stuck it in the envelope thinking I would read it, thinking it would be interesting that someone had taken the trouble to list all that stuff.

Q I thought you had mentioned a name in connection with who may have written this list. Do you have any recollection of that?

A Did I say it on the record?

Q No, I thought you mentioned a name, but I may be mistaken. Do you have any idea as to who may have written this?

A It may have come through the Startup Department, the engineers who would be doing the startup.

Q But you can't suggest any individual?

A Those engineers are John Ulrich, I think he is at GPU as an employee, and Jack Garrison, a Met Ed employee. I can't remember any of the other names right now. Those are two of the startup engineers.

I believe it was extracted from their log or they may have been keeping a running accounting of the days for some reason.

Q Do you know any other detail about the significance of this list or why it was put together?

A No, it was just interesting, I suppose.

Q Referring you now to Frederick Deposition Exhibit No. 17, do I correctly identify it as a letter or a note in your handwriting, dated May 3, 1978 to Jim Seelinger from yourself?

A Yes.

Q Have you had a chance to review that today, so that you have the content of the letter fresh in your mind?

A I reviewed it briefly. I didn't read the whole thing.

Q If you would like to take the time, please feel free to do so.

A Okay.

Q Have you now had a chance to review Deposition Exhibit 17?

A Yes.

Q And I correct that this letter was produced to us pursuant to a request that we made yesterday in connection with the subpoena that is outstanding from the Commission to Met Edison?

A Yes.

#16
sm/ w

Q Now, could you tell me the background for this letter which is marked as Exhibit 17? The letter, itself, refers to an evaluation of an April 23, 1978 transient that apparently Mr. Seelinger or someone close to him had made; is that right?

A Yes.

Q And it is your reaction to the evaluation by Mr. Seelinger or whomever of this April 23 transient?

A Yes. That is exactly what it is. It is my reaction. It didn't involve a great deal of studying, it is just comments that I wanted to call to Mr. Seelinger's attention to see what he would reply.

Q What knowledge did you have of that transient? Had you been in the control room at the time of the transient?

A Yes.

Q Tell me what happened during that transient as best you recall it now.

A That is tougher than it may seem. I have an awful lot of memories that I lost through this accident.

Q Describe it in broad detail.

A We experienced a feedwater transient that caused a reactor trip which opened the main steam relief valves and they stuck open rather than reseating after

they relieved the excessive pressure. It caused a severe cooldown transient.

Q When you refer to main steam valves, are you referring to the bypass or the atmospheric?

A The main steam safety relief valves that relieve to the atmosphere.

Q To the atmosphere?

A Yes.

Like I say, this letter kind of lists the problems that I saw in the accident that I didn't think were touched by his evaluation.

Q Were you present in the room during the entire transient?

A Yes.

Q Who else was present?

A The shift supervisor was Bernie Smith and I think Craig Faust and Hugh McGovern were on the shift with me at the time.

Q McGovern would have been foreman?

A No, he was a control room operator in training. The foreman, I don't remember. It may have been Pat Loidonn.

Q Was that transient a transient that led to a prolonged shutdown of Unit 2 in 1978?

A It resulted in replacing all the main steam safety valves.

Q The plant was down for several months, is that correct?

A Yes.

Q You referred to a report or actually used the word "your evaluation" in your letter to Mr. Seelinger. Do we have a copy of the evaluation that you were referring to here in the room, and will you identify it for us?

A I can't positively identify this document. I remember this document being one that I remember I was responding to, but it looks like the same thing to me. The only reason I identified it as being from Jim Seelinger is that it had a cover letter on it for us to review it and it was from him, I believe, so that is why I addressed this letter to him. I don't even know for sure that he was the author of the document.

I was addressing it more to his position which was technical superintendent of the unit more than to him personally.

(Discussion was held off the record.)

Q Mr. Frederick, I think while we have been off the record you had a chance to go through a number

of documents that relate to the April 23rd transient here at TMI 2 and you had segregated out of those documents something which appears to me to be some sort of a report or analysis, and just so we identify it correctly, it is a Table of Contents, that is the first page, and it appears to be on the order of 75 to 100 pages long, and the first page number is A2-3.

Does that appear to be the report or evaluation to which you have had reference in the first paragraph of your May 3, 1978 letter to Seelinger?

A Yes. That appears to be the same document.

MR. ROCKWELL: Why don't we have that marked as this time?

(Above-described document was marked Frederick Deposition Exhibit 20 for identification, this date.)

Q The report evaluation, let's call it the "Seelinger Evaluation" just to use a shorthand term for it, has now been marked Frederick Deposition Exhibit 20; am I correct?

A Yes.

Q Now, when you wrote your letter, had you had a chance to review the evaluation?

A Yes.

Q Reading from your letter, you indicate:

"Dear Jim, your evaluation of the April 23rd incident would have been more complete and accurate if mention were made of these items:

"No. 1, along with the problem of the stuck open safeties should be noted that some safeties did not lift when they should have."

Can you tell me what you meant by that?

A After reviewing the evaluation, some of the operators -- meaning the operators on my shift and the shift supervisor -- were discussing the transient and we thought it was just as significant that some of the safety valves did not open when their setpoints were reached, that that was just as important as if when stuck open after they did, after the correct setpoint, that both of them indicated unsafe conditions.

Q Do you know how much above the setpoint for some of those safeties the pressure went without their opening?

A No, I don't recall. That data, from when they tested the relief valves subsequent to the transient, revealed that the setpoints were not all repeated. In other words, before they decided to replace all the safety valves, they tested them all again and they found

that as carefully as they were putting in the setpoint, they weren't able to repeat actuation at the setpoint, each time would be a little higher or lower, and it was that inaccuracy that made basically the decision to replace the valves.

Q Do you know who manufactured the safety relief valves?

A The original ones?

Q The ones that were in place on the 23rd.

A I don't remember the name. I think they have Dresser valves in there now.

Q You don't know whether Dresser was the manufacturer?

A No. We changed manufacturers. The original manufacturers, I don't remember right now.

Q Crosby?

A No, I don't think so.

Q How many of the safety valves did not lift when they were supposed to?

A I should probably have been more specific in this letter in giving him the setpoint and the number of valves, but I don't remember what I was basing that statement on.

Q Are you fairly certain, as you recall, that

there was more than one?

A Yes, there were several. I would say three or four.

Q Would a transient where you had a trip, as you did there, cause the loss of feed, as I recall -- is that what you said, loss of feed started the sequence?

A No. The feedwater system complicated the transient somehow by -- I think we were only running one feed pump and it was in manual, and during the one backtrip, we didn't manually control that feed pump for several minutes. It took us a few minutes to get to that station and run the speed of the pump down, so we were running cool at the time with the feedwater running and the safety relief valves stuck, and it was stated in the evaluation that it was the equipment response to the feed pump that kept the pressure from going as low as it did.

Q What was the original cause of the trip on the 23rd?

A I don't remember that.

Q Well, would it be fair to say that where you had safeties failing to lift at their setpoints and where you have a trip, that at least in those terms you

are looking at a multiple failure?

A Yes. You had failure or out of spec condition caused the original trip and then you had another failure complicate the transient. Yes, that is what I consider to be a multiple failure.

Q And then to the extent that you wanted to regard slow reaction time in terms of manually throttling back the pump, you may be into a situation where you even have three simultaneous --

A Three compounding effects, yes.

Q Was that ever discussed at the time of the transient, that it was more than a single failure incident?

A It was discussed among, like I say among us operators as I decided to write this letter, which I guess is rather unusual to specifically address one person with concerns like this. It probably should have been brought off through a different avenue, in other words, through the Training Department or something like that.

Q Was there a clear avenue?

A Yes. I should have --

Q In Metropolitan Edison for expressing these kinds of general safety concerns?

A As I said before, I should have addressed this to my supervisor who was Bernard Smith that night, but he was filling in for Bill Zewe that night for some reason. In other words, he is not my normal supervisor and I should have addressed those concerns through the supervisor rather than going directly to Mr. Seelinger.

MR. YUSPEH: I presume the reason though that it was addressed to Jim Seelinger was because it was in response to a memorandum circulated by Jim Seelinger; is that correct?

THE WITNESS: Yes.

Q But I take it other than sending it up through the management chain through your immediate superior there was no other standardized procedure or review group at Met Ed to which you would address a letter of this sort?

A I don't know if there is a procedure for doing it. I would have to either address it to my supervisor or to the operating engineer or particular engineer I knew was cognizant of the system. I was concerned with -- there is no written procedure on how to submit a suggestion.

Q Or there is no central group that exists as a clearing house for any safety concerns such as the

ones you were bringing up here?

A Not outside of the chain of command, so to speak.

Q You mentioned that you had discussed --

A Could I look at this?

Q Sure. Did you want to take a moment to look at it?

A No. I think as I wrote this letter I was following along the recommendations section of this report.

Q Feel free to take a moment now and also to refer to the recommendations as we discuss your letter.

Do you want a moment to go through --

A Just a minute, yes.

(A brief recess was held.)

Q Coming back to your letter, I think you indicated that you had some discussion or there had been some discussion between yourself and some of the other operators. Was this letter a product of discussion that you and other operators had been having in the days following the transient?

A Yes.

Q Did it reflect not only your thoughts but some of the thoughts they had as well?

A I think it would be more accurate to describe it

as the thoughts I came away from the discussions with. I can't say it represents anybody else's.

Q But these were the ideas or points that you made in your letter or the ones that you probably had raised and discussed with the other operators?

A Yes.

Q Did anyone suggest that you write a letter?

A No.

Q That was your idea?

A Yes.

#17

Q Now, do you want to tie the first point of your letter in with some point of the document which was a report of the transient?

A No. I took a look at it because I just remembered that is how I wrote the letter, and if you have any more significant questions, I could refer to the points.

Q Since the document has recently been produced to us and I haven't had a chance to read it, if you want to tie it in, please do, as we go forward.

A Yes.

Q Going to the second part of your letter, you indicate, "Flow testing of the MUV-16s completely ignores the fact that MUV-17-18 are open during ES."

What does "ES" mean?

A Emergency Safeguards or Safety Features Actuation.

Q Then you continue, "This causes runout on the makeup pumps and erroneous flow indications which mislead the operator."

Could you explain what that means, that second point in the letter?

A One of the points of discussion I brought back from the transient was that we were observing inaccurate flow through the high pressure injection lines, and that statement was made in the report that on the ES, when the operator saw inadequate flow through the MUV-16s, he didn't realize flow was also going through MUV-17 and MUV-18. I took that as a point of contention. It was Jim McGovern and myself who came to that conclusion and pointed it out to the supervisor as the reason that we were experiencing inadequate high pressure injection flow.

I thought it was conflicting with the conclusion that we made that the MUV-17 and 18 were a problem, and he stated in his report that we didn't recognize that. I felt that was worthy of mention.

That kind of describes that during the startup testing that we did, when we set the mechanical restriction on the high pressure injection valves which

throttle them automatically to 250 GPM, it doesn't at the same time have MUV-17 and 18 open which are the normal makeup valves.

In other words, when we did the flow setting on those valves, we didn't account for the flow that also goes through the normal makeup line.

Q I think you have lost me. Can we go back? Let me tell you what I don't understand. I don't understand the connection between the 16 on the one hand and the 17 and 18 on the other.

A The 16s are referred to as high pressure injection valves that are automatically opened on the actuation of the safeguard system. They move from full shut to some mechanically stop position that will allow 250 GPMs to flow through that system behind pressure or operating pressure.

MUV-17 and 18 are two valves through which normal makeup to the reactor coolant system passes during normal operating conditions. When pressurizer level goes down, MUV-17 opens to refill the pressurizer. When it gets up high, it closes. It is an automatic level control.

Valve 18 is the block for that automatic control valve.

During that transient, when pressurizer level began to decrease, 17 and 18 opened and when ES actuation occurred, the 16s also opened, so what we had was the emergency flow path and the normal flow path open at the same time. That made the emergency flow path experience less flow than what would have been indicated if the normal flow path was shut.

So when we recognized that during the accident, during the transient and late in the analysis of the transient, we decided it was worthy to point out to someone that the 17 and 18 should be shut during a transient like that.

Q You mean automatically shut?

A Yes, so that you could be assured that your high pressure injection was not starved for water.

Q So the erroneous flow indications which you refer to in Point No. 2 of your letter which mislead the operator relates to the fact that you have less flow than you would expect through the 16 because the 17 and 18 was open?

A Yes.

Q And then trying to relate that back to Point No. 7 on Page 11 of the Seelinger analysis, he says, "On ES actuation, when the operator saw inadequate

flow to the MUV-16s, he did not realize flow was also going through the MUV-17 and the MUV-18."

Now, can you tell me how you disagree with that statement if you disagree with that statement?

A I disagreed with it because, as I remember, we realized where the extra flow was going and we made a request to close MUV-18. I feel he was in error in making that statement.

Q Let's go on to Point No. 3. This is on Page 2 of your letter: "The alarm system in the control room is so poorly designed that it contributes little in analysis of the casualty. The other operators and myself have several suggestions on how to improve our alarm system. Perhaps we can discuss them sometime, preferably before the system as it is causes severe problems."

Can you tell me what you had in mind and the other operators had in mind with respect to the poor design of the alarm system?

A You want to know why I feel it is a poor alarm system?

Q Yes.

A Well, simply because there are so many alarms. There are, I know for sure, over 1,000 alarms displayed

on the panels that the operator can see. There is no way to differentiate between important alarms and unimportant alarms either by sound or by visual representation, so that in a transient which initiates 100 or 200 alarms, all of the alarms become meaningless because you don't have time to read them and you have no way of sorting out which one is important unless you take the time to read them all, and you very seldom have that much time.

Q I want to make sure that you are referring to your analysis and reaction to the transient in the spring of 1978 and not the analysis and reaction you had to the transient in March of 1979.

A Yes, that's right.

Well, other than the number of alarms, the display is difficult to read and the acknowledging system was at that time inadequate because if you acknowledge alarms that are recently actuated, you also erase or cancel out alarms that have been in for some time. So you don't really have any way of maintaining a status of alarms or a sequence of alarms as they existed from the beginning of the transient.

Q Now, you mentioned the alarms are difficult to read. What do you mean by that?

A Well, from where the operator stands at the front of the console, the alarms are about 10 feet away and they are in, I would say, type that is maybe 3/8 to a half inch high.

Q You mean you can't read the letters?

A Yes; it is difficult to read.

Q Too small?

A Right, and the display is kind of confusing.

In other words, the writing is small, the number of alarms in any given space is rather large -- there may be, I think, 35 alarms in any given group which is represented in a two-foot by two-foot area approximately -- so that when they are flashing on and off, trying to read them from that distance and maintain what you are trying to see while it is flashing is difficult.

So it is intended that you push the button to stop it from flashing so you can read it after it lights up. They are easier to read after it lights up, but if you don't want to push the button, you have to read them while they are flashing.

Q The reason you wouldn't want to push the button is what, again?

A You would clear alarms that have just come in

momentarily and go out again, but you would also freeze in alarms that for which the alarm condition still existed. So that as soon as you push the button alarms that were there for only a few seconds would disappear and you wouldn't be able to tell whether or not they actually ever did come in.

MR. YUSPEH: When you have a blinking light that represents an alarm and you push the button to acknowledge it, does the light stop blinking but it stays lit until the alarm situation has been resolved?

THE WITNESS: It depends on whether the alarm condition is clear. If the alarm condition suddenly exists and the alarm starts to flash, it flashes brightly and so long as the condition exists, it will continue to flash, and when you push the button and the condition continues to exist, it will stay brightly lit. When the alarm condition clears, it would begin to flash again, but somewhat dimmer.

We push the button to clear it. That is the sequence that you should go through, but this could happen several -- our several hundred alarms, so many coming in, so many going out,

some remaining in, some are clearing, so each time you push the button, it does the same thing, it does all four functions at the same time.

Q Are there any other things relating to the poor design of the alarm system that you had in mind when you wrote that letter?

A I think at that time I had a few suggestions how to improve it or at least how to weed out some of the unimportant alarms.

What I intended was that he would assign an engineer to work with an operator on a long-term basis to kind of correct some of the problems that we thought existed in the alarm system.

#18

Q Can you remember what specific suggestions you had in mind at the time?

A Well, as far as hardware goes, I wanted to change the acknowledging system.

Q Yes, how?

A So that it took at least another button, one to acknowledge an alarm that is coming in, and there should be a separate button that clears an alarm for which the alarm condition no longer exists; in other words, the same button shouldn't do those two functions.

Q Say that again.

A I wanted to change the system so that it was at least a two-button system, one button would acknowledge alarms as they became new. Alarming conditions existed, and you get an alarm, you should be able to acknowledge that with one button. The other button would be to acknowledge an alarm which is clearing an alarm condition that is ended.

Q Were there other changes to the alarm system hardware that you had in mind?

A I wanted to have more stations at which you could acknowledge alarms. At that time we had only one button in the control room to acknowledge all of the alarms. It was located on the center console.

Q Was that also the condition on March 28 of 1979, that you had one button to acknowledge all alarms?

A No. We had, I think they installed three or four other buttons since that April accident in 1978.

Q Had you installed a two-button acknowledgement system?

A No.

Q As of the 28th of March 1979?

A No. The system was essentially the same as it was in April except that they installed a few more buttons of the same type that we had before.

Q What other system changes did you have in mind for the alarm system?

A I wanted to eliminate a good number of alarms by evaluating their importance. In other words, an awful lot of alarms that we have on the front panel that an operator doesn't necessarily need during a transient of this type, what I consider administrative alarms or inconsequential alarms, but for information purposes, should be on a different panel or be eliminated altogether.

Q Have you done any alarm-by-alarm analysis of which ones were necessary and which ones you thought could be eliminated and which ones you thought were a question mark?

A I never wrote it down, but we had several in mind that we could eliminate.

Q I take it you had in mind that you might eliminate several hundred?

A Yes.

Q You never made a list up?

A No.

Q What other specific changes did you have in mind for the alarm system?

A There had to be a better way for identifying alarms

from satellite panels.

Q By "satellite panels," you mean what?

A Panels that are located elsewhere in the control room or elsewhere in the plant; in other words, in a different building.

Q Why did you need a better way to identify alarms from satellite panels?

A Most of the satellite panel alarms come in on one of the rear panels. It is the same panel that has the reactor coolant drain tank on it, the ventilation system. That has the same sound, same acknowledging system as all the other alarms in the front panel. So there is no way to differentiate between a rear panel alarm and a front panel alarm. You have to walk around to see the light flashing.

In the event an alarm on the front panel came in simultaneously with a satellite alarm, you would clear them with the same motion and never know that the satellite alarm had, in fact, come in.

We had discussed installing different sounds for different panels. We have, I guess, 19 or 20 panels in the control room that have alarms on them, and we thought that either dividing the room into zones by sound or by single visual indicators -- this is the

area that the alarm is in -- something like that, that would be helpful in quickly locating alarms.

As it is now, the way the control room is lit and with the reflection from different panels, it is often very difficult to see alarms even if it is flashing, especially if it is a clearing alarm; it is very dim.

It is also interesting to note that of the 1200 or 1600 alarms that are there, each one has two light-bulbs in it. Each one is tested daily to see whether it is operable. But we still have alarms in which lightbulbs are blown out so that if that particular alarm were to actuate, it would not flash but still sound, the audio alarm, the audible alarm, and it would be impossible to detect without testing each panel and examining each alarm individually to see if the light-bulbs were good.

Q There is no other backup system to go on?

A Thats' right.

Q Did you have any other ideas in mind at that time?

A I don't think so. That is about it. These were all things I wanted to discuss with either him or the engineer that he assigned to examine the problems with

the alarm system.

Q Let me jump ahead a little bit in time. We have Mr. Seelinger's response to your letter which was dated, it seems to be dated the same date; is that right?

MR. YUSPEH: Yes.

Q Yes, May 3, 1978. Did you get his response to your letter on or about the date he wrote it?

A Within a few days, yes.

Q Did you ever have a chance to talk with him in person about the points you had made and the responses he had given?

A No, I don't recall. After he sent this letter in reply to mine, I didn't follow it up because I was waiting to see what actual programs were undertaken as a result of this letter and our correspondence.

Q Up until the time of March 28, 1979, did you ever have a chance or occasion to talk with him about your letter and his response?

A I can vaguely recall discussing the content of the letter. Neither one of us had a copy of the letter with us at the time and we were just discussing whether or not in general things were going to be done about my concerns, and I believe he stated at that time that the

analysis that he wrote up was going to be forwarded to GPU with various action items noted, and then he would have to wait and see what GPU considered to be important before they could take action.

Q Why did he have to send it to GPU, to your understanding?

A Well, I imagine because they are the corporate mother, so to speak, and pass any design changes and major modifications through their engineering evaluation group.

Q Since we have just been discussing Point No. 3, let's look at his response to your Point No. 3.

He says, "In order to insure and understand each of the things you said: One" -- by this, and I assume he is referring to your Point No. 3, "I assume you meant the safeties" --

A He is referring to my Point No. 1.

Q I get it, all right. He is referring to your Point No. 1, so let's go back to your Point No. 1 and his comment addressing your Point No. 1 is this:

"By this, I assume you meant the safeties lifted prematurely on the B side. I am not sure this is true. Please respond to this."

Was it true that they lifted prematurely

on the B side?

A I don't recall now. There was, you know, extensive testing after this that decided which valves opened and which ones didn't, which valves had the proper setpoints, and I don't remember what the results of that testing were because they wound up replacing them all anyway.

#19 Q He says, "Please respond to this."

Did you ever go back and check to see whether the safety lifted prematurely on the B side?

A I don't remember.

Q Then his response to your Point No. 2, he says, it is addressed under his recommendations and action items.

Was it?

A I will have to look. I didn't have my own copy of this report. It was a circulated memo for review, so I probably didn't have one to pull out and check.

Yes, that would be at Page 16, "Procedure Changes," 1(c).

Do you want me to read that?

Q Yes, please read it into the record.

A It says, "Flag to the operator on safety injection to not only monitor high pressure injection flows,

but also flow through MUV-17 and MUV-18. Flag how to properly throttle flow in this situation - Mackey - May 10."

Obviously Terry Mackey was supposed to take action on that.

Q Was that basically the point that you were making?

A Yes, that it should have been pointed out in the procedure that MUV-17 and 18 will cause erroneous indication of high pressure injection flow.

Q Going on to his response to your Point No. 3, he says that his response is the same as the response to your Point No. 2, namely, apparently that it is addressed under recommendations and option items.

A That is the alarm system.

It had to be covered under "Other" on Page 17, No. 2. It says, "Escalate the alarm window correction program in priority. This will eliminate an excessive number of lighted panel alarms at the base condition and give the operator a better chance to focus on what to respond to. Shovlin -- ongoing."

It doesn't, however, address all the concerns that I pointed out.

Q Let's go on to your Point No. 4. Your point

reads, "Your report mentions adding more valve conditions to the control room on feedwater/main steam related valves. This should be given very high priority!"

Why did you think this should be given higher priority?

A Some of the valves that were not indicated in the panel were the main feedwater control block valves which operators have repeatedly pointed out to supervision as being a problem. We didn't know the position of some of the major feedwater drain valves, and on loss of feedwater the position of those valve is very critical in analyzing the situation.

Q At that time where would you have to go to get a position indicator on those block valves?

A You would have to go directly to the valve and look at the stem position outside of the plant.

Q How much before this April 23rd transient had that been a concern, that the block valves were not gauged in the control room or indicated in the control room?

A I don't know. It came up several times during the startup. I don't know that we ever documented it other than in field change requests.

Q Has that been accomplished, the indicating

of block valve positions for the feedwater main steam valves by the time of the accident on the 28th of March, 1979?

A Yes.

Q Your Point No. 5 reads, "The suggestion is made in your report to provide the control room with a system and tank volume reference. That is an excellent idea."

What do you mean by a system and tank volume reference?

A It would be a book of graphs and tables that would list by system name the total water volume or steam volume of that system, including all the tanks at different operating temperatures. We have one up there now.

Q Why is that such a good idea?

A Well, we needed an easy reference when you are making -- for instance, when you are going to make a boron concentration change in the reactor coolant system, if you have one book that contains the graphs and tables that you need to make the calculation, it makes your job a lot easier. When you are trying to refer to tank volumes and system volumes during an emergency, it would be best to have those available in

a single volume that you could quickly locate the information rather than having to search through an operating procedure or through a system description.

Q Seelinger indicates in his response to your Point No. 3 that he is not sure he understands your comment and that he thinks perhaps it is more all-encompassing than what he had in mind. Would you get back to him on that point?

A I don't know.

Q By the way, he does indicate in the sentence -- he refers to "what I had in mind." Would you infer from that that he, in fact, did write these recommendations?

A Yes.

Q Going on to your Point No. 6, "You may want to consider a mechanical switch to actuate an alarm which indicates the steam safeties are lifted. It would be actuated by the steam flow and seems more reliable than a sound-actuated system."

Had there been some problem with reliability in that system in the past or during the transient?

A We had no system for determining whether or not the steam relief valves were open, and his report

proposed a system of microphones and speakers to relay the sound of the steam passing through the pipes up to the control room as an indication that these steam relief valves were open.

Some of us felt that that might not be adequate, that a mechanical system like this might be more advantageous. As it stands now, I would change this recommendation to agree with the installation of the audible signal because it is much more effective.

Q Why is it more effective?

A Because what I proposed would result in just another alarm light, okay, whereas his results in a distinguishable change in sound in the control room and it is much more effective. I think it is a better idea.

Q Let me make sure I understand what you are saying. You did not have an indication that the steam safeties had come into play at all or you did not have an indication that they were holding open?

A We did not have any way of telling that the steam relief valves were open at any time, whether they were stuck or whether they were cycling as they should have because they are located outside the control room and the sound doesn't penetrate the walls. You can't hear

them, so during that transient we didn't realize that the steam relief valves were stuck open because we had no indication of it other than the fact that we were cooling down which we thought was a feedwater transient.

When someone walked through the control room door, it just happened that the turbine building door was open at the same time and we could hear the relief valve open. Someone opened the door and the sound level changed, so that is why we developed this as a way to check the valve open.

Q His comment to your Point No. 6 is, "They will evaluate it," right?

A Yes, that's right.

Q Your Point No. 7, "I feel that the mechanical values, poor system designs, and improperly prepared control systems were very much more the major cause of this incident than was operator action. Although training is always essential and welcome, nothing that we study or practice could have prepared us for this unfortunate chain of events.

Could you tell me what you had in mind in your Point No. 7 that I just read? In other words, what lies below the surface of those words?

A I believe it was his comments on operator action

on Page 11. It seems to me that he was enumerating the causes of the transient relating all our, most of those causes to operator action. I immediately took offense to that, of course, but I wanted to point out that much of what he saw was not what we were trained on because we hadn't considered that transient in our training, stuck open relief valves.

#20 Q You have not considered that?

A No. So I guess he made seven or eight comments here directed toward operator action. It seems to me he was emphasizing operator action as a compounding effect without stipulating the cause for those operator actions.

Q And you were trying to probe the reasons for the actions that you as operators had taken?

A Yes.

Q And relate them back to what you point out as mechanical failures, poor systems designs and improperly prepared control system?

A Yes.

Q What did you have specifically in mind when you referred to "mechanical failures," the failure to open of the safeties?

A They were stuck open.

Q Failure to reclose?

A Yes.

Q But you also had some that never opened at all.

A Yes, but we didn't know that at the time. We discovered that later on in testing.

Q Were there any other mechanical failures that you experienced in the course of the transient?

A I don't remember what the initiating event was. That is my problem. I would have to review the transient to find out. In other words, to refresh my memory on exactly what happened.

Q Did the PROVs stick open on this transient?

A That is what I was trying to remember. I am not

Q Then you say "poor system designs." What did you have in mind there?

A Specifically that those two components about the poor system design and improperly prepared control system were kind of linked between how they represented the system on the control panel. We couldn't see all the valves that were necessary to control the system. As a result of this transient, we got more indications installed on the panel. I was more concerned with the design of the display of the system rather than the

design of the components, I think.

Q Would that be similar to the concern you have already expressed about the fact that you didn't have a quench tank or drain tank pressure and temperature indicators within immediate view during the March 28, 1979 transient?

A That would be a similar concern, yes.

Q Was there anything else behind your comment in Point No. 7 of your letter?

A I can't really remember very many specifics. It is a pretty old letter.

Q Going to Mr. Seelinger's response to your Point No. 7, he says, "I tend to agree with you; however, you now know that on a steam leak the only way to mitigate the consequences is to boil the OTSG dry."

What is that supposed to mean?

A I think it was a reference to the new piping we were receiving as a result of the transient that we were now to change our operating philosophy and allow the steam generators to boil dry on a major steam leak rather than trying to feed the leak which was not something that we had specifically been trained on prior to that transient.

As a result of that transient, he is saying we are

now going to change our operating philosophy.

Q If you were to boil the steam generator dry in that kind of a situation, what would you do for heat sink?

A Well, the reason for boiling steam generator dry was to initially start the pressure transient in the steam system and get the steam relief valves to reseat if they have to.

Q But you are still going to have decay heat from the core, right?

A Yes. You are soon going to have to begin feeding the steam generators either through the emergency feed or feed system, but for the time you let them boil dry.

Q Did they give you that training, to boil the steam generator dry under those particular circumstances?

A They included it in the emergency procedure, I believe. I don't remember how it was treated in training or the simulator. I didn't go to the simulator between that transient and this one, so whether they covered that in the training, I don't know.

Q Did they cover it in the training that was given here on the Island?

A I believe so, in the context of reviewing the

new emergency procedure.

Q Did you ever get that training?

A Yes, I think so.

Q Did they tell you how you boil a steam generator dry, would you just cut off all feed?

A Yes.

Q How long would it take to boil dry in those circumstances?

A I don't know.

Q Any estimate?

A I think it would be less than a minute knowing what I know now.

Q Did they give you any guidance once you boil the steam generator dry as to how long you could let it stay dry?

A I don't remember any specific guidance along those lines. It may be in the procedure. I just don't remember it.

Q Did they give you any guidance once you got it dry what to do for an alternative heat sink if your core pressure and temperature started to rise rapidly?

A No, I don't remember any guidance like that.

Q How would boiling the OTSG dry mitigate the consequences of a steam leak?

A Well, steam leak would have to eventually stop because you would run out of steam. There would be no more water to convert to steam and the steam would stop.

Q You just wouldn't have any steam?

A Yes.

Q Your Point No. 8, "I feel that a very critical eye should be turned toward the test acceptance criteria we are using on" and then you have the initials "RPS" and "ICS."

What is "RPS," reactor pressure system?

A Reactor protection system.

Q And "ICS" stands for integrated control system?

A Yes.

Q What do you mean when you refer to the test acceptance criteria?

A The startup test acceptance criteria. In other words, criteria by which the systems are declared operable and capable of performing their design functions.

Q Why did you think that you needed to turn a critical eye on those acceptance criteria?

A I think in this report he pointed out that the feedwater valves respond more slowly in automatic than they do in manual, and I am having trouble remembering

specifics I based that comment on, but it had to do with how the ICS and RPS responded to the loss of feed in the trip. I must have had some concerns about whether or not the ICS was capable of responding to loss of feed or something like that; I don't remember.

Q But there was some question in your mind about the underlying criteria by which the reactor protection system and the integrated control system were deemed to be adequate or sufficient?

A Yes.

Q Did you ever have an opportunity to discuss that with an engineer?

A Not that I remember. I may have, but I don't remember.

Q Seelinger says in his response that he will look at that question. Did you ever have a response from him on that point?

A No.

Q Going to your Point No. 9, "You might do well to remember that this is only the tip of the iceberg. Incidents like this are easy to get into, and the best operators in the world can't compensate for multiple casualties which are complicated by mechanical and control failures."

You used the term "multiple casualties." Had that term ever been used before that? Had you heard any discussion about casualties in the training program?

A Yes. You have -- I think there must be a basic differentiation between a multiple casualty and a single failure criteria for FSAR. They are not necessarily the same thing.

A multiple casualty would be, to me, at least according to this letter here, more than one problem at the same time, you would have a reactor trip, loss of feed, stuck open relief valve, and whatever, excessive cooldown, something like that. Those are multiple casualties to me, but they do not fall into the realm of single failure criteria for safeguard systems, all right?

#21

Q They do or do not?

A They do not.

THE WITNESS: (To Mr. Tew.) Do you agree with that?

A (Continued) The way I understand single failure criteria is that in a redundant system, for instance emergency feed system, single failure of the emergency feedwater system seems complete failure of one train,

okay. In other words, an entire train of emergency feedwater is rendered noperable.

A multiple falure of a safety system would, to me, indicate both trains, emergency feedwater eliminated by some means.

Now, multiple casualty, as I was referring to it here, referred to several different systems and not eliminate a total safeguard system.

Q I see.

A I guess the best way to say it is I was complaining that I wasn't equipped to react to a casualty which compounded itself in this way and was not properly indicated on the control board.

Q Were you also indicating that the multiple casualty, as you called it in your letter, was not accounted for in the single failure criterion?

A I think I was saying I was not trained to recognize or to react to a multiple casualty of any sort. What I was trying to point out just a moment ago is I wasn't specifically referring to a single failure criteria that they were discussing in the Unit 2 accident.

Q His response then is "The ability to do this comes with experience and I think the operators who had

this transient performed very well considering their experience."

When he says "the ability to do this," is it your impression that he is referring to the ability to compensate for multiple casualties?

A Yes.

Q Let me go back to your comment No. 9. You say, "it is only the tip of the iceberg." What do you mean by that?

A I was trying to get -- I guess I was trying to initiate some kind of probe into the incident or the accident that could result in a transient that the operators were not prepared to respond to by saying "it is the tip of the iceberg." I was suggest. that there might be other mechanical failures that would cause a similar chain of events that we hadn't discussed in our training up to that time and that somebody ought to look at it.

Q Was that also a product of your discussion with the other operators?

A I don't know.

Q Do you know whether the other operators that you have discussed the April 23rd transient with ever reduced anything to writing?

A No, I don't. I believe that the supervisor, Bernie Smith, also wrote a letter to Seelinger as kind of a, like a reactor trip report, a common report that you fill out after a transient, telling him what you did. The supervisor is tasked with giving a summary of the transient. I believe he included some of his own personal comments in that and submitted it just through the paperwork chain.

Q You didn't see that letter or report in any of the other materials that you reviewed here in connection with the Seelinger evaluation?

A No.

Q That was Bernie who?

A Smith. That is only as assumption on my part. I am not sure whether he did or not.

Q Then going on to the end of your letter, "Some of our suggestions are good. We made suggestions on feedwater valve indications years ago (submitted many FCRS)" -- FCRS are what, again?

A Field change requests.

Q "We have complained about this alarm system since Day 1." When you refer to having submitted many field change requests, what are they? I don't think we have discussed what a field change request is.

A During the startup it was a form that we used to point out to the engineering evaluation group that there may be something that we should have changed to make it easier to operate or to provide better indication in the control room or any type of change that you thought was worthwhile, you could submit on that form and it would be evaluated and acted on if they thought it was necessary.

What we had been finding on these suggestions on feedwater and on the alarm system is that they were never passed on for action.

Q Would they all have been put through in the form of a field change request or would there be other paperwork channels that you would follow ?

A I think that is the one we were using.

Q And to whom would a field change request be addressed? It is by its nature addressed to a particular position?

A I think so, yes.

Q What is that?

A I don't know. At the time it went to startup group I don't know what happened to those documents or where they are now.

Q Is the startup group a defined group?

A No. I refer to that as being the interfacing engineers between Met Ed and the construction firm when they are deciding what they want to include in the plant as far as equipment, et cetera.

Q During 1976 to 1978 would there have been a lot of field change requests filed, is that a fairly common thing?

A Yes.

Q What kind of numbers would we be looking at, say, on a monthly basis, 100, 5 -- and I know this is perhaps just guesswork on your part?

A Somewhere between 5 and 100; I don't know. I imagine the Operations Department probably submitted 10 to 20 a month, something like that on a good month.

Q You started in 1973. When would field change requests have come into use, first come into use?

A I believe they were in use before I arrived. Well, all during Unit 2 construction. I don't know when they really would have originated as a document.

Q I mean in their use at TMI 2 they would have been in use during construction?

A Yes.

Q You indicate that "We have complained about this alarm system since Day 1." Day 1 being what point

in time? Obviously before you had a control room built, you wouldn't have been complaining about it, would you?

A When the operators first went over there and started examining the control panels and the alarm panels as they were being built, we were impressed right away with the number of alarms, and I think it was our job to become familiar with the control room and how it was laid out, and that was a comment that we had from the beginning, that the alarm system seemed to be rather extensive.

Q When would you have had that first exposure to the number of alarms, how much before the spring of 1978?

A In 1975 or 1976 when they were building the control room, we were over there on shift.

Q When you said "we made suggestions on feedwater valve indication two years ago," that is what we have already discussed; is that the one we have referred to a moment ago?

A Yes.

MR. ROCKWELL: For the record, I would like to request all of the FCRS from July 1, 1974 -- no, from July 1, 1975.

THE WITNESS: We may be able to separate

them by systems; in other words, you may be able to get the FCRS concerning the feedwater system and the FCRS concerning the alarm system rather than get them for everything.

MR. ROCKWELL: Let me put it this way and then you can suggest any modifications: I would like to have available to us all of the FCRS from January 1, 1975 to June 30, 1978. If they can be segregated by subject matter, could those FCRS relating to feedwater valves and alarm systems be made available to us, and I would suggest that they don't need to be copied at this point if we could just have them available so we can review them, that would be sufficient for the time being.

MR. YUSPEH: If they are here on site, can we simply direct you to where they are located and give you access to them?

MR. ROCKWELL: Absolutely.

Or if they are not too voluminous, maybe they could be brought over here and we could review them over here.

MR. YUSPEH: All right.

Q There is a P.S. on your letter, "By the way,

we had a 17 GPM primary leak during evolution."

Does that mean a leak in the primary system?

A Yes.

Q Where was that leak?

A I don't remember. We must have done a leak rate prior to the accident and he didn't mention it during his evaluation. I thought that he might want to investigate this and maybe make it as a comment in the initial plant conditions prior to the incident when he was setting up his evaluation.

Q Is that a significant leak rate, 17 GPM?

A Yes.

Q Is that a leak rate which would permit continued operation within the tech spec?

A It would depend what type of a leak it was.

Q You mean where it is in the system?

A Yes.

Q You don't remember, as you sit here now, where it was?

A No, I don't.

Q Seelinger's response to your PS is "Maybe the leak should have been mentioned, although I am not sure it added to the incident significantly at the actual time of the incident."

Did you feel, based on what you had seen from the control room, that it did add significantly?

A I don't remember if I felt it was significant or not. I just thought that in the drawing of the picture of the initial conditions or the accurate picture of the transient, maybe it should have been incorporated. I guess he didn't think it was that important.

Q Do you know whether the leak preceded the transient?

A No, I don't remember. I don't think it would have. That is a rather large leak.

Q In that large a leak?

A Yes.

Q Has there ever been any other correspondence between you and anybody else that you know of relating to this April 23, 1978 transient?

A I think this is about the only time I wrote a letter to someone in supervision concerning a transient.

Q Do you know of any other operator who has ever written a letter expressing concerns about a transient or concerns about a circulated circumstance to someone in the management structure?

A I don't recall ever hearing about anybody doing it. Someone may have written a letter; I don't know about it.

Q Obviously I am just asking about your knowledge.

A I don't know if I have heard that that I remember.

MR. ROCKWELL: Off the record.

(Discussion was held off the record.)

Q My understanding is that the Exhibit 20 has come from a group of documents which were produced in response to a request during Mr. Hilbish's deposition on July 9 and that that request in that deposition related to a number of memoranda relating to the April 23, 1978 transient here at TMI 2. I would like to request that, or to ask that Met Ed review whether or not we have everything in these materials relating to April 23rd transient, and if not, if we could be advised of whatever materials do exist at this point -- I am primarily not interested in the reactimeter data or strip chart or raw technical data, but rather in analysies and evaluations -- and I would ask that the indication of what else is available in the files that addresses itself primarily to correspondence, memoranda, analyses, evaluations, reports, that sort of document.

#22 Q Now, referring you, Mr. Frederick, to Frederick Deposition Exhibit 19, did this come from

the miscellaneous file in the materials that you submitted for our review?

A Yes.

Q Do I correctly identify it as a memorandum from G. P. Miller to TMI staff relating to overtime policy?

A Yes.

Q And has this been in effect since it was issued in June of 1978, to your knowledge?

A I don't know. I haven't read it. I mean what I remember -- I would have to review it because it was stuck in that folder for about a year.

Q If you review it, do you think you would be able to tell if it is in effect now?

A Yes.

(A brief recess was held.)

Q Have you now had a chance to review Frederick Deposition Exhibit 19?

A Yes.

Q Does that appear to you to be the overtime policy which is presently in effect?

A It resembles it very closely. I am not sure whether all of the details are correct. It is over a year old. There may have been some changes.

Q But it is a general --

A Generally it is about the same, yes.

Q Are you aware of an investigation that was made by a Mr. J. G. Miller of why the 12 valves were closed on the 28th? Was there an investigation after the March 28, 1979 accident?

A No, I don't think so.

Q Did he ever talk to you about what if anything you knew about that?

A You mean talking about the operation manager, Jack Gary Miller?

Q No.

A No?

Q I am talking about another Miller. We are referring to a man named J. G. Miller, John G. Miller, an older man?

A I don't know that I ever talked to him. Many people asked me why they were shut and I usually said I don't know.

Q Mr. Ed O'Connor, who also was working with Mr. J. G. Miller on that investigation, did you ever talk to a man named O'Connor about that subject?

A I don't know.

Q They apparently, as far as I understand,

they were commissioned by Met Ed to make the investigation. We were just wondering if they had talked to you.

A I really don't know if I have talked to them or not.

Q At this time, Mr. Frederick, I am going to recess your deposition. In recessing it, we leave you subject to recall for further testimony by deposition should that be necessary at some future point. We don't have any present plan to call you, but if it is necessary, we will let you know through counsel and we will set it up.

I thank you for your patience.

(Whereupon, the deposition was adjourned at 3:35 p.m.)

Edward R. Frederick

Subscribed and sworn to before me this 30th day of July 1979

F. X. Lawyer

Notary Public

NOTARY PUBLIC
[illegible] County, PA
My Commission Expires Nov. [illegible]

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Edward R. Frederick

Subscribed and sworn to
before me this_____
day of_____
1979

Notary Public

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C-E-R-T-I-F-I-C-A-T-E

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

We, STEPHEN McCRYSTAL, Notary Public of the State of New York and STANLEY RUDBARG, C.S.R. and Notary Public of the State of New York, do hereby certify that the foregoing deposition of EDWARD R. FREDERICK was taken before us on the 24th day of July, 1979.

The said witness was duly sworn before the commencement of his testimony; that the said testimony was taken stenographically by ourselves and then transcribed.

The within transcript is a true record of the said deposition.

We are not related by blood or marriage to any of the said parties, nor interested directly or indirectly in the matter in controversy, nor are we in the employ of any of the counsel.

IN WITNESS WHEREOF, we have hereunto set our hands this 24th day of July, 1979.

STEPHEN McCRYSTAL

STANLEY RUDBARG, CSR

PRESIDENT'S COMMISSION ON THE
ACCIDENT AT THREE MILE ISLAND

Corrections to July 22, 1979, Deposition of Edward R. Frederick

Page	Line	Change	To Read
24	25	Peters	Beers
28	3	Courses	quizzes
47	9	Box	books
52	24	control control	class class
54	16	class	clock
87	17	division	revision
93	20	seven	several
95	25	matter	met Ed
113	23	pleas verify - I believe this should be "no"	two?
114	15	fuel	look at their hats
136	9	notice their habits	

Edward R. Frederick

Subscribed and sworn to
before me this 30th day
of July, 1979

Notary Public

PRESIDENT'S COMMISSION ON THE
ACCIDENT AT THREE MILE ISLAND

Corrections to July 22, 1979, Deposition of Edward R. Frederick

Page	Line	Change	To Read
140	4	Cill	? throttled ?
160	13	accompanied	covered
160	22	spray	spring
176	8	smartest	hottest
197	7	isolated	unisolable
223	23	BUST	BUS
236	15	B	P
258	15	These times were not transcribed correctly	
305	16	such	Shut
309	21	temperature	temporary
311	7	little	e-delete - not transcribed correctly
330	5	year	dear

Edward R. Frederick

Subscribed and sworn to
before me this 30th day
of July, 1979

Notary Public

POOR ORIGINAL

PRESIDENT'S COMMISSION ON THE
ACCIDENT AT THREE MILE ISLAND

Corrections to July 22, 1979, Deposition of Edward R. Frederick

Page	Line	Change	To Read
338	10	deckshifts	backshifts
319	4	whole package	multiple failure
412	23	and	to end
428	20	majors	measures
428	22	if	that
432	5	kennedy	kemmony
440	19	them	me
502	12	JACKS - delete	

Edward R. Frederick

Subscribed and sworn to
before me this 30th day
of July, 1979

Notary Public

NOTARIAL SEAL
Reading, Berks County, Pa.
My Commission Expires Nov. 19, 1979

POOR ORIGINAL

17.3 to George Kunder and somewhere in the conversation we just pulled it out.

This business about the T_{sat} meter, I believe you asked me whether I think it is valuable. I don't know what you are looking for there. Any information you can get is valuable. You have to analyze whether or not or how it is valuable. It can provide pressurizer level

Q I suppose you could say that about every gauge.

A Right.

(There was discussion off the record.

Whereupon, at 4:55 p.m., the deposition was adjourned until the following day at 7:30 a.m.

Edward R. Frederick

Subscribed and sworn to before me this 30th day of July 1979

Notary Public

Notary Public
[illegible] County, Pa.
My Commission Expires Nov. 19, 1979

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open, that the operator reported a temperature of 345 degrees downstream of the valve.

Q What plant was that, do you know?

A This one.

Q Was this in the spring of '78?

A Yes. It was a little accident that resulted in putting in the new indicator.

Q Had you been aware of that reading before March 28, 1979 or have you found out about it since?

A I don't know. I am a little cloudy about when I learned all this stuff.

MR. ROCKWELL: We will break now and start again tomorrow. We will resume at 8:00 o'clock.

(Whereupon, the hearing was adjourned at 4:00 p.m.)

Edward R. Frederick

Subscribed and sworn to before me this 30th day of July 1979

Notary Public

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