UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMSSION

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In the matter of: :

METROPOLITAN EDISON COMPANY : Docket No. 50-289 (Restart)

(Three Mile Island Unit 1) :

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25 North Court Street,
Harrisburg, Pennsylvania

Tuesday, November 18, 1980

Evidentiary hearing in the above-entitled matter was resumed, pursuant to adjournment, at 10:18 a.m.

BEFORE:

IVAN W. SMITH, Esq., Chairman,
Atomic Safety and Licensing Board

DR. WALTER H. JORDAN, Member

APPEARANCES:

On behalf of the Licensee, Metropolitan Edison Company:

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On behalf of the Commonwealth of Pennsylvania:

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On behalf of Union of Concerned Scientists:

ELLYN WEISS, Esq.,
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On behalf of the Regulatory Staff:

JAMES TOURTELLOTTE, Esq.
JAMES M. CUTCHIN, IV, Esq.
Office of Executive Legal Director,
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Petitioners for leave to intervene pro se:

STEVEN C. SHOLLY,
304 South Market Street,
Mechanicsville, Pennsylvania

C O N T E N T S

P R O C E E D I N G S

MS. WEISS: I made a proposal to the parties yesterday, and we discussed it again this morning and have agreement on changing the order of some of the scheduled items. What I proposed and what was agreed to is that we proceed through completion if Item 3, emergency feedwater reliability, through Item 4, safety system bypass and override, and through UCS 12, which is the environmental qualification Contention, which is part of Item 5, and the Board questions on UCS 12. At that point -- and at that point proceed to some additional testimony which the Licensee intends to file this week, responding to some more questions that were raised by the Board on emergency feedwater. They intend to file that. Our plan is to do that at that point, at that point to break from the UCS Contentions, and we have estimated that that would take us probably through the middle of next week and perhaps through the end of next week, at that point, to break at whatever point that is and to go down to Contentions in which UCS is not directly involved, beginning with Item 8, integrated control system, Item 10, containment isolation; Item 11, computer; and Item 13, instrument ranges, to give UCS the time when those Contentions were being heard here to go back and prepare for the rest of the Contentions on which it is directly involved.

Now, Licensee has said that it has no problem accommodating that schedule with staff. It knows that some of its witnesses are available for some of those issues. It does not yet know if all of them are available for all of those issues. Generally, I think that nobody has any objection to proceeding in that way.

CHAIRMAN SMITH: I see. You are the most affected, Mr. Sholly.

MR. SHOLLY: No problem.

CHAIRMAN SMITH: So staff witness availability will be the controlling consideration.

MS. WEISS: I should tell the Board that I have talked with ECNP and they have no objection.

MR. BAXTER: I should note for the Board that ECNP is the designated lead Intervenor on Items 11 and 13, which are two of the four we just identified.

CHAIRMAN SMITH: On Items what?

MR. BAXTER: 11 and 13.

CHAIRMAN SMITH: Have you been working with ECNP on these Contentions?

MR. SHOLLY: Not very much at this point. We were waiting to see where the schedule is going to fall in. We should be getting together this evening, and we will work more details out at that point.

CHAIRMAN SMITH: Okay. You do anticipate an

active role of Intervenors on these issues, do you?

MR. SHOLLY: I do, yes.

CHAIRMAN SMITH: Okay.

MR. SHOLLY: We have been working separately on what we would like to do in the way of cross examination. It is a matter of getting together, who is going to do what.

CHAIRMAN SMITH: You at least have plans for active participation. You just have not consolidated it.

MR. SHOLLY: Yes.

MR. BAXTER: Our main motivation, Mr. Chairman, in agreeing to this schedule is it will not result in any loss of hearing days or interruption in the ongoing process. That is why the agreement of ECNP as represented by Ms. Weiss and Mr. Sholly is important to us in reaching this agreement, that we will not find ourselves short, unprepared, and we will go forward.

CHAIRMAN SMITH: The way that that would affect us is the first week in December --

MS. WEISS: It could -- I think it is conceivable it coulds affect us by Tuesday of next week, but I think it is more likely it won't affect us until the first week in December, and I told ECNP that it could happen as early as --

CHAIRMAN SMITH: Were you able to work out anything for the 24th?

MS. WEISS: No, we will be here. This proposal

that I have made --

CHAIRMAN SMITH: Gives you relief?

MS. WEISS: Yes. We can prepared for all of it up to that point.

CHAIRMAN SMITH: Okay.

Mr. Sholly, if you would like to use the FTS telephones that we have in our office to contact people at ECNP to bring them into the consideration, you are welcome to do that.

Do you understand?

MR. SHOLLY: Yes, sir.

CHAIRMAN SMITH: We can arrange that during breaks, but you say you normally would be in touch with them this evening anyway?

MR. SHOLLY: Yes.

CHAIRMAN SMITH: Okay.

(The Board conferred.)

CHAIRMAN SMITH: Let's go off the record and get the sequence that has been recommended. I did not take notes.

(Discussion off the record.

CHAIRMAN SMITH: Back on the record.

The Board has announced that we will be having hearings on the 22nd, 23rd and the 24th. Is there anything further before we begin with the witnesses?

All right, proceed.

One further comment. Dr. Little is on a hearing in Illinois this week and we are proceeding under the quorum rule. The reason for Dr. Little choosing the hearing in Illinois compared to this one is that she is badly needed on that one because it has a strong environmental consideration, and this one, as we know, is hardware of that nature.

Whereupon,

GARY R. CAPODANNO and LOUIS C. LANESE,

called as witnesses by counsel for Licensee, having previously been duly sworn by the Chairman, resumed the stand, were further examined and testified as follows:

CROSS EXAMINATION -- Resumed

BY MR. POLLARD:

Q Mr. Lanese, I would like to ask you one or two questions on your testimony on Friday.

Could you please refer to transcript pages 5699 and 5700? There is a sentence beginning on line 2 of 5700 which reads, "Safety grade is a more narrow description of the function of the clearance of the system."

Please review as much of the transcript as you need, but I would like you to explain the meaning of that sentence.

(The Witness reviewed the document.)

A (WITNESS LANESE) In reading the transcript, I noted that appeared to be an error. The function of the clearance I am sure was functional criteria of the system.

Q So the sentence would read, "Safety grade is a more narrow description of the function of the criteria --

A (WITNESS LANESE) Functional criteria of the system.

Q Is a more narrow description of the functional criteria of the system.

A (WITNESS LANESE) That is right.

CHAIRMAN SMITH: Without objection, the Board will order the correction in the transcript accordingly.

BY MR. POLLARD: (Resuming)

Q With those changes, could you please expand on the meaning of that sentence, that safety grade being a more narrow description of the functional criteria of the system -- I am sorry, I don't know what you are getting at.

A (WITNESS LANESE) Safety grade system I think would -- would require a consideration of applicable regulatory guides on the standards, and where the GDC again are very general, when you talk about a safety grade system now, you are talking about how is that particular General Design Criteria implemented, and how is it interpreted, and the Reg Guides are the staff interpretation of the General Design Criteria.

Q I would just like to read to you from the introduction to Appendix A to Part 50 and ask you if you agree with this. The introduction to Appendix A to 10 CFR Part 50 -- that is on page 359 -- pursuant to the provisions of Section 50.34, "An application for a construction permit must include the principal design criteria for a proposed facility. The principal design criteria establish the necessary design, fabrication, construction, testing and performance requirements for structures, systems and components important to safety, that is, structures, systems and components that provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public."

Do you agree with that paragraph and particularly the emphasis on the phrase "components important to safety," or the phrase "important to safety"?

A (WITNESS LANESE) Yes, I do.

Q Thank you.

If we could return now to your testimony, your response to Board Question 6G on page 7, do I understand your testimony correctly, particularly beginning at the third paragraph, that one emergency feedwater pump is sufficient to mitigate a small break loss of coolant accident, or a loss of main feedwater transient?

A (WITNESS LANESE) Yes, that is correct.

Q Would you please refer to Figure 1 of Licensee's Exhibit 15.

Am I correct that the valves to the left of each of the pumps labeled EFV 19A and B ands EFV 21 are what are termed recirculation valves. I am sorry, I gave you the wrong valve numbers, didn't I? I meant to refer to EFV 2A and 2B ands 2C, I think. I cannot quite read -- I am talking about the valves which are apparently controlled by flow going through the pump, and it comes off the discharge of the pump and recircs back to what is labeled a train to the CST de-ice line. I cannot read the other figure.

A (WITNESS LANESE) Those are the EFV 8A, B, and C valves, and those are pump recirculation lines.

Q Now, if I understand your testimony, in deciding that one emergency feedwater pump is sufficient to mitigate small break loss of coolant accidents and loss of main feedwater transients, that you require a minimum flow of 500 gallons per minute, is that correct?

A (WITNESS LANESE) The minimum analyzed flow for small break LOCA is 500 gpm.

Q My question is, if the recirculation valve for one of the motor operated pumps, assuming that is the only pump we have, if the recirculation valve is open, what is the maximum flow capability from the pump being delivered to the steam generators?

A (WITNESS LANESE) For the motor driven pumps it would be less than 500 gpm.

Q Do you know how much?

A (WITNESS LANESE) The number I remember is on the order of 70 or 80 gpm recirc flow.

Q So that I would assume that that is roughly 420 or 430 gallons per minute being delivered to the steam generators.

A (WITNESS LANESE) Yes, that is right.

Q Would that amount of flow being delivered to the steam generators change depending upon whether the flow was going to one steam generator or two steam generators?

A (WITNESS LANESE) That is correct also.

Q It would change.

A (WITNESS LANESE) Yes.

Q It would be higher if you were delivering to two steam generators?

A (WITNESS LANESE) Yes, it would.

Q Assuming we are delivering to two steam generators, am I correct in that what you just said is the flow from one motor driven pump with a recirculation valve failed to open would be in the range of 420 to 430 gallons per minute.

A (WITNESS LANESE) It would certainly be less than 500, and as I said, I think about 420 to 430.

Q And that if we were only delivering to one steam generator, it would be even less than that value.

A (WITNESS LANESE) It should be somewhat less than that, yes.

(Pause)

Q If I could refer you now to page 2 of Licensee Exhibit 25 --

A (WITNESS LANESE) I should also clarify part of my response. When I said 500 gpm, that is immediately following -- 20 minutes after a LOCA, as the testimony states, approximately 300 gpm if you have a prompt initiation of emergency feedwater.

Q Yes.

Now, at the top of page 2 on Licensee Exhibit 15, the first paragraph, it states that the control valve -- am I correct, they are referring there to the recirculation control valves -- that these control valves fail open on loss of control air.

Is that correct?

MR. BAXTER: Excuse me. What line were you on?

MR. POLLARD: I am referring to, in general, the first paragraph on page 2 at about the middle of the paragraph. It states that the cxontrol valves fail open on loss of control air. It is slightly after the middle of the paragraph.

BY MR. POLLARD: (Resuming)

Q I have two questions.

First, are the control valves referred to in that sentence the recirculation control valves? That is the first question.

A (WITNESS LANESE) That is correct.

Q And is it correct that those control valves fail open on loss of control air?

A (WITNESS LANESE) Yes, that is also correct.

Q And it will remain -- the design will remain in that way at the time of restart.

(Pause.)

A (WITNESS LANESE) I am not positive, but I tink that is also true.

Q Is there something that you could consult that you could be more positive about whether or not that is an aspect of the design that will change prior to restart?

A (WITNESS LANESE) Nothing that I have with me, no.

Q But I am correct, in Section B of Licensee Exhibit 15, that is where you have enumerated the modifications that will be made prior to restart.

(Pause)

A (WITNESS LANESE) Yes, that is true.

Q Perhaps on the next break you can attempt to determine whether or not this aspect is going to be changed

prior to restart. We will go on for now.

Is it a design basis for Three Mile Island Unit 1 that you should be able to mitigate small break loss of coolant accidents and loss of main feedwater transients with one motor driven emergency feedwater pump?

A (WITNESS LANESE) No, it is not because that is more than one single failure to get you to that point.

Q Is it a design basis accident for the steam line to the turbine driven feedwater pump to fail or break or rupture?

A (WITNESS LANESE) As an independent event, or simultaneous with LOCA?

Q That would be the accident, a break of the steam line to the emergency feedwater pump.

A (WITNESS LANESE) Yes.

Q Excuse mea, I meant the emergency feedwater pump.

A (WITNESS LANESE) Yes, that is what I understood.

Q If that were an accident and t. ingle failure was a diesel generator failing to setart, is i' not correct that you would, under those circumstances, have only one motor driven pump remaining?

A (WITNESS LANESE) That is correct, but under those circumstances you would not need as much emergency flow. In fact, we have an analyzed event for Unit 2 with a higher power level that demonstrates that for Unit 2 460 gpm is

more than adequate for that event.

Q Are there any small break loss of coolant accidents or loss of main feedwater transients which are within the design basis for Three Mile Island Unit 1 which would require more than one motor driven emergency feedwater pump to mitigate?

A (WITNESS LANESE) No.

DR. JORDAN: Was the answer no?

WITNESS LANESE: The answer was no.

(Pause)

BY MR. POLLARD: (Resuming)

Q If I refer you to a paragraph in your testimony labeled Case 2 --

CHAIRMAN SMITH: What page?

MR. POLLARD: Page 8 of his direct testimony.

BY MR. POLLARD: (Resuming)

Q There is a paragraph labeled Case2. Am I correct that your testimony states that B&W did an analysis assuming emergency feedwater flow rate of 550 gallons per minute must be supplied within 20 minutes, but that was for a higher power level plant than Three Mile Island Unit 1.

A (WITNESS LANESE) That is right.

Q Do I understand your testimony that for Three Mile Island Unit 1 you need a minimum of 500 gallons per minute?

A (WITNESS LANESE) We asked B&W to verify that 500

gpm would still be adequate, and they verified that 500 gpm was adequate. That does not imply that lower flow rates could not be demonstrated to be adequate.

Q Do you have any analysis to demonstrate that lower flow rates are adequate?

A (WITNESS LANESE) No, we have not analyzed that specifically.

Q Okay.

Now, is it your testimony that one motor driven emergency feedwater pump can deliver 500 gallons per minute regardless of whether it is delivering to both steam generators simultaneously or only to one steam generator?

A (WITNESS LANESE) Delivery to one steam generator would be less than 500 gpm.

Q But that one motor driven pump could deliver 500 gpm minimum to both steam generators.

A (WITNESS LANESE) That is correct.

Q Could we now go to your direct testimony in response to Board Question 6I, and I see this was jointly authored with Mr. Capodanno. The Board asked, "Will the reliability of the emergency feedwater system be greatly improved upon conversion to safety grade, and is it the Licensee's and the Staff's position that the improvement is enough such that the bleed and feed backup is not required?"

Your testimony begins with a sentence which

states, "The ability of the emergency feedwater system to respond to anticipated transients and many other accidents will not be substantially improved upon conversion to safety grade since the principal deficiencies in the existing emergency feedwater system are in the environmental qualification of equipment for non-LOCA events."

After emergency feedwater is made safety grade, will some equipment still not be environmentally qualified?

A (WITNESS LANESE) No, that is not true.

Q Perhaps you can explain to me, then, the first sentence of your response which seems to say to me that after conversion to safety grade, that is not going to make a lot of difference because the principal deficiency is that the equipment is not environmentally qualified. But now you have told me after it is safety grade, all the equipment will be environmentally qualified.

A (WITNESS LANESE) What I --

MR. BAXTER: What is the question?

BY MR. POLLARD: (Resuming)

Q Do you understand the source of my confusion?

A (WITNESS LANESE) Yes, I think I can explain that. Since the major deficiencies would be in the ability of the system to respond to high energy line breaks outside containment, I dids not believe there was a significant improvement since those are low probability events. That

was my intention of saying while we were going to improve the system response for those events, since they were not high probability events, that in the overall plant improvement to safety, that was not a significant contributor.

Q That was very helpful.

Let me see if I understand now your testimony which we covered either Friday or another day was that at the time of restart, the emergency feedwater system will be safety grade for small break loss of coolant accidents and loss of main feedwater transients. Is that correct?

A (WITNESS LANESE) That is correct.

Q But it will not be safety grade for high energy line breaks in the immediate building.

A (WITNESS LANESE) That is correct.

Q Could you -- just simply stated, the probability of a high energy line break was low. Could you compare for me the relative probability of a high energy line break versus the probability of a small break loss of coolant accident?

A (WITNESS LANESE) That is why I generally use the term likelihood because it is certainly not a quantitative assessment.

Q I understand that. What I would like to know, do you have any opinion as to whether the small break loss of

coolant accident is more or less likely than a high energy line break?

A (WITNESS LANESE) I think a small break loss of coolant accident is more likely than a guillotine break of a main feed or steam line in the intermediate building.

Q Is it -- by making that distinction of a guillotine high energy line break, do you mean to say that those are the only high energy line breaks?

A (WITNESS LANESE) No. I think we would -- we would not have any environmental qualification problems with the small breaks in the intermediate buiding. The guillotine rupture is the one that results in higher calculated temperatures than we had calculated before. I am not saying that there is no environmental qualification in the intermediate building.

Q So then your exact testimony was that for high energy line break of the type involving a guillotine break of a high energy line, that that is less probable than a small break loss of coolant accident.

A (WITNESS LANESE) Yes, that is correct.

Q Can you tell me the basis for that judgment? In other words, are there more stringent standards applied to high energy lines than compared to the primary system?

A (WITNESS LANESE) No. I think it is based on some judgment and also some experience in having seen some

probability analysis on pipe break, and also on crack propagation. While I am not an expert in this, I have at least seen summaries of such reports, and it is not very likely that you would propagate a guillotine rupture in a pipe in a very short period of time. That takes a substantial period of time to -- it takes a substantial period of time to create a guillotine rupture.

DR. JORDAN: Could I ask in considering the small break loss of coolant accidents, were you factoring in a failed PORV as being a major item contributing to the probability of a break?

WITNESS LANESE: Well, certainly that is, as we have seen, that does contribute to the likelihood of a small break LOCA. On the other hand, in a strict legal sense, that is not a break in the reactor coolant system. I did intend to include the valve failures as a loss of coolant from the reactor --

DR. JORDAN: I see. You did not really mean to include the PORV.

WITNESS LANESE: I am considering that.

DR. JORDAN: I see. Okay. And so therefore, considering PORV as part of the primary system, you feel therefore the probability of a break which includes a failure of the PORV in the primary system is more likely than a break in the secondary system.

WITNESS LANESE: Well, I am including not only the likelihood of the valve failing open, but leaks or cracks in the primary coolant piping in general.

DR. JORDAN: And does this include failures in the bearings of the reactor coolant pumps?

WITNESS LANESE: Yes, that is true.

DR. JORDAN: Thank you.

CHAIRMAN SMITH: Has there ever been a guillotine break in the secondary system such as you describe, a fast one that would have the effect that you referred to?

WITNESS LANESE: Never in the types of materials that are used in commercial power plant piping today, now.

CHAIRMAN SMITH: Has there ever been a non-valve LOCA in the primary?

WITNESS LANESE: I am sorry, could you repeat the question?

CHAIRMAN SMITH: Has there ever been a non-valve loss of coolant accident in the primary system in a nuclear plant?

WITNESS LANESE: There have been seal leakages, but there have never been any broken pipes that I am aware of, reactor coolant pump seals.

DR. JORDAN: Wasn't there an instance of a failure of the secondary system whereby steam valves -- steam safety valves opened, and the result of the reaction forces tore

open the steam line itself?

WITNESS CAPODANNO: Yes, I believe that is correct, and I think it occurred on the order of six or seven years ago, possibly longer. I remember one instance that occurred at Turkey Point Station, as I recall, and it was as a result of thrust imbalance from a discharging main steam relief valve causing a failure at the juncture between the inlet pipe and the relief valve and the main steam piping itself.

BY MR. POLLARD: (Resuming)

Q Are there any other accidents like a guillotine high energy line break for which the emergency feedwater system will not be safety grade prior to restart?

A (WITNESS LANESE) The only accident that it would not be fully qualified for would be steam or feed line breaks in the intermediate building.

Q And the reason it is not safety grade for those accidents is that some of the equipment is not environmentally qualified. Is that correct?

A (WITNESS LANESE) It is more correct to say that we have not yet demonstrated whether they are qualified.

Q You have not demonstrated that either they are or they are not?

A (WITNESS LANESE) That is correct.

Q So you just don't know?

A (WITNESS LANESE) We are still working on it, yes.

Q But it is your testimony, though, that it meets all other safety grade requirements such as single failure criterion for small break loss of coolant accidents and loss of main feedwater transients?

A (WITNESS LANESE) That is correct.

Q Does it meet the single failure criterion with respect to -- I will wait until later. I am sorry.

CHAIRMAN SMITH: Can you give us just a moment?

(Whereupon, a brief recess was taken.)

CHAIRMAN SMITH: Mr. Pollard, you may proceed

BY MR. POLLARD: (Resuming)

Q We are still on your answer to Board Question 6I.

Is it your position that the reliability of the emergency feedwater system has been greatly improved as a result of converting it to safety grade for small break loss of coolant accidents and loss of main feedwater transients?

A (WITNESS LANESE) No, I would not characterize it as greatly improved. I would characterize it as optimized. There has been improvement.

Q Is it your position that the improvement in reliability of the emergency feedwater system is sufficient such that you need not rely upon the feed and bleed mode of ECCS?

A (WITNESS LANESE) Yes.

Q Is that stated anywhere in your response to Board Question 6I?

A (WITNESS LANESE) I think that was the implication in the first paragraph when I said that the system at restart will have redundancy, diversity, sufficient capacity to supply RCS cooling under the single failure assumptions.

Q Could we move on to your response to Board Question 6J?

In you testimony you used the word "reliability," and you say that the reliability of that system has been

demonstrated by ten manual emergency feedwater initiations which exhibited no component failures, and by surveillance testing of individual components which did not reveal conditions in excess of allowable technical specification limits.

My question is what do you mean by the word "reliability" in that sense?

A (WITNESS CAPODANNO) In the sense that when the system was tested, it ran and functioned at is should have.

Q What quantitatively -- what reliability is demonstrated by ten manual initiations?

A (WITNESS CAPODANNO) I do not have a probabilistic assessment, if that is what you are referring to. Again, I think we used the term in the sense that one might apply to even a piece of household equipment or personal automobile, that when the thing was tried, it worked, rather than trying to say that there was some absolute number that we could quote.

Q It is your testimony that you conclude, though, that the emergency feedwater system is sufficiently reliable to permit restart of the plant, is that correct?

A (WITNESS CAPODANNO) That is correct.

Q How many of these successful manual initiations would it take for you to be able to reach that conclusin?

A (WITNESS CAPODANNO) Again, as I stated, the term

as I used it there means in each instance where it was tried, it worked. Consequently, the conclusion that it is reliable.

Q Would you change your conclusion if you had tried it only five times?

A (WITNESS CAPODANNO) I am sorry, more than five times?

Q More than five times.

A (WITNESS CAPODANNO) No.

Q Would you change your conclusion if you had tried it only once and it was successful?

A (WITNESS CAPODANNO) Again, in the context that we use the term reliability, as it is tried each time and it is demonstrated to work, it proves itself to be reliable. So if it was done once or ten or fifty times, I would still give you the same answer.

Q Let me try a different one. Suppose you tried it ten times and one out of the ten times it failed; would that change your conclusion?

A (WITNESS CAPODANNO) No, but again, you would have to look at what the specific failure was. Generally I would say no.

Q Generally you would say what?

A (WITNESS CAPODANNO) No.

Q No, that it would not change your conclusion?

A (WITNESS CAPODANNO) That is correct, it would not change my conclusion.

Q Suppose it failed five out of the ten times that you tried it?

MR. BAXTER: Objection, Mr. Chairman.

CHAIRMAN SMITH: I think you are near to running the string out on this line of questioning. However, proceed, but you know, bring it to a reasonable conclusion.

BY MR. POLLARD: (Resuming)

Q Would you change you conclusion if out of the ten manual initiations it failed five times?

A (WITNESS CAPODANNO) I think yes. At some point -- you know, that is not again an absolute, but at some time you would make a judgment, a qualitative judgment that it was not functioning as frequently and as thoroughly as you would like.

Q So then, am I correct then in preparing your testimony, you had no quantitative goal in mind as a basis for your conclusion that the system is sufficiently reliable to permit restart?

A (WITNESS CAPODANNO) That is correct, and if I may, I would like to explain that a little bit. I think that a quantitative goal by itself is a difficult thing to deal with. What strikes me as more significant is that as the system was tried, it worked. If I had a reliability

calculated or a reliability goal stated, I am not certain what one does with an absolute number like that, whereas if the system is tried and each time it works, it is operational proof of its reliability.

Q I would like to now refer you to Table 1 in Licensee Exhibit 15.

Can you explain to me please the footnote which appears on the bottom of the first page of Table 1 which reads, "Where noncompliance has been identified for a GDC, it has not been repeated for instances where that noncompliance would affect compliance to another GDC."

A (WITNESS CAPODANNO) What we are attempting to identify with that note is the GDCs have some degree of interrelationship, and I do not think in evaluating one it was intended that you read it as automatically tied to the others, but rather you look at the specifics of what each GDC says.

So, as an example, if, speaking hypothetically for the moment, if someone identified a system, says, that was non-seismic Category 1, there might also be another GDC that addresses perhaps pipe rupture. What we are saying is that look, some of those things are obviously tied one to the other, and it could get confusing if we kept repeating overk and over again the interrelations between the GDCs. So what we try to do is address the specifics of the wording of the

GDC and give our comments.

Q So am I correct, then, that there may be other GDCs which are not met which are not on this table?

A (WITNESS CAPODANNO) There are others that we felt that did not have direct applicability to emergency feedwater, and we did not list them.

Q My question was, does this footnote mean that there are other GDCs that might not be met or are not met, but those are not identified on this table?

A (WITNESS CAPODANNO) Again, I have trouble with your terminology, "not met." What I am trying to indicate to you is we feel other GDCs make reference to certain requirements that do not apply to emergency feedwater, and that is why they are not listed.

Q All right. Let me ask you specifically, then, some of the GDCs which are not listed.

Oh, before we start that, this table reflects the status of the emergency feedwater system at what point in time, at the time of restart?

A (WITNESS CAPODANNO) Yes.

Q You have two columns there. One is labeled the Restart System and one is labeled the Future System.

A (WITNESS CAPODANNO) Yes. That is intended to identify what the condition would be under each.

Q At the time of restart, will the emergency

feedwater system meet General Design Criterion 1, which is quality standards on the records?

CHAIRMAN SMITH: Does this portend what I think it does?

MS. WEISS: Yes.

MR. BAXTER: Mr. Chairman, before the question is posed as to whether this meets GDC 1, I believe it has to be established in the Witness's mind whether this criterion is applicable.

CHAIRMAN SMITH: Where are we now on the testimony? He has already testified that he has eliminated the criteria that he does not believe is applicable from the table, and now the cross examination I would expect is going to try to establish that he was mistaken in his judgment.

I mean, is that where we are going?

MR. BAXTER: Except the first question was whether or not it meets General Design Criterion 1.

MR. POLLARD: I will be happy to ask if he believes each is applicable to the emergency feedwater system.

CHAIRMAN SMITH: Okay. I think there can be an accommodation among parties on this.

MR. BAXTER: The problem is going to be I think the Witness, as you stated, Mr. Chairman, he is probably going to testify that they are not applicable, and the

question as to whether they are met seems to me to be hypothetical at best, and I don't know what kind of reliable evidence it will be for the record.

DR. JORDAN: I guess I had not realized, is it on the record, and it is the Witness's testimony that the only GDC criteria that are applicable to the emergency feedwater system are the ones listed, starting with GDC 2. You believe that none of the other criteria are applicable to this system?

WITNESS CAPODANNO: No, I would not be that absolute. What we are trying to identify is specifics of system design as opposed to, say, General Quality Assurance Program that is applied to the entire plant. Have I mentioned we tried not to get so broad in scope that we ended up discussing everything that exists in Part 50.

I think there are other areas that you can point to where programs are in place to do the things identified, but we were not trying to identify the entire quality assurance program as a topic for discussion in this table. What we are trying to say is there are specific GDCs that relate to design, physical configuration that we thought ought to be addressed. We identified those and gave our comments on them.

DR. JORDAN: Are there any General Design Criteria that might in part be applicable that the system does not

meet?

WITNESS CAPODANNO: I think this Criterion 1 and the general reference of quality assurance has been applied to the system already. So yes, in that context, yes.

DR. JORDAN: Yes, but my question was somewhat broader. Are there General Design Criteria that you do not meet with the design of the emergency feedwater system? Have you looked them over to see, and are there some that you do not meet?

WITNESS CAPODANNO: Again, there are ones we don't meet because we felt they do not apply. Just glancing at the book in front of me, there are criteria on reactor design, Criterion 10, reactor design, addressing core and associated controls and such.

DR. JORDAN: Okay. That is what I meant, though, either they don't apply or you meet them, all of the General Design Criteria.

WITNESS CAPODANNO: Yes, I think that is correct.

DR. JORDAN: All right.

MR. BAXTER: I don't know if it is any help., The Exhibit at page 10 describes what I think the witnesses were attempting to use this for. It says they compared the system with the GDCs that are directly applicable to the system design.

MS. WEISS: That is exactly what we are going to

be questioning on then.

(The Board conferred.)

CHAIRMAN SMITH: I think part of the problem is that the Board question, of course, was presented in a void of any record whatever, and it is something we want to be assured on, but now we are looking at the question with a background of a great deal of testimony on the subject. We are going to permit you to continue along this line, so long as it appears to be productive, but I hope that you will select your criteria with that in mind, and you are not going to just go through every one of them.

MR. POLLARD: No. It is my intention to go through primarily only those that are on the cross examination plan.

CHAIRMAN SMITH: Okay. In this discussion I had not referred to your cross examination plan.

MR. POLLARD: For example, I do not intend to ask the witness about GDC 10.

CHAIRMAN SMITH: I had overlooked the cross examination plan on the question.

BY MR. POLLARD: (Resuming)

Q Does General Design Criterion 1 apply to the emergency feedwater system?

A (WITNESS CAPODANNO) Yes, I think it does.

Q At the time of restart, will the emergency

feedwater system fully comply with GDC 1?

A (WITNESS CAPODANNO) Yes, I believe it will.

Q Does General Design Criterion 2, fire protection, apply to the emergency feedwater system?

(Pause)

A (WITNESS LANESE) Excuse me. Is that in relationship to LOCA or in general?

Q It is in relationship to the wording of the criterion which states, "Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions."

A (WITNESS LANESE) What I am getting at is if you are asking if that has to be applied simultaneously with a LOCA, our answer would be no, it does not apply.

Q Does the emergency feedwater system have to be designed such that a fire cannot disable the emergency feedwater system? That is the sense in which I asked the question, does General Design Criterion 3 apply to emergency feedwater?

A (WITNESS LANESE) We would have to review the previous fire hazards analysis to determine if emergency feedwater was required to shut the plant down subsequent to a fire.

Q What other way is there to remove heat from a shut

down reactor at full temperature and pressure other than through the steam generators which you are relying upon for restart?

A (WITNESS LANESE) That is one way. The main feedwater system might also be available. It would depend upon the location of the fire. For example, if you were to postulate a fire in the intermediate building, the main feedwater system should still be available, or might still be available. I am being hypothetical now.

Q We are not up to the point of asking you yet whether or not you meet GDC at the time of restart, GDC 3. I am only asking you at this point does GDC 3 apply to the emergency feedwater system?

A (WITNESS LANESE) I would think it does, yes.

Q The next question is, at the time of restart, do you know whether or not the emergency feedwater system will fully comply with GDC 3?

A (WITNESS LANESE) To the best of my knowledge, it complied prior to restart. We are not doing anything that would change that compliance.

Q Does -- in preparing your testimony and this exhibit, did you specifically look to see whether the emergency feedwater system complies with General Design Criterion 3?

A (WITNESS LANESE) I did not re-review the fire

hazards analysis, no.

Q Did you do anything else to try and determine whether the emergency feedwater system complies with the GDC 3?

A (WITNESS LANESE) We had been required to do a fire hazards analysis for the -- I think several years ago, and that was a detailed analysis which determined whether the plant was capable of being safety shut down as a result of design basis fires, and that has been reviewed by other people within our organization. I have some cognizance of the results which said yes, we could meet -- we could shut the plant down safely after a fire. That was reviewed and approved by the staff, and I can think of nothing that we are doing that would change those results.

Q Does General Design Criterion 13, instrumentation and control apply to the emergency feedwater system?

A (WITNESS LANESE) No, I do not think so.

Q It is your testimony, though, that you are relying upon emergency feedwater to mitigate small break loss of coolant accidents and loss of main feedwater transients, is that correct?

A (WITNESS LANESE) That is right.

Q Can you explain to me, please, why you think General Design Criterion 13 does not apply to the emergency feedwater system?

A (WITNESS LANESE) It specifically addresses those variables and systems that can affect the fission process, the integrity of the reactor cooler/reactor coolant pressure boundary containment and associated systems.

Q It is your testimony, then, that you think the operation of failure of the emergency feedwater system cannot affect the integrity of the core?

A (WITNESS LANESE) I think the intention of the General Design Criteria is with respect to emergency core cooling systems, and the General Design Criteria that apply to ultimate heat sinks are those that are applicable to the emergency feedwater system.

Q Is loss of main feedwater an anticipated operational occurrence within the meaning of GDC 13?

A (WITNESS LANESE) Loss of feedwater is an anticipated operational occurrence as defined in Appendix A.

Q Can I refer you, please to NUREG-0578, page A-32. The first paragraph on page A- --

MR. BAXTER: Excuse me, Mr. Pollard, it will take us just a minute to find it.

(Pause)

BY MR. POLLARD: (Resuming)

Q The first paragraph on A-32 states, "The issuance of a standard review plan, the auxiliary feedwater systems in PWR designs has been treated as a safety system. It is

used to remove heat from the reactor system with the mawin feedwater system is not available. General Design Criteria 13 of Appendix A in 10 CFR Part 50 sets for the requirements for instrumentation to monitor the variables and systems over their anticipated ranges of operations that can affect reactor safety."

Would you like to reconsider, in light of this paragraph, whether or not General Design Criteria 13 applies to the emergency feedwater system?

A (WITNESS LANESE) No, there is always some matter of interpretation in the General Design Criteria. Even the staff is not consistent in saying that GDC 13 applies. For example, the standard review plan does not reference GDC 13. I do not think we would have any quarrel with the fact that the in rumentation system for emergency feedwater has to be -- monitor the appropriate variables over the appropriate ranges.

Q Well, is there a GDC which specifies instrumentation to monitor the variables over their anticipated ranges which you believe does apply to the emergency feedwater system if it is not GDC 13?

A (WITNESS LANESE) I think in general it would still be the General Design Criteria for fluid systems.

Q Which one is that, please?

A (WITNESS LANESE) For example, 34. It does not

specifically reference monitoring variables over the appropriate range. I am not arguing with the idea that we need an instrumentation system that has to monitor variables over their appropriate range.

Q To the extent that the words of General Design Criterion 13 reflect what you believe to be the requirements for emergency feedwater that may be implicit in some other General Design Criterion, will the emergency feedwater system, prior to restart, comply with those requirements?

A (WITNESS CAPODANNO) I would say yes, in the context that Mr. Lanese has just provided, in that we have instrumentation to indicate flow and instrumentation to indicate steam generator levels. There is also instrumentation to indicate status of components in the system operating, not operating, open or closed. I think that provides sufficient instrumentation to allow one to monitor the important variables of the system.

DR. JORDAN: Are you also saying that those instruments meet the safety grade criteria?

WITNESS CAPODANNO: For restart, we have said that with qualification, yes, some do. I think I identified the other day the qualification of certain transmitters, where their aging characteristics have not been fully determined by the manufacturers.

DR. JORDAN: [illegible] feel they do meet, however,

the single failure criteria?

WITNESS CAPODANNO: Yes.

BY MR. POLLARD: (Resuming)

Q Does General Design Criterion 20 apply to the emergency feedwater system? The title of it is Protection System Functions.

A (WITNESS CAPODANNO) No.

Q Can you explain to me why it does not apply?

A (WITNESS LANESE) In the table of contents for Appendix A, Criteria 20 through 29 are grouped under reactivity and protection systems, and my understanding of those criteria has always been that they apply to the reactor protection system, and later on they had been extended to emergency core cooling systems, and I think they primarily refer to prompt initiation as a result of prompt initiation for large break LOCAs and for reactivity transients.

Q Is the emergency feedwater system being used -- is it your position that the emergency feedwater system at the time of restart will be relied upon to mitigate small break loss of coolant accidents?

A (WITNESS LANESE) In certain break ranges, that is correct.

Q You just told me you thought General Design Criterion 20 had been applied to ECCS systems.

A (WITNESS LANESE) I do not agree that emergency feedwater is an ECCS system.

Q But you would agree tht it performs a function of cooling the core during loss of coolant accidents.

A (WITNESS LANESE) It serves a function as an ultimate heat sink, yes.

Q And that without it you would not be able to cool the core unless you resorted to something like bleed and feed.

A (WITNESS LANESE) Yes. That is also true of many other ultimate heat sink components and the pump components on systems.

MR. POLLARD: Mr. Chairman, rather than taking time right now, may I suggest that we take our lunch break and we will resume this questioning after lunch?

CHAIRMAN SMITH: Okay. We will return at 1:10.

(Whereupon, at 12:05 o'clock p.m., the hearing in the above-entitled matter recessed, to reconvene at 1:10 o'clock p.m. the same day.)

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AFTERNOON SESSION

MR. BAXTER: Mr. Chairman, Mr. Lanese has advised me over the lunch hour that he made an error in one of the answers he gave to Mr. Pollard earlier. I believe it was on the question leading out of the examination on GDC 13 as to whether there was another general design criterion which might relate to instrumentation and controlled supplies to emergency feedwater.

The reference was to General Design Criterion 34. Did you have a change to make to that testimony, Mr. Lanese?

Whereupon,

LOUIS C. LANESE

and

GARY R. CAPADANNO

the witnesses on the stand at the time of the noon recess, resumed the stand and were further examined and testified as follows:

WITNESS LANESE: Yes. I meant General Design Criterion 44.

MR. POLLARD: In the further questioning we will be using Standard Review Plan Sections 7.3 and 7.4. We will also be using from the restart report, Chapter 2, and Supplement I, Part 1 and Part 3.

MR. BAXTER: Will the witnesses be provided with copies of the Standard Review Plan sections?

MR. POLLARD: Standard Review Plan Section 7.3 is among proposed exhibits from the staff. I don't recall if they have actually introduced it yet.

MS. WEISS: We don't have extra copies of it. This is questioning which we did not know we were going to have to make, but we will show the witness a copy, and he can read it. We have one copy.

MR. BAXTER: I think counsel and the Board ought to be able to follow along. I hate to suggest another break, but I don't think I have copies of the Standard Review Plan sections here. I might be able to locate them across the street.

CHAIRMAN SMITH: All right. We'll take a break.

(Brief recess.)

CHAIRMAN SMITH: Back on the record.

CROSS EXAMINATION - Resumed

BY MR. POLLARD:

Q Section 7.1 of the Standard Review Plan has attached to it Table 1 which is entitled -- Table 7-1 entitled "Acceptance Criteria for Instrumentation and Controls." And the table lists among other things all of the -- well, at least many of the general design criteria, and then it has columns for Section 7.3 and 7.4 of the Standard Review Plan showing which criteria are applicable to which systems.

I will show it to you after I stop my introduction. Then you can refer to it.

CHAIRMAN SMITH: Do you have that to which he is referring?

MR. BAXTER: No.

CHAIRMAN SMITH: You don't have that.

MR. POLLARD: The witnesses do have 7.3.

MR. BAXTER: Yes.

MR. POLLARD: But the staff does not.

MR. CUTCHIN: The staff does not have a copy of that, nor am I able to determine that we have a copy available across the street.

(Pause.)

CHAIRMAN SMITH: Apparently there is going to be quite a bit of this back and forth.

MR. POLLARD: No. That is all.

CHAIRMAN SMITH: Okay.

MR. POLLARD: You could run those two pages if you wish to illustrate the GDC.

(Discussion off the record.)

MS. WEISS: I am distributing to the parties a two-page table 7-1 entitled "Acceptance Criteria for Instrumentation of Controlled Systems" from Section 7.1 of the NRC Standard Review Plan.

(Counsel distributing documents to parties.)

MR. POLLARD: This is Revision I. It is down at the lefthand side of the table.

(Witnesses reviewing documents.)

MS. WEISS: Perhaps we should give it an exhibit number for identification purposes.

CHAIRMAN SMITH: That would be UCS Exhibit 7.

MR. POLLARD: We already have in 7 and 8, I am sure of that.

CHAIRMAN SMITH: Okay. So it is 9.

MS. WEISS: I think it is 9. That is what I thought. The document will be UCS Exhibit 9.

(The document referred to was marked as UCS Exhibit No. 9 for identification.)

MR. POLLARD: Am I correct the witnesses have before them Section 7.3 of the Standard Review Plan entitled "Engineered Safety Features Systems." Down at the bottom righthand corner is labeled Revision I.

WITNESS LANESE: Yes. I am in possession of it.

BY MR. POLLARD: (Resuming)

Q What I would like to do is summarize parts of it and then see if you disagree with any part of it. This section of the Standard Review Plan describes how the staff reviews typical engineered safety features systems, and that included among typical engineered safety features systems

are pressurized water reactor auxiliary feedwater systems. And also noted on the front page there is a parenthetical phrase which says "See Standard Review Plan Section 7.4 for review of the safe shutdown functions of this system," meaning the auxiliary feedwater system.

Is that correct?

A (WITNESS LANESE) That is what the page shows.

Q If you would turn now to page 7.3-3, paragraph labeled "Acceptance Criteria." The first sentence reads, "Acceptance criteria for the review areas of the Standard Review Plan section are referenced in Table 7-1, reference 3, and include the General Design Criteria, industry standards, regulatory guides, and branch technical positions that are applicable to the ESFAS and the instrumentation and controls of essential auxiliary supporting systems."

I would like now to direct your attention to UCS Exhibit 9. Is it correct that the Standard Review Plan indicates that General Design Criterion 13 is applicable to systems covered in Standard Review Plan, Sections 7.3 and 7.4?

A (WITNESS LANESE) That is correct.

Q Would you agree that that means, at least as far as the staff is concerned, that the requirements of GDC 13 apply to what they call auxiliary feedwater systems which you call emergency feedwater systems?

A (WITNESS LANESE) No, I do not agree.

Q You do not agree that that is --

A (WITNESS LANESE) No.

Q You don't agree with the Standard Review Plan?

A (WITNESS LANESE) I do not agree that that is what the Standard Review Plan indicates.

Q Could you please tell me what the Standard Review Plan indicates?

A (WITNESS LANESE) Based on Standard Review Plan 10.4.9, the staff calls out the general design criteria that specifically apply to auxiliary feedwater systems.

Q Now, in that Section 10, is that Section 10 of the Standard Review Plan referring primarily to the mechanical portions of the system?

(Pause.)

A (WITNESS LANESE) That is with respect to mechanical and instrumentation for secondary review. The problem I am having differentiating is that while there are x's in all those columns, there are many systems that are referenced in the introduction to that Standard Review Plan. So I do not know that every x applies in every instance to every system.

Q And you are familiar with the Standard Review Plan to the extent you know that there is also a section of the Standard Review Plan that applies to emergency core cooling

systems, is that correct?

A (WITNESS LANESE) That is correct.

Q And that it appears that Section 7.3 also applies to emergency core cooling systems, is that correct?

A (WITNESS LANESE) That is correct.

Q So isn't it possible that the Standard Review Plan is organized such that the instrumentation and controls for a system are covered in Section 7.3, and the mechanical portions for ECCS are covered in Chapter 6, and the mechanical portions of emergency feedwater are covered in Section 10?

A (WITNESS LANESE) Yes.

Q Okay. Back to Table 7-1, UCS Exhibit 9. At line K it says "General Design Criterion 20, Protection System Functions." Would you agree that the Standard Review Plan indicates that GDC 20 also applies to the systems, the instrumentation and controls for systems covered by Sections 7.3 and 7.4?

A (WITNESS LANESE) Yes, I do.

Q With respect to your testimony now that General Design Criterion 20 applied to the emergency feedwater system --

MR. BAXTER: Excuse me. I need a clarification. Is the question the TMI-1 emergency feedwater system?

MR. POLLARD: Yes.

WITNESS LANESE: My testimony stands as it is.

BY MR. POLLARD: (Resuming)

Q That General Design Criteria 20 does not apply to auxiliary feedwater systems.

A (WITNESS LANESE) That is correct. I think the requirements for the instrumentation systems are at least implied.

MS. WEISS: Would you say that again?

WITNESS LANESE: The requirements for the instrumentation systems for emergency feedwater are implied by the general design criteria for ultimate heat sinks.

BY MR. POLLARD: (Resuming)

Q Which was GDC 44.

A (WITNESS LANESE) Forty-four, 45, 46.

Q Would you agree GDC 44 is in a section of the general design criterion, Section 4, which is labeled "Fluid Systems?"

A (WITNESS LANESE) That is correct.

Q Would you agree that General Design Criterion 20 is in a section of the general design criterion labeled Section 3, "Protection and Reactivity Control Systems?"

A (WITNESS LANESE) That is correct.

Q Let me ask you what instrumentation do you believe General Design Criterion 20 applies to, recognizing that there are also criteria which are applied to ECCS systems

listed in the GDC which apply to fluid systems such as the decay heat removal? What is unique about GDC 20? What instrumentation does it apply to?

A (WITNESS LANESE) Could you repeat the last part? Did you say what section does it apply to?

Q What instrumentation and controls does General Design Criterion 20 apply to?

A (WITNESS LANESE) As originally written I believe it applied to reactor trip functions, and it was later extended to include initiation of emergency core cooling systems. That would include containment protection and high pressure/low pressure injection.

Q And General Design Criterion 35, Emergency Core Cooling System -- Emergency Core Cooling, is in the same section of the GDC as GDC 44, is it not?

A (WITNESS LANESE) Yes, it is.

Q But your testimony is that GDC 20 applies to the instrumentation and controls for the systems referenced in GDC 35, but it does not apply to the instrumentation and controls for the systems referenced in GDC 44, is that your testimony?

A (WITNESS LANESE) Yes, because again as originally written that section was intended to mean the reactor protection system, and it was extended to emergency core cooling.

Q You were trying to make a distinction apparently between what was originally written and what happened later. What I would like to know is right now today or perhaps at the time of restart does General Design Criterion 20 apply to Three Mile Island Unit 1 emergency feedwater systems?

MR. BAXTER: Objection, Mr. Chairman. The witness has answered the question before lunch and after lunch. This is the third time it has been posed.

MS. WEISS: Let me -- let's withdraw that one.

You were asked a question about whether it is your opinion that GDC 20 applies to the systems included within GDC 35 but not to the systems included within GDC 44, and your answer was yes. You then gave an explanation which made a distinction between as originally written and as currently interpreted. I want to make sure I understand your answer.

BY MS. WEISS:

Q As of today, how it is now interpreted, is it your understanding that GDC 20 applies to the systems covered by GDC 35 but not to the systems covered by GDC 44?

A (WITNESS LANESE) That is correct.

Q Would you tell me why as now written that is -- as now interpreted that is the case?

A (WITNESS LANESE) The systems described under GDC

35 are emergency core cooling systems. The systems described under GDC 44 are ultimate heat removal systems, and that is the distinction I understand between those.

Q Where does it say that GDC 20 does not apply to ultimate heat sink systems?

A (WITNESS LANESE) It does not say that in the affirmative in GDC 20.

Q Is there anything other than your own opinion that supports this intepretation of the scope of General Design Criteria 20?

MR. BAXTER: I object to the question, Mr. Chairman. They have asked the witness for his opinion. If it were clear from the regulation, I assume UCS could simply cite it in their proposed findings.

MS. WEISS: The question was anything other than his opinion. Does it state anywhere in any NRC staff document that General Design Criterion 20 does not apply to the instrumentation and controls for emergency feedwater?

WITNESS LANESE: I think you have asked me two different questions.

BY MS. WEISS: (Resuming)

Q Does it appear anywhere in any NRC documents that General Design Criterion 20 does not apply to the instrumentation and control for pressurized water reactor emergency feedwater systems?

A (WITNESS LANESE) No.

BY MP. POLLARD:

Q I understand now you do not think the General Design Criterion 20 applies to emergency feedwater systems, but let me ask you at the time of restart will the instrumentation and controls for emergency feedwater meet the requirements set forth in GDC 20?

A (WITNESS LANESE) Yes.

Q Okay. Referring now to Table 7-1 of the Standard Review Plan, would you agree that it indicates that General Design Criterion 21 applies to the instrumentation and controls for those systems covered by Sections 7.3 and 7.4 of the Standard Review Plan?

A (WITNESS LANESE) Yes.

Q Does General Design Criterion 21 apply to the Three Mile Island Unit 1 emergency feedwater systems?

A (WITNESS LANESE) No, I do not believe so.

Q At the time of restart will the Three Mile Island Unit 1 emergency feedwater system meet the requirements set forth in GDC 21, recognizing your opinion that it does not apply?

(Pause.)

A (WITNESS LANESE) I believe we would need GDC 21.

Q I'm sorry. I did not hear you.

A (WITNESS LANESE) I believe we would need GDC 21

at the time of restart.

Q In answer to my last question, did you think at the time of restart the emergency feedwater system will comply with the requirements of GDC 21, is that answer based upon any specific review or is that your general opinion today?

A (WITNESS LANESE) Based on my understanding of the system design and my understanding of GDC 21 I think we meet the requirements of GDC 21.

Q In other words, you have done a specific analysis to see whether or not you meet GDC 21.

A No. As I said, based on my understanding of the design and my understanding of the GDC, I believe we need it.

Q Okay. Referring again to Table 7-1 of the Standard Review Plan, would you agree that that indicates that General Design Criterion 22 applies to the instrumentation and controls for those systems covered by Standard Review Plan Sections 7.3 and 7.4?

A (WITNESS LANESE) Yes, I do.

Q Does General Design Criterion 22 apply to the emergency feedwater systems for Three Mile Island Unit 1?

A (WITNESS LANESE) Yes, they do.

Q Can you explain to me why GDC -- why you believe GDC 22 applies to Three Mile Island Unit 1 emergency feedwater systems but GDC 20 and 21 do not?

A (WITNESS LANESE) I must have misunderstood your question. I do not believe GDC 22 applies to the emergency feedwater system. I believe that we would meet it.

Q You were anticipating my next question. You believe you would meet it at the time of restart.

A (WITNESS LANESE) That is right.

Q Thank you.

Would you believe that Table 7-1 indicates that General Design Criterion 23 applies to instrumentation and controls of the systems covered by Standard Review Plan Sections 7.3 and 7.4?

A (WITNESS LANESE) Yes.

Q Does General Design Criterion 23 apply to the emergency feedwater systems at Three Mile Island Unit 1?

A (WITNESS LANESE) No.

Q At the time of restart will the emergency feedwater systems at Three Mile Island Unit 1 comply with the requirements of GDC 23?

A (WITNESS LANESE) No, it would not.

Q Can you tell me in what respects it will not comply with it?

A (WITNESS LANESE) It would not be qualified with respect to postulated adverse environments, namely extreme heat and steam. Again, it is a high energy line break in the intermediate building.

Q Paying particular --

A (WITNESS LANESE) Could we back up on that a second?

Q Sure.

A (WITNESS LANESE) I think I was thinking in general about the mechanical equipment. I do not believe there are any of the instrumentation systems that would be subject to the adverse environment in the intermediate building, so from an instrumentation and controls point of view, with the exception of the control of the regulating valve I would -- I think we meet GDC 23.

Q Okay. With respect to the -- did you refer to them as regulator valves?

A (WITNESS LANESE) The EFV 30 valves.

Q With respect to the regulator valves is the reason you do not meet GDC 23 involve loss of air?

A (WITNESS CAPODANNO) No, sir.

Q Perhaps, Mr. Lanese, you can first explain to me why you believe it will not meet GDC 23, the recirculation valves.

A (WITNESS LANESE) Again, it would be the operation of the valve in that environment. I think the connected electrical wiring and at this point an inability to recall if there is any instrumentation specifically located on that valve that might cause it to fail.

Mr. Capodanno, did you wish to add something?

A (WITNESS CAPODANNO) Yes. We have identified for those valves at least a couple of areas where we have suspicions. I don't believe we have absolute proof yet that components are or are not good for the resultant environments. Those areas involve some of the materials of construction of the valve. Elastomers, in particular, I don't believe have complete qualification. And secondly, there is a device called an electric to pneumatic converter that is used for the operation of those valves that is in a similar situation. That device is not mounted on the valve, but it is located in the area where the valves are, and that device likewise either must be completely qualified, or in the longterm it would have to be replaced to satisfy the environmental conditions -- the conditions being those postulated for a high energy line break.

Q Referring again to Table 7-1 of the Standard Review Plan would you agree that it indicates that General Design Criterion 24, separation of protection and control systems, applies to the instrumentation and controls of those systems covered by Standard Review Plan Sections 7.3 and 7.4?

A (WITNESS LANESE) Yes, I do.

Q Does General Design Criterion 24 apply to the emergency feedwater systems at Three Mile Island Unit 1?

A (WITNESS LANESE) No, it does not.

Q At the time of restart will the Three Mile Island Unit 1 emergency feedwaters meet the requirements of GDC 24?

A (WITNESS LANESE) Yes, I believe it would.

Q Referring to the next page of Table 7-1 of the Standard Review Plan would you agree that it indicates that General Design Criterion 29, protection against anticipated operational occurrences, applies to the instrumentation and controls of those systems covered by Standard Review Plan Sections 7.3 and 7.4?

A (WITNESS LANESE) Yes, I would.

Q Does General Design Criterion 29 apply to the emergency feedwater systems of Three Mile Island Unit 1?

A (WITNESS LANESE) No, it does not.

Q At the time of restart will the emergency feedwater systems at Three Mile Island Unit 1 meet the requirements of GDC 29?

A Yes, I believe it will.

Q Could you please refer to the Restart Report, Section 2, page 2.1-7, which is labeled "Amendment 22?" I am sorry. I meant to say 2.1-27. It is page 2.1-27, Amendment 22. There is on that page a paragraph labeled "F" which states, "Safety grade indication of auxiliary feedwater flow to each steam generator is being provided in the control room."

Can you tell me in that paragraph what the phrase "safety grade" means in terms of which general design criterion it must meet in order to be called safety grade?

A (WITNESS LANESE) The general design criterion that we have referenced in our testimony in Table 1 of Exhibit A.

Q Of Exhibit 15?

A (WITNESS LANESE) Exhibit 15, excuse me.

Q That is all.

A (WITNESS LANESE) I think we have also indicated that GDC 1 is applicable.

Q Okay. Now, is this safety grade indication of auxiliary feedwater flow through each steam generator being provided prior to restart?

A (WITNESS LANESE) Yes.

Q What changes had to be made in order to make it safety grade?

A (WITNESS CAPODANNO) I am not sure I understand the question.

Q I am sorry. Perhaps I should ask a different question. At the time of the Three Mile Island Unit 2 accident was this flow instrumentation provided in the control room and was it safety grade or is this a change since the accident?

A (WITNESS CAPODANNO) This is in addition for

restart. It did not exist at the time of the TMI accident.

Q The second sentence in paragraph F states -- I am sorry. You have already answered my question. Would you refer now to the paragraph immediately following the paragraph labeled "G?" The second sentence states, "In addition, provision for testing of the initiating circuits, although not currently included in the design, will be provided."

The provision for testing that that sentence refers to, will that be provided prior to restart?

A (WITNESS CAPODANNO) It is my understanding that those provisions will be included prior to restart.

Q Can you tell me which general design criterion requires such testing?

A (WITNESS CAPODANNO) Again, I think in the table attached to our exhibit we have not identified any specific design criteria that does that.

Q That may be true. The question still remains, do you know which GDC requires such testing of these initiating circuits for emergency feedwater systems?

A (WITNESS CAPODANNO) I think we have also answered that in the context that you questioned Mr. Lanese on Criterion 21 about reliability and testability, and he stated he did not feel it applied directly to emergency feedwater.

Q So there is no general design criterion that requires the initiating circuits for initiating feedwater, is that your testimony?

A (WITNESS CAPODANNO) I believe that is correct, yes.

Q Can I now direct your attention to Section 2.1.2.6 of the Restart Report which begins on page 2.1-41, labeled "Amendment 18," and continuing on page 2.1-42, labeled "Amendment 22." It indicates there that the auxiliary feedwater system autostart circuits are being implemented in two phases. First, as a control grade autostart which is a short-term approach, and then item 2 is the safety grade autostart, and that would be a long-term modification where the initiation will meet the requirements for Class 1-E systems and the system as functionally described below.

My question is does this section accurately reflect those changes which will be done after restart?

A (WITNESS CAPODANNO) No, that is no longer true. When this particular paragraph was written -- and I do not see a date on here, but the timeframe was such that the modification was going to be control grade only, based primarily on the fact that a significant amount of the hardware was already in the plant.

Because of the delay in restart I believe we have safety grade components available, and they will be

installed for this auto initiation.

DR. JORDAN: For my information, you do refer to Class 1-E. Where did the criteria for Class 1-E systems appear? What are the criteria for 1-E systems?

WITNESS LANESE: I think we were referring to the IEEE standards in that case.

DR. JORDAN: Is that generally true, when one refers to a Class 1-E that one refers to IEEE standards?

WITNESS LANESE: Yes.

DR. JORDAN: IEEE-279 or other.

WITNESS LANESE: 279 is the implementing document for most of the others. Most of the other documents are interpretations of 279.

DR. JORDAN: Good.

BY MR. POLLARD: (Resuming)

Q Does IEEE-279 use the phrase "Class 1-E" at all?

A (WITNESS LANESE) No, it does not.

Q If you can refer to the subsequent page 2.1-42 which is labeled "Amendment 22," and Amendment 22 was dated October 17, 1980, we would like to go through and ask you some questions on page 2.1-42. Item 1, the second paragraph states, "The system initiation on low steam generator level will eventually be added. This will be done after the necessary analysis and engineering have been completed to assure that the signal will give a satisfactory actuation

and will not interact with other plant functions."

Will the automatic initiation of emergency feedwater on low steam generator level be installed prior to restart?

A (WITNESS LANESE) No, it will not.

Q At the first paragraph of item 1 it says, "The safety grade emergency feedwater autostart will be implemented -- when implemented will automatically initiate the system on the presence of the following conditions with or without the availability of offsite power."

At the time of restart will the automatic start circuit for emergency feedwater be safety grade?

A (WITNESS LANESE) At the time of restart there will be two safety grade autoinitiation circuits for emergency feedwater, and there will be loss of both normal feedwater pumps and loss of all four reactor coolant pumps.

Q And those two functions will be fully safety grade.

A (WITNESS LANESE) That is my understanding, yes.

Q But you will not have either the low steam generator level or the low differential pressure between the normal feedwater and main steam lines at either steam generator.

A (WITNESS LANESE) No, we will not.

Q Item 2 on 2.1-42 states, "All cables associated with the initiating logic will be qualified for Class 1-E

application, and the initiations will be designed to meet the single failure criteria. All circuits will meet the regulatory criteria for separation of Class 1-E circuits."

Will that requirement be met prior to restart?

A (WITNESS CAPODANNO) Yes, I believe it will.

Q What general design criterion requires this of emergency feedwater systems?

(Pause.)

CHAIRMAN SMITH: What was the question?

MR. POLLARD: Which general design criterion requires these features which are set forth in paragraph 2 on page 2.1-42 for emergency feedwater systems?

WITNESS LANESE: I cannot find a specific reference outside of the series 20 general design criteria that might apply.

BY MR. POLLARD: (Resuming)

Q But you would agree at least part of those requirements in paragraph 2 on page 2.1-42 are incorporated in General Design Criterion 21.

MS. WEISS: We withdraw that.

MR. POLLARD: I am sorry. Ellen corrected me. We do not need you to answer that question unless you want to.

WITNESS CAPODANNO: Mr. Pollard, we identified in Table 1 of the attachment to Exhibit 15 GDC 44, and that GDC does make reference to a suitable redundancy in components

and features, and it also -- let's see. Well, it makes mention of suitable redundancy in components and features, which is one basis for drawing the conclusion about what you asked.

BY MR. POLLARD: (Resuming)

Q But there is nothing in your exhibit for GDC 44 that talks about the separation of Class 1-E circuits, is that correct?

A (WITNESS CAPODANNO) That is correct. It does not specifically say Class 1-E circuits.

Q And it does not say anything about separation either, is that correct?

A (WITNESS CAPODANNO) Are you referring to the text of the GDC or the table in our exhibit?

Q Well, I thought you had referred me to the table under GDC 44.

A (WITNESS CAPODANNO) I actually mentioned both. That is what I am a little unclear. However, in either event I don't see the words you mentioned.

(Pause.)

Q Mr. Lanese, when you answered you said you thought this came from the series 20, the 20, 21, 22, 23, 24, which you said you did not think applied to emergency feedwater, is that correct?

A (WITNESS LANESE) That is correct. But I think

again in order to explain what I mean by the applicability of GDC 44, those general design criteria are the places where protective system instrumentation and control system criteria are spelled out. They had a particular applicability, and in the absence of any other criteria they are applied in a limited manner to designing the ultimate heat sink systems.

Q Now, on your exhibit on Table 1, page 3 where you are talking -- excuse me -- page 4 where you are talking about compliance with GDC 44, you indicate that at the time of restart it will be partially not in compliance with GDC 44, is that correct?

A (WITNESS LANESE) That was with respect to other events. That is correct.

Q And would you agree that if you don't meet GDC 44 you might also not meet the requirements of series 20 of the GDC?

(Pause.)

A (WITNESS LANESE) In the context of our remarks as to why we are in non-compliance I agree.

Q Okay. Referring to paragraph 3 on page 2.1-42 of the Restart Report it states that, "The initiating logic will include hardware for the following purposes," and it specifica' mentions testability of the initiating circuit. This testability of the initiating circuit, will

the be completed and installed prior to restart?

A (WITNESS CAPODANNO) Yes, I believe it will.

Q Is there any difference between the testability of the initiating circuit mentioned on page 2.1-42 with the testability we talked about on page 2.1-27?

A (WITNESS CAPODANNO) I think perhaps there might be in the sense we have mentioned on the top of page 2.1-42. Some initiating signals that we have identified would not be in the plant for restart. So the extent --

Q If the circuits are not there, obviously they cannot be testable.

A Yes.

Q I understand that.

CHAIRMAN SMITH: Ms. Weiss, I have lost the train of the testimony on your cross examination plan. Could you --

MS. WEISS: We have been off the cross examination plan ever since we got the witnesses' answers that they did not think any of the other GDC applied. So after that paragraph, which is question 6-J, we have not been back to that yet. We are working our way around back to it.

CHAIRMAN SMITH: So you got to page 3.

MR. POLLARD: We have covered everything on page 3 except the last paragrah.

CHAIRMAN SMITH: Except the last paragraph.

DR. JORDAN: I need some clarification. With regard to control of flow in the emergency feedwater system, I thought I understood that this would be done manually in case the integrated control system was not working.

WITNESS CAPODANNO: That is correct.

WITNESS LANESE: That is correct.

DR. JORDAN: That is correct?

WITNESS LANESE: Yes.

DR. JORDAN: I see. So that in that sense then it does not meet the criteria.

WITNESS LANESE: I think our major objection to -- our major difference with the criteria is we do not feel that automatic and immediate flow control is necessary to meet the acceptance criteria for the event.

DR. JORDAN: I see. So initiation will be automatic.

WITNESS LANESE: Yes.

DR. JORDAN: It is the control that is not. This is just for my information.

WITNESS LANESE: If the ICS does not work, then that is right.

DR. JORDAN: I see. Thank you.

BY MR. POLLARD: (Resuming)

Q Paragraph 4 on page 2.1-42 of the Restart Report states, "Indication will be provided in the control room to

identify the source of the initiation." Will that be provided to restart?

A (WITNESS CAPODANNO) Yes.

Q Which general design criterion or NRC regulation requires such indication?

MR. BAXTER: Objection. No foundation. There has not been any testimony that it is required by any NRC regulation or general design criterion. I also fail to see the relevance of whether our motivation in putting it in is to be responsive to a regulation or whether we are doing it for some independent reason.

MS. WEISS: I think the point is that we got an answer that a lot of the general design criteria do not apply. We are now attempting to make a showing that in fact they do, and one of the ways to make that showing is to show that in fact they are the criteria which compel the various steps which are being taken to upgrade emergency feedwater.

Now, if the licensee's position is going to be they are not required by the general design criteria but we have decided to do them anyway, well, maybe that -- then that is something we have to know. But in our view it makes an important difference because if what I take to be the licensee's position is the correct one, then they have an option whether or not to comply with other portions of the general design criteria; and we do not believe that there is

an option.

MR. BAXTER: My concern was they are not asking the witnesses why was this upgrade undertaken; did you do it in response to a regulation or what you viewed to be an applicable general design criterion. The question was which one was it. And I just think they are one step ahead of what the testimony is.

MS. WEISS: I don't think we need to ask the question the way you want it asked.

MR. BAXTER: We have a larger problem about the general design criteria which I can argue from the regulations without a witness, but it may go to the worth of spending this much time on the subject, and that is, the effective date of that entire appendix to 10 CFR Part 50 which falls in 1971. And I believe that is -- well, after the construction permit issued for this unit.

MS. WEISS: If that is going to be their position then, you know, let's hear it. But in our view one defines the reliability of a system primarily by reference to the general design criteria. In other words, if you comply with them, I think that be definition you have a reliable system. If you do not comply with them, then there is a good argument that you do not have a reliable system. And it is in that context that we think it is important to know from whence cometh these requirements, and we are asking

these specific questions with regard to Table 1 of Exhibit 15 which is entitled "Evaluation of TMI-1 EFW System Using the General Design Criteria of 10 CFR Part 50, Appendix A." Certainly that gives us the right to ask about the other GDC that are not listed on the table.

It seems to me that they have waived their right to argue that Appendix A does not apply. This is your testimony. Is it your testimony that you can pick and choose among the GDC? If so, we have a right to find out the basis upon which you do so.

MR. BAXTER: Mr. Chairman, I am not going to respond to Ms. Weiss, and I have not objected to questions that went to other GDC. My objection is that instead of asking the question why was a particular modification made -- was it made in response to a general design criterion, the question is which general design criterion required it, and the witness has not testified.

CHAIRMAN SMITH: You made a similar objection earlier. Mr. Pollard said if it was necessary he would ask it as a preliminary matter. Then we went on and seemed to be doing quite well, but I suppose we can accomplish that.

Now, I think the point that you are making, your broader point, I guess it can be established on redirect if you'd prefer. I think, though, the record might be better, however, if it were established at the time the point was

brought up. However, that is your option, but I do think that the record would be better.

MR. BAXTER: I see a difference between this objection and the one earlier. The one earlier was do you meet a particular general design criterion, and I objected that they had not shown which one applied.

MS. WEISS: We are going to ask another question.

MR. BAXTER: This one is which criteria motivated you to make a change, and they have not testified that any did.

CHAIRMAN SMITH: He is perfectly capable of saying that.

MS. WEISS: We are going to ask another question. In any case, I have lost track of what the original one was.

MR. POLLARD: I will withdraw the question and start again.

BY MR. POLLARD: (Resuming)

Q With respect to paragraph 4 on page 2.1-42, would you agree that IEEE standard 279-1968 requires such indication?

(Pause.)

A (WITNESS LANESE) I would agree that it is a requirement of that standard.

Q And paragraph 5 on page 2.1-42 of the restart report states that, "Annunciation will be provided in the

control room to alarm autostart of the emergency feedwater system. This will be a common alarm for both the trains and initiating conditions being bypassed. This will be a common alarm for all initiating conditions associated with the same train."

Will that annunciation described in paragraph 5 be provided prior to restart?

A (WITNESS CAPODANNO) Yes, it will.

Q Would you agree that IEEE standard 279-1968 requires such annunciation?

(Pause.)

A (WITNESS LANESE) Yes, I agree.

CHAIRMAN SMITH: One of the things that is confusing me -- I think it might be helpful -- one of the things that has tended to confuse me during this current debate is that the Restart Report along this line has followed roughly the requirements of the hearing order, and when -- not exactly, not in detail, but almost in the same sequence.

What is, in your view, the difference between you and these witnesses? These are requirements, general requirements of the hearing order as short-term actions, 1-A, which in turn references the emergency feedwater systems -- system. So could you explain -- I mean just for guidance. I am not trying to suggest there is anything

wrong with your cross examination or anything else, but I would like to know just where we are.

MS. WEISS: I think it is our position that in response to the Board question asking generally about the reliability of emergency feedwater, which is a very pertinent issue, that the primary way in which you judge that is with reference to the general design criteria. And to the extent that -- if it were really true -- if it were true, let me with out prejuding the matter, if it were true that the licensee met all the GDC that we have discussed, then it would not matter whether they thought they applied or not. That would be of no importance.

But this is the first in the line of questions, I think, to get at whether they are fully met, and the first thing we needed to ask was do they apply, and we are now going to get into whether they are in fact met.

Now, as far as the argument goes later on, I anticipate from my knowledge of where we differ on my intepretation of the facts that we may argue that certain portions of the GDC are not met, where the licensee may argue that they are and that it may become -- then it would become important whether or not they in fact apply. So it is really two stages. The line of questioning has to involve, I think, both stages.

Did that help at all?

CHAIRMAN SMITH: Yes. That aspect of it was pretty apparent, but then there is another aspect of the debate which Mr. Baxter has raised which I do not understand quite what your position is, and I am not sure I understand Mr. Baxter's point entirely either.

I think it would be helpful if it could be discussed thoroughly at this point. We could excuse the witnesses while this discussion is going on, although I am wondering for that matter whether the witnesses' judgment as to the applicability of the GDC is binding upon the licensee anyway, but that is a different matter.

I just think we need a better demonstration of what is happening here, just the finer points of the dispute between the parties.

MS. WEISS: I can tell you that our opinion is that all of the GDC that we have gone over today, in addition to the ones listed in the table, apply to emergency feedwater. And it is our position that certain of them are not met.

CHAIRMAN SMITH: Okay. Mr. Baxter, could you tell us then what your objection is to this line? Already you said you don't like this because da, da, da, da, because it assumes that they are doing what they are doing because they are required by the general design criteria.

MR. BAXTER: That is correct.

CHAIRMAN SMITH: Could you elaborate on that a little bit?

MR. BAXTER: It really is not -- it is really not a deep philosophical position, Mr. Chairman. It is simply that it is not clear to me from the examination we have had that necessarily all the things that are being done to modify the emergency feedwater system before restart were done based on licensee's or anyone else's analysis of the general design criteria.

CHAIRMAN SMITH: And then we went from there saying all right, you will have your chance to do that on redirect, but it would be better, if you prefer, for it to be established now because now you are done with that line of questioning.

MR. POLLARD: Almost. I have two minor questions first, then we will go back to our cross examination plan.

CHAIRMAN SMITH: Okay.

BY MR. POLLARD: (Resuming)

Q I am now referring to Supplement I, Part 1, question 10-G as in "George." There is no page number or amendment number noted of that section of the Restart Report up here apparently.

A (WITNESS LANESE) We do not have that section of the restart up here apparently.

Excuse me, we do have that section of the restart report up here.

CHAIRMAN SMITH: Question 10?

MR. POLLARD: Question 10G.

DR. JORDAN: I find Questin 10 and Question 11.

CHAIRMAN SMITH: Question 9, no Question 10G.

MR. BAXTER: Supplement 1, Part 1.

CHAIRMAN SMITH: Supplement 1, Part 2.

DR. JORDAN: But you want --

MR. BAXTER: Part 1.

DR. JORDAN: That is what I meant.

MR. POLLARD: Is everyone ready?

BY MR. POLLARD: (Resuming)

Q In Question 10G, the NRC stated, "We require that the emergency feedwater system should possess the capability to automatically terminate auxiliary feedwater flow to a steam generator and to automatically provide feedwater to the intact steam generator."

My question is, on your response you indicate that you do have provisions to isolate the flow to the depressurized steam generator. My question is are such features at the time of restart in compliance with the single failure criterion?

(Pause)

A (WITNESS LANESE) Yes, in one sense only, and that is that obviously we could get into a situation in which there is no immediate emergency feedwater supply to either steam generator. The consequences of that event are not unacceptable.

Q I am sorry. Perhaps I did not phrase my question correctly. With respect to the function of terminating flow to the steam generator which has been depressurized, which presumably has a leak, is the function of terminating flow to that steam generator in compliance with the single failure criteria?

A (WITNESS LANESE) I'm sorry, I did misunderstand the question. No, it would not be.

Q And that in the long term you are going to make modifications after restart such that it would be, is that correct?

A (WITNESS CAPODANNO) Yes.

A (WITNESS LANESE) The additions of the cavitating venturis.

Q And also the addition of another regulator valve in parallel with the 30A and the 30B, as well as the addition of two new isolation valves for those regulator valves.

A (WITNESS LANESE) No, that is not correct. We

would meet the -- meet that criteria by virtue of the cavitating venturis alone, so we would not automatically terminate flow. We would limit it sufficiently that it could be manually terminated without any undue effects.

Q I am sorry, I will have to ask one more question.

The staff's position was this has to be done automatically. As I understands your answer now, you are going to add cavitating venturis for the purpose of allowing more time for the operator to do it, is that correct?

A (WITNESS LANESE) Yes. I think that Question 10G is somewhat misleading because the staff, again, in standard review plan 10.4.9, in one section it says exactly that, that you have to automatically terminate emergency feedwater, but in another section states that you have to either terminate or limit emergency feedwater flow.

Q Can you please tell me which section that is that says you have to terminate, or --

A (WITNESS LANESE) It is page 10.4.9-7.

Q And how did you decide to choose between terminating or limiting?

A (WITNESS LANESE) We have been fairly consistent in that from the design of TMI 2 in that we believe that the cavitating venturis represent a better design option than complete termination of flow.

MR. POLLARD: Mr. Chairman, for your information,

I am going back to the standard review plan now, the cross examination plan, the last paragraph on page 3.

CHAIRMAN SMITH: Before you proceed, I notice that Mr. Levin has appeared.

Did you just drop in as an observer, Mr. Levin, or did you have business you would like to bring up?

MR. LEVIN: I am just an observer today.

BY MR. POLLARD: (Resuming)

Q If we can go back, now, to Table 1 of Licensee Exhibit 15, the title of the table states "Evaluation of Three Mile Island 1 Emergency Feedwater System Using the General Design Criteria of 10 CFR 50 Appendix A."

My question is in preparing Table 1, did you evaluate whether or not the essential auxiliary supporting systems for emergency feedwater meet the General Design Criteria of Appendix A?

(Pause)

A (WITNESS CAPODANNO) Yes. I think that was considered in the overall answer.

Q If you did so, I am puzzled by the absence from Table 1 of General Design Criterion 17 that deals with electric power systems.

A (WITNESS CAPODANNO) Again, we tried to make the point earlier that this table is looking at the system itself, and that you could expand into some of the items we

have discussed today and Friday, such as HCIC systems, electric power systems. We did not do that for the purposes of Table 1.

Q Perhaps I misunderstood your answer, then. When you were preparing Table 1 and listing those GDCs which you either complied with or did not comply with, you did not consider whether the essential auxiliary supporting systems comply or do not comply.

A (WITNESS CAPODANNO) I understood your question to be did we evaluate it and include responses for those supporting systems in Table 1.

Q Yes.

A (WITNESS CAPODANNO) My answer is we looked at the supporting systems, we did not include specific responses for the supporting systems in Table 1.

Q So that from your testimony we determine whether the essential auxiliary supporting systems for emergency feedwater comply or do not comply with the General Design Criteria, is that correct?

A (WITNESS CAPODANNO) I think in answer to one of the earlier questions in the written testimony we did identify these or lack of effects of supporting systems on emergency feedwater operation. That is not specifically included in the table. It is given in the direct testimony.

Q Yes. But as I recall the direct testimony, you

did not discuss specifically whether the supporting systems meet or do not meet particular General Design Criteria, isn't that correct?

A (WITNESS CAPODANNO) That is correct.

Q The first entry on Table 1 deals with General Design Criterion 2, which covers design bases for protection against natural phenomena, and you state that the Licensee has become aware that some of the valves within the emergency feedwater system do not fully satisfy seismic Class 1 requirements.

My question is how did you become aware of this fact?

A (WITNESS CAPODANNO) By reviewing documentation on the emergency feedwater system such as the diagrams that are in the restart report and other documents lists and such that are in-house which are not included in the restart report, and tracing those back through files to ultimately stress reports for the valves within the system.

Q And this was done after the Three Mile Island Unit 2 accident, is that correct?

A (WITNESS CAPODANNO) Not entirely. My understanding is, at least in the instance of two valves, the FE 30A and B valves, that was identified prior to the accident.

Q I am correct that the restart report did not exist

until after the Three Mile Island Unit 2 accident?

A (WITNESS CAPODANNO) Yes, that is correct.

Q Which valves do not fully satisfy seismic Class 1 requirements other than the two you just mentioned?

A (WITNESS CAPODANNO) At this point I am not certain that any of the other valves do not meet the seismic criteria.

Q But you are reviewing all the other valves, is that correct?

A (WITNESS CAPODANNO) Yes, sir.

Q Of the valves you reviewed so far, are you certain some of them do meet the requirements of GDC 2?

A (WITNESS CAPODANNO) Am I certain that some of them do?

Q Yes, sir.

A (WITNESS CAPODANNO) Yes, sir, that is my understanding. The ones that have been reviewed do satisfy seismic criteria.

Q So the status of your review is you have identified some valves that do meet GDC 2, some valves don't, and you are still reviewing the other valves?

A (WITNESS CAPODANNO) Outside of the No. 30 valves, I am not aware of any that have been reviewed to date that do not meet seismic criteria.

Q But you are still conducting the review.

A (WITNESS CAPODANNO) Yes, it is still being completed.

Q Licensee Exhibit 15 indicates that the future system will fully comply with GDC 2, but that at the time of restart you will not fully comply with GDC 2.

Why do you intend to continue your work on Three Mile Island Unit 1 to make sure it does comply with GDC 2?

A (WITNESS CAPODANNO) I think there is something I have to give a little bit of explanation on. This system was designed to an older set of criteria --

DR. JORDAN: What?

WITNESS CAPODANNO: To an older set of criteria to define seismic events, and in those days you identified operating basis earthquake and design basis earthquake. Current terminology and design practice is a little bit different in that first of all it refers to safe shutdown earthquake and one half of safe shutdown earthquake, and does not establish the criteria in the same way, and in fact, from what I am aware of, the seismic loadings under the old criteria appear to be more conservative, that is, higher than you would come up with under the new criteria.

So what we are reviewing this for is to see whether or not in every instance we do or dso not satisfy either all the old criteria or the new criteria. It is difficult when terminology changes to say that you do or do

not meet a specific criteria, and that is the intent of this review, to find out where we stand in terms of current criteria, and then be able to answer a question such as do you or do you not fully meet GDC 2 as it is currently written.

BY MR. POLLARD: (Resuming)

Q In the future, in your continuing investigation, if you find any deficiencies you will correct them so that in the future system you will fully comply with GDC 2 as now interpreted?

A (WITNESS CAPODANNO) That is correct.

Q Why are you making this effort?

A (WITNESS CAPODANNO) Because we have always identified that this system was seismically supported, and I will say that in order to satisfy the question of is it or is it not seismically supported, we would conduct this review and then make changes appropriately so that it would remain seismically supported.

Q So when you complete this review, you will have a high degree of assurance that the system meets GDC 2 as presently interpreted, and therefore would have a high degree of assurance that the plant design is safe.

A (WITNESS CAPODANNO) I would not say that. I think the seismic criteria, since they have changed, lead you to have to make this investigation and come to the

ultimate decision. My feeling right now is that this system is in fact seismically supported, and quite conservatively designed, and will satisfy the current criteria with the net result that there will be no change to the system.

Q You did identify two valves. Which two valves were those?

A (WITNESS CAPODANNO) EFV 30A and B.

Q Do you intend to modify those valves or their separate systems in the future?

A (WITNESS CAPODANNO) If the review, when completed of those valves, identifies that they do not satisfy Seismic 1 criteria, they would be modified, yes.

Q And the present schedule calls for that review to be completed after restart, is that correct?

A (WITNESS CAPODANNO) I think that effort is ongoing now. It quite probably could be done before restart. That is my understanding.

Q Is it your position that it must be done before you are willing to restart the plant?

A (WITNESS CAPODANNO) No, sir, I do not think it has to be.

Q With respect to Valves EFV 30A and 30B, what is the status of your review with respect to those valves? Have you determined that they do not now meet the present interpretation of GDC 2?

A (WITNESS CAPODANNO) I am not positive of the answer to that for the reason that there was a report done earlier -- when I say earlier, by the equipment manufacturer -- that we are obtaining with the other valve seismic reports. I understand from others -- and this is not based on any evidence that I have seen -- that those reports at least tend to indicate that the valve would have to be modified to comply fully with Seismic 1 requirements.

Q And that is the basis or at least part of the basis for indicating on Table 1 that at the time of restat, Three Mile Island Unit 1 will not fully comply with GDC 2?

A (WITNESS CAPODANNO) Yes.

Q And it is also your position that it need not fully comply with GDC 2 prior to restart.

A (WITNESS CAPODANNO) Yes.

Q What is your basis for saying, then, that the plant is safe enough to restart?

A (WITNESS CAPODANNO) The seismicity review that is identified in both the TMI 1 and TMI 2 final safety analysis repo ts indicates that the seismic loadings in the area of the plant are significantly below, I think by a factor of one-half, those used for design of this piping system and the valves in particular. That is, I believe the historical record shows the seismic loading to be .03 G; the operating basis earthquake which is used for the design of this piping

system indicates a .06 G loading. Consequently, on that basis alone, and the fact that the seismicity information given in both of those final safety analysis reports covers a period of some 200 years that we have small likelihood of an earthquake of such magnitude that it would really affect these valves. That is, historically there has not been an earthquake of even the OBE magnitude; and secondly, the one that has occurred, the greatest magnitude was only half of that for which the valves were designed at operating basis earthquake conditions. I think that that is my basis, really, for making the comment.

Q So at least part of your basis, then, is your assessment of the likelihood of such an earthquake.

A (WITNESS CAPODANNO) Both the likelihood and the magnitude, yes.

A (WITNESS LANESE) I think there is another point to that. We have not determined it clearly, but all of those valves will function under the OBE earthquake loadings. So the additional review that is under way now is to be sure that they would not only stay -- we already know they would stay intact for an SSE. We have to verify that they would indeed function during an SSE.

A (WITNESS CAPODANNO) SSE being safe shutdown earthquake.

MR. POLLARD: Mr. Chairman, I know we had an extended break, but I would prefer to have our afternoon break now.

CHAIRMAN SMITH: Okay.

MR. POLLARD: In fact, I have to.

CHAIRMAN SMITH: I will return at 3:15.

(Recess.)

CHAIRMAN SMITH: Mr. Pollard.

BY MR. POLLARD: (Resuming)

Q We will return now to page 3 of Table 1, Licensee Exhibit 15, where you are discussing the extent of compliance with general design criterion 4. Did I understand you earlier that you are now unable to demonstrate compliance with GDC-4 for a high energy line break?

(Pause.)

A (WITNESS CAPODANNO) Is the question did we say we are now able to comply with environmental conditions for high energy break?

Q I was just trying to recall. Your earlier testimony today, as I understood it, it was that at the present time the emergency feedwater system equipment is not environmentally qualified to withstand a high energy line break in the intermediate building; is that correct?

A (WITNESS CAPODANNO) Not quite. I think what we

said is that there is a review going on, and without all the results in we are not sure whether every component is or is not qualified for those conditions.

Q So you are unable now to demonstrate that it is qualified?

A (WITNESS CAPODANNO) That is correct, yes.

Q Do you know when or -- when will you be able to make such a demonstration?

A (WITNESS CAPODANNO) I am not totally sure of that, for the reason that in doing that review information has been requested from equipment manufacturers and I really do not know when each one of those is going to provide that information.

Q But it's your position that it need not be done prior to restart, is that correct?

A (WITNESS CAPODANNO) That is what we said, yes.

Q When did you discover this potential problem with environmental qualification of emergency feedwater?

A (WITNESS CAPODANNO) It came out of the review required by I&E Bulletin 79-01B.

Q When was that bulletin issued, approximately?

A (WITNESS CAPODANNO) I am sorry. Repeat the question?

Q When was I&E Bulletin 79-01B issued?

A (WITNESS CAPODANNO) Some months ago. I am really

not sure of the date.

Q Does the 79 indicate it was some time in 1979?

A (WITNESS CAPODANNO) I believe it does, yes.

A (WITNESS LANESE) I can be more specific about the timing of that, because I was involved in the identification of the problem. It was approximately -- it was some time this summer that we reviewed the blowdown data for the steam line break accident inside the intermediate building and determined that it was nonconservative with respect to our plant design, and initiated a re-review and re-analysis of the intermediate building environmental conditions. And that was completed late August or early September, the re-analysis was completed.

Q With reference to Remark C, page 2 of Table 1, where you say, "Licensee has identified that a postulated break in the main steam supply line to the emergency feedwater pump turbine could whip and damage the common emergency feedwater pumps discharge line," is it your position that a break in the main steam line to the emergency feedwater pump turbine is an accident you are required to protect against?

A (WITNESS CAPODANNO) Yes.

Q And as I understand the further sentence in the remark, "The Licensee is providing a rupture restraint to protect the emergency feedwater line from the main steam

line prior to restart of Three Mile Island 1."

Am I correct that putting in restraints will not preclude the break; it will just prevent the pipe from whipping, is that correct?

A (WITNESS CAPODANNO) Yes.

Q Well, if we could still have the pipe break, then you do not know or cannot demonstrate yet that the emergency feedwater equipment can withstand that environment? What is your basis for saying that the plant is safe enough to restart?

A (WITNESS LANESE) I think it comes down to the discussions we had this morning. It is not the situation that any break of any size in the intermediate building is going to disable the entire emergency feedwater system. The previous analysis demonstrated that for a temperature profile of something on the order of 320 or 330 degrees, that the system would survive.

What we have seen is that under the new assumptions for the guillotine rupture of the steam lines, that the profile approaches 350 degrees for some period of time. So again, the situation is that for most breaks the equipment appears to be satisfactory. For the instantaneous -- for the very sudden guillotine rupture, we have not been able to demonstrate acceptability. And we do not believe that that in itself is a significant risk for one-cycle

operation.

There is some other background to that also. I believe -- it was before my tine, but one of the licensing bases for TMI-1 was that breaks in the intermediate building were not postulated, because there was a requirement to do a 100 percent radiographic inspection of the steam line. So the original licensing basis for the plant was that they were -- breaks in that building were not likely.

Q But I keep recalling your testimony that you are still in the process of completing your review of the environmental qualification of emergency feedwater system components, and you cannot now demonstrate that for the range of breaks in the intermediate building, that for all such breaks the emergency feedwater system will remain operable; is that correct?

A (WITNESS LANESE) That is correct.

Q And is it correct that I&E Bulletin 79-01B covers more in terms of environmental qualification than just looking at high energy line breaks in the intermediate buildiong?

A (WITNESS CAPODANNO) Yes, I believe it does.

(Counsel for UCS conferring.)

Q Have you completed the reviews required by I&E Bulletin 79=01BA

A (WITNESS CAPODANNO) I think I have to explain my

answer a bit.

Q Could you answer, please, yes or no, and then explain it, please, if that is possible?

A (WITNESS CAPODANNO) I do not think it is, for this reason. Some information has been obtained from which you can draw conclusions. There is some information that has not been obtained. A survey, if you will, a look at all the equipment that is impacted by all the requirements has been done.

Many of the vendors of that equipment have provided the information. Others have not.

BY MS. WEISS:

Q Are you finished your answer?

A (WITNESS CAPODANNO) Yes.

Q Your answer, then, is no, you have not completed the requirements of I&E Bulletin 79-01B?

A (WITNESS CAPODANNO) Yes, I agree with that.

Q Could you briefly explain what the I&E Bulletin called on you to do? We will be going into more detail with witnesses who are specifically talking about environmental qualification.

A (WITNESS CAPODANNO) My understanding is the I&E Bulletin applied to electrical equipment outside containment and required a review of the capability of that equipment to withstand environmental conditions, including high energy

line break and radiation.

Q I am sorry. Wasn't -- I thought you said outside containment. Didn't it also apply to electrical equipment inside containment?

A (WITNESS CAPODANNO) I do not believe it did.

Q Didn't that bulletin require you to identify -- to come up with a master list of all electric equipment required to be environmental qualified pursuant to GDC-4?

A (WITNESS LANESE) Can we go back for a second, because I think you are correct in that it required that equipment inside containment be considered. But the requirement was that if -- rather, if there was an automatic building spray initiation system, that the LOCA environmental qualification was considered bounding by the staff.

Q Okay.

A (WITNESS LANESE) So we made it in that sense. We have LOCA qualified equipment, and that is still the most severe environment for breaks inside containment.

Q Okay. But the question I am trying to establish is, what were the requirements. And we will discuss later in what way you met them or have not yet met them. But am I correct that the bulletin, the first thing which the I&E Bulletin required you to do was come up with a master list of all equipment covered by General Design Criteria 4 which

is required to be qualified to withstand the accident environment?

Whichever one of you knows the answer to that; if Mr. Lanese does -- you might have indicated you had more familiarity with the document.

A (WITNESS LANESE) I am not sure that I can answer. I think I am generally familiar with 79-01B. I am more familiar with the aspect I just discussed.

CHAIRMAN SMITH: I am having a hard time following how this is related to emergency feedwater.

MS. WEISS: The implication of the table, particularly page 2 of the table dealing with GDC-4, is that the only problem with environmental qualification is this high energy line break. It is my understanding that that may be the only piece of equipment which has been specifically identified to be unqualified, but they have not yet been able to demonstrate or they have not completed demonstrating along the broad range of equipment, but they have documentation to prove that it is qualified.

That is the purpose of these questions.

MR. BAXTER: In the emergency feedwater system?

MS. WEISS: Yes.

CHAIRMAN SMITH: How did you get inside the containment?

MS. WEISS: I got inside the containment because

the witness answered that the bulletin applied only to outside the containment. It was my understanding it applied to all electrical equipment. That was just a clarifying question.

CHAIRMAN SMITH: All right.

BY MS. WEISS: (Resuming)

Q Let me ask you in summary fashion, if it is not accurate that Met Ed has not yet been able to demonstrate that all equipment required to be qualified under General Design Criterion 4 is in fact qualified?

MR. BAXTER: Is the question limited to the emergency feedwater system or the entire facility? If it is the latter --

BY MS. WEISS: (Resuming)

Q Limited to emergency feedwater.

A (WITNESS CAPODANNO) In responding to 79-01B, I think the answer is yes, we have not been able to demonstrate full compliance with the requirements of that. In regard to Criterion 4 which you mentioned, I just have some trouble in that. I am not certain that one can say that is a mandatory requirement on us or someone else, for that matter. And the reason I am a bit hesitant is that, as was mentioned by someone earlier, this plant was designed to an earlier set of GDC's. These have come along after TMI was licensed and operated.

Q Are you familiar with the Commission's decision CLI-8021 and the DOE guidelines on environmental qualifications?

A (WITNESS CAPODANNO) I don't believe I am, no.

Q We are going to get into that in detail, so, with your explanation of why you qualified your answer, I think that will suffice at this point and we will take up the detailed questions with a witness who is more intimately familiar with environmental qualifications.

BY MR. POLLARD: (Resuming)

Q Returning now to page 3 of Licensee Exhibit 15, item 3 discusses the degree of compliance with General Design Criterion 5. Am I correct that the principal reason you have identified full compliance with this criterion is that there really are no shared portions of the emergency feedwater system?

A (WITNESS LANESE) That is correct.

Q As I understood it earlier, you did not include in Table 1 general design criteria that were not applicable?

A (WITNESS CAPODANNO) As we explained, those we felt that were not directly applicable to emergency feedwater.

Q If you could just briefly tell me why GDC-5 is appicable to the Three Mile Island Unit 1 emergency feedwater systems, when those systems do not share any

components between Units 1 and 2?

A (WITNESS LANESE) I think there was an additional reason why we put some of the GDC's in, namely that they were referenced in the standard review plan, and GDC-5 was specifically.

Q You are referring there to what section?

A (WITNESS CAPODANNO) 10.4.9.

Q Thank you.

On the next, item 4 discusses the degree of compliance with General Design Criterion 19, which deals with the control room. You talk about in your remark communications between the alternate shutdown locations and the remote shutdown panel. Now, this remote shutdown panel, will that be completed prior to restart?

A (WITNESS CAPODANNO) First of all, I am not certain that what you said is what we wrote.

Q All right. I am sorry. I tried to summarize, and I shouldn't do that. Let me read what you wrote.

CHAIRMAN SMITH: Well, all right.

MR. POLLARD: It is my fault for trying to speed things up, and I guess I just cannot do it.

CHAIRMAN SMITH: All right, go ahead.

BY MR. POLLARD: (Resuming)

Q "Means for controlling the emergency feedwater system is provided in the control room. Alternate shutdown

locations for emergency feedwater control prior to completion of the emergency feedwater control from the remote shutdown panel will be located at the emergency feedwater regulating valves. An improved and reliable communications system between the control room and the emergency feedwater regulating valve area will be provided prior to restart of the TMI-1, which will allow the control room operators to direct the operators stationed at those valves."

My question was, in the second sentence where you referred to "prior to completion of the emergency feedwater control from the remote shutdown panel" -- my question was, will that remote shutdown panel be completed or the control of the emergency feedwater from that panel be completed prior to restart?

A (WITNESS CAPODANNO) I do not think it will be. I am not absolutely certain, however.

Q And what will be done from this remote shutdown panel when it is completed? Under what conditions would you be using it and what would be done at the remote shutdown panel?

A (WITNESS CAPODANNO) There are a number of instruments, such as steam generator level, reactor coolant system instrumentation, that is included in this remote shutdown panel to allow operation or shutdown of the plant

from outside the control room in the event of a control room fire.

Q Am I correct that there will be some instrumentation at the remote shutdown panel which is not available at the regulating valves?

A (WITNESS CAPODANNO) Instrumentation in the panel that is not --

Q That is not duplicated at the location of the regulating valves?

A (WITNESS CAPODANNO) At the valves themselves, yes, I believe that is correct.

Q Now, you say you are going to have an improved communications system between the control room and the regulating valve area; is that correct?

A (WITNESS CAPODANNO) Yes.

Q And do you recall that there will also be a communications system between the control room and the remote shutdown panel?

A (WITNESS CAPODANNO) I believe that is planned also.

Q My question is, will there be direct communication between the regulating valve area and the remote shutdown panel?

A (WITNESS CAPODANNO) I really do not know the answer to that.

Q Would you agree that in order to meet General Design Criterion 19, such a communications system would be required?

A (WITNESS CAPODANNO) I think when the remote shutdown panel is completed, it will have the capability to achieve the shutdown without the necessity of sending an operator to the location of the valves to manually operate them. And this improved communications system is defined as something that will be used in the interim.

CHAIRMAN SMITH: What was your question, direct communication?

MR. POLLARD: By that I meant instead of through the control room.

(Counsel for UCS conferring.)

CHAIRMAN SMITH: It seems to me that I could almost patch that up.

MR. POLLARD: If you wish to instruct Met Ed to install such a communications system, I can stop this line of questioning.

CHAIRMAN SMITH: I am just wondering if it is a quibble or a serious safety concern.

MR. POLLARD: That is why I was consulting with Ms. Weiss. We already have on the record emergency procedures which indicate it is necessary at the time of restart to communicate with both the regulating valve area

and the remote shutdown panel. And what I was trying to explore with these witnesses was that if you lost access to the control room you would not have this communication link.

CHAIRMAN SMITH: All right.

(Counsel for UCS conferring.)

BY MR. POLLARD: (Resuming)

Q Are you aware that there are emergency procedures which will be in effect for the plant design at the time of restart which require communications between the control room and the regulating valve area, as well as between the control room and the remote shutdown panel?

A (WITNESS CAPODANNO) Not specifically aware of those procedures, no.

Q Let's assume that that is the case, that there are procedures which require communication between the control room and the regulating valve area, and between the control room and the remote shutdown panel. And as I understood your earlier question, your earlier answer was that as far as you knew there would be no direct communication at the time of restart between the regulating valve area and the remote shutdown panel.

Now, assuming that is correct, everything I have just said, would you agree -- Mr. Lanese, are you shaking your head at me or someone else?

MR. BAXTER: I will shake my head.

WITNESS CAPODANNO: There is something in there, I am not sure I said it all.

BY MR. POLLARD: (Resuming)

Q Let me slow down. It is my fault again. One thing at a time.

Let me postulate for you that there are emergency procedures which require communication between the control room and the regulating valve area, and then require also simultaneously communications between the control room and the remote shutdown panel.

A (WITNESS CAPODANNO) Okay.

Q Now, did you not just answer a previous question of mine that at Three Mile Island you knew of no plans to have direct communication between the regulating valve area and the remote shutdown panel?

A (WITNESS CAPODANNO) I believe I said I am not aware of any plans to do that, yes.

Q I believe you also said you would not need such plans because when the remote shutdown panel is fully revised, you can control the valves from there.

A (WITNESS CAPODANNO) Yes.

Q Okay. Now, my question is a hypothetical one. That is, assuming that there is a need for communication between the control room and the regulating valve area and between the control room and the remote shutdown panel, and

that there is no direct communication between the regulating valves and the remote shutdown panel, under those conditions, would you agree that the design does not comply with General Design Criterion 19 if you lose access to the main control room?

(Pause.)

A (WITNESS CAPODANNO) I believe I would if your assumption includes the fact that you had no control from the remote shutdown panels for the valves that the operator would be at.

Q And then one followup question. Is it your position or Met Ed's position that the remote shutdown panel must be fully modified prior to restart?

A (WITNESS CAPODANNO) I am not sure what fully modified is intended to mean.

Q Well, I refer you back to your remark on Page 3 of Table 1, where you said, "prior to completion of the emergency feedwater control from the remote shutdown panel." With respect to whatever you are referring to in your own testimony, is it your testimony that those modifications or completion must be done prior to restart or not?

A (WITNESS CAPODANNO) No, I believe we said we did not feel that was the case.

Q With respect to your evaluation of the emergency feedwater system using today's interpretation of the general

design criteria, do I understand your testimony and your position to be that prior to the Three Mile Island Unit 2 acccident, the emergency feedwater systems of Three Mile Island Unit 1 were reliable, and you have made changes now, and the emergency feedwater system is more reliable, but you still don't meet some of the general design criteria at the time of restart?

A (WITNESS CAPODANNO) I think we have stated yes, that we have made these systems more responsive, more timely, and that, yes, we have said under some conditions we do not satisfy some of the requirements, that is, high energy line break.

Q It was also your testimony that before you made modifications, you had a reliable emergency feedwater system. Is that correct?

A (WITNESS CAPODANNO) Yes, we did say that.

(Pause.)

Q I refer you now to the text of Licensee Exhibit 15, and first Item 3, which appears on Pages 1 and 2, and more specifically the last paragraph of Section 3, which appears on Page 2, that states that each motor-driven pump discharges to a common discharge crosstie via check valves and normally open valves.

Am I correct that if there is a break in a steam line upstream of the main steam stop valve, that this could

lead to a severe overcooling event if emergency feedwater flow into that steam generator were to continue?

(Pause.)

A (WITNESS LANESE) You said a break upstream of the main steam isolation valve?

Q Yes, between the steam generator and the main steam isolation valve.

A (WITNESS LANESE) A blowdown of one steam generator essentially.

Q Yes.

A (WITNESS LANESE) Yes, that would be an overcooling event, certainly.

Q Is this common discharge crosstie between the pumps fully safety grade?

A (WITNESS CAPODANNO) I believe it is in the context of the seismic design with some of the qualifications that I mentioned earlier, and some of the environmental qualifications that I mentioned earlier.

CHAIRMAN SMITH: Metal qualifications?

WITNESS CAPODANNO: Environmental qualifications.

CHAIRMAN SMITH: Oh, environmental.

BY MR. POLLARD: (Resuming)

Q How many switches -- let me slow down.

How do you detect a broken steam generator pipe such as I have postulated for the purpose of isolating

feedwater flow to that steam generator?

A (WITNESS LANESE) On an individual steam generator there are pressure switches which would detect low pressure in the generator.

Q How many switches are there on each steam generator?

A (WITNESS LANESE) I believe it is four per generator.

Q Are those switches fully safety grade?

A (WITNESS LANESE) I cannot recall.

Q In preparing Exhibit 15, and Table 1, where you attempt to evaluate the compliance of the emergency feedwater system to the general design criterion, did you not examine the switches?

A (WITNESS CAPODANNO) Yes, we did make a comment to the effect on Page 11 of the text of the exhibit that upgraded main steam rupture detection system to meet safety grade requirements is one of the long-term modifications, and the reason for that is the same issue of environmental qualification.

Q And if these switches detect a low pressure in one steam generator, what action results?

A (WITNESS CAPODANNO) They are suppose to isolate fee[illegible]er to the affected steam generator.

Q By closing which valves?

A (WITNESS CAPODANNO) EFV 30 valves in the case of emergency feedwater.

Q And if that valve fails to respond, then feedwater would not be isolated. Is that correct?

A (WITNESS CAPODANNO) Emergency feedwater flow path would still be open.

Q As I understood you earlier, you will not have those cavitating venturis installed prior to restart. Is that correct?

A (WITNESS LANESE) That is correct.

A (WITNESS CAPODANNO) That is correct.

Q Item 5 of your exhibit, which beings on Page 2, is entitled Steam Supply for The Emergency Feedwater Turbine. And you state in the last sentence of the first paragraph, "Also connected to the steam lines are the ICS controlled atmosphere dump valves MSV 4A and B and main turbine bypass valves."

Considering that the integrated control system controls the atmospheric dump valves, is it possible for a failure in the integrated control system to result in an overcooling transient by signalling the dump valves to open and remain open?

A (WITNESS LANESE) It would be possible for an ICS failure to cause a dump valve on one steam generator to go open.

Q How many dump valves are there per steam generator?

A (WITNESS LANESE) One -- there are only two.

Q I did not know. That is why I asked.

Now, if a dump valve was fully opened, what effect would this have on the pressure in the steam generator?

A (WITNESS LANESE) There would be a gradual depressurization.

Q By gradual, how fast would the pressure drop and to what pressure would it reach?

A (WITNESS LANESE) Well, it is only 3 percent steam flow. So it would not be very rapid. If the turbine controlled header pressure the way it normally does, there would not be a depressurization of the steam generator.

Q Well, would the same -- What would happen to steam generator pressure if the main turbine bypass valves are stuck open?

A (WITNESS CAPODANNO) Maybe I should interject something here. I see that you are questioning the operation of these valves. There is another modification to be made on these valves prior to restart which is going to cause them to stay closed on an ICS failure.

In the case of the turbine bypass valves, they will simply fail closed if there is an ICS failure. In the case of the atmospheric dump valves, in addition to failing

closed on an ICS failure, a manual control for those valves is also going to be provided, with the consequence that if there is a failure in the ICS controls for these valves, they will fail safe.

Q When you refer to ICS failures, at least in your testimony last week, you were only referring to failures of the pipe such as loss of power.

A (WITNESS CAPODANNO) That is correct, yes.

Q As I understood your testimony, you did not evaluate the integrated control system for any other failure mode?

A (WITNESS CAPODANNO) Again, let me explain. That is correct, what you said about power failures in the testimony I was giving last week. My undertanding is, however, that for the modification of these valves, it is addressed to ICS failures, not specifically power supply failures, but failures within the ICS.

Q Then it is your testimony that there is no possible failure in the integrated control system that would result in sending a signal to the atmospheric dump valves and the main turbine bypass valves that would cause them to go open?

A (WITNESS CAPODANNO) It is my understanding that that is what the modification will achieve.

Q Did you personally do this evaluation?

A (WITNESS CAPODANNO) Not for these valves, no, sir.

A (WITNESS LANESE) I don't think Mr. Capodanno was saying there would be a single failure that might cause one turbine bypass or one atmospheric dump valve. I think he is saying there is no common -- there is no failure that would cause the opening of more than one valve. Or at least would not cause the opening of the atmospheric dumps and the turbine bypass valves.

BY MS. WEISS:

Q Is that what you meant, Mr. Capodanno?

A (WITNESS CAPODANNO) I think that is generally correct. I am really not familiar enough with the details of how this modification goes to provide those details.

Q Could you tell us where we can find a discussion of this particular modification?

A (WITNESS CAPODANNO) I do not know that any such description has been submitted.

Q Who told you about this modification?

A (WITNESS CAPODANNO) Discussion with instrumentation and control engineers in our company.

Q Was that over the weekend?

A (WITNESS CAPODANNO) No, ma'am. It was done several weeks before we got here.

Q Did they prepare a written document for you describing the modification, or did they simply tell you

their conclusion about its results?

A (WITNESS CAPODANNO) I did not get a written document. It was a verbal discussion.

Q Did they describe to you the modification or just its results?

A (WITNESS CAPODANNO) They described what the end results would be.

Q All right. So you cannot tell us today what this modification will consist of?

A (WITNESS CAPODANNO) In detail, that is correct, I cannot.

Q Can you tell us anything other than what you have been told about what its results will be?

A (WITNESS CAPODANNO) Not really.

CHAIRMAN SMITH: The question was, can he tell anything other than what he has been told?

MS. WEISS: What he has been told its results will be.

DR. JORDAN: But I gather what you have been told is that it will in a sense always be a safe failure, no matter what the failure is. It will always be in such a direction as to be safety grade -- be a safe operation.

WITNESS CAPODANNO: Yes.

DR. JORDAN: That, I guess, I have never been able -- I have tried to design protection systems which fail safe

always, and it is a very, very difficult requirement, so I guess I am interested in how one designs a piece of equipment that will always fail safe, no matter how it fails, whether it fails calling for an opening or calling for a closure. It will always fail in the right direction.

WITNESS CAPODANNO: I think Mr. Lanese's amplifying comment is what I intended, that we would not end up with simultaneous failures with all the dump valves wide open. There will be no relay or some such device that will cause them all to go open simultaneously. I think in that context fail safe is an appropriate term.

MS. WEISS: Mr. Chairman, I move to strike all references to this modification. The witness has nothing but the merest hearsay familiarity with it.

CHAIRMAN SMITH: You elicited the information in cross examination.

MS. WEISS: Not until I got the answer to the last question, can you tell us anything other than what somebody told you.

CHAIRMAN SMITH: That was not your question.

MS. WEISS: Yes.

CHAIRMAN SMITH: As a matter of fact, I had a question that I thought should be inserted here which would include everything. Can you tell us anything more about the valves and the fail safe features than what you have already

testified to?

WITNESS CAPODANNO: No.

CHAIRMAN SMITH: All right.

MS. WEISS: In light of that --

CHAIRMAN SMITH: Even in light of that, however, I do not think you can strike the answer. I think you can argue its weight, but it was an accurate answer to a question you inquired about on cross examination. I am certain that you will use it on proposed findings. No, it is denied.

MS. WEISS: I think it is prejudicial to leave on the record a reference to a system which we have been -- which this witness is not competent to testify to at all, and I realize that I will be able to argue the weight, but I just think that no reference should appear.

CHAIRMAN SMITH: I don't understand your concept of cross examination, how you can spend all this time cross examining the witness and then go through and pick and choose the answers on cross examination which were responsive to the questions.

Now, it would be another matter if you asked a question and then he went on a venture of his own with additional information, but that was not the case. You asked the question. You got the answer.

MS. WEISS: I had to ask a series of questions

before I could draw it out of the witness that he had no personal knowledge.

CHAIRMAN SMITH: Moreover, even -- well, your motion is denied. It is denied.

BY MR. POLLARD: (Resuming)

Q When these four pressure switches monitoring steam pressure monitor a depressurized steam generator, am I correct that they are actually measuring pressure in the steam generator and not differential pressure between the steam generators?

A (WITNESS LANESE) That is correct.

Q In your --

DR. JORDAN: Could I inquire just a bit about that? You measure the pressure in the steam generator, and if the pressure falls below a certain point, then you close the feedwater to that steam generator. Isn't that correct?

WITNESS CAPODANNO: Yes.

WITNESS LANESE: That is correct.

DR. JORDAN: Now, you say that you have more than one pressure indicator, so that they are redundant, I believe you said.

WITNESS CAPODANNO: There are four pressure switches per steam generator.

DR. JORDAN: All right. In what sense are they redundant? Are they redundant in that any one of those

pressure switches indicate -- indicating a low pressure indicate the need for emergency feedwater?

WITNESS CAPODANNO: I believe it is a two out of four logic. If any two out of four sense the low pressure, then isolation will occur.

DR. JORDAN: I see. That helps.

BY MR. POLLARD: (Resuming)

Q When you say that any two out of the four sense low pressure isolation would occur, what you really mean is, a signal would be sent demanding isolation?

A (WITNESS CAPODANNO) Yes.

Q But since we have only one valve to accomplish the isolation, it might not actually be accomplished?

A (WITNESS CAPODANNO) There are two valves.

Q There is only one valve per steam generator. Is that not correct?

A (WITNESS LANESE) No, it is not.

Q Could you please tell me which valves are signalled to close by the pressure switches?

A (WITNESS LANESE) Well, we were referring to main or emergency feedwater. I am sorry, maybe I misunderstood the question.

Q I am talking about emergency feedwater.

A (WITNESS LANESE) There is one valve in the emergency feedwater system and two valves in the main

feeiwater system that would receive a pressure signal in each generator.

Q And the two valves in the main feedwater system which are used to isolate feedwater flow, are those in series or parallel?

A (WITNESS LANESE) They are in series.

Q All right. Which two valves are you referring to? Are you referring to the main regulating valve and the startup regulating valve?

A (WITNESS LANESE) No. They are the main regulating valve, and the downstream block valve, and the startup valve and its block valve also get a closure signal, so really there are four.

Q Four valves?

A (WITNESS LANESE) Yes.

Q All right. That is four valves per steam generator.

A (WITNESS LANESE) That is right.

Q In your evaluation for the design of Three Mile Island Unit 1, did you agree that this plant is very sensitive to overcooling transients?

A (WITNESS LANESE) I think its sensitivity to overcooling has been somewhat exaggerated, but it is sensitive to overcooling transients, yes.

Q Are you aware that NRC at one time considered

stopping construction of B&W plants after Three Mile Island Unit 2 accident because of this extreme sensitivity, as they phrased it, to overcooling transients?

A (WITNESS LANESE) No, I do not remember that.

CHAIRMAN SMITH: Are you leaving this subject matter? Are you going to the next item?

MR. POLLARD: We are on the first paragraph, Page 5.

CHAIRMAN SMITH: I would like a short break before you leave this subject matter.

(Pause.)

MS. WEISS: I should note for the record that we are distributing to the parties and the Board a letter from Harold Denton, director of the Office of Nuclear Peactor Regulation, NSNRC, to Mr. S. H. Howell, vice president, Consumers Power Company, dated October 25, 1979, Subject, 10 CFR 50.54 Request Regarding The Design Adequacy of Babcock and Wilcox Nuclear Steam Supply Systems Utilizing Once-Through Steam Generators (Midland Unit Numbers 1 and 2), and an attachment to that letter entitled Primary System Perturbations Induced by Once-Through Steam Generator.

I would ask that that be marked at this time for identification as UCS Exhibit 10.

(The document referred to was marked for identification

as UCS Exhibit Number 10.)

MS. WEISS: Okay. I should also note, to be accurate, that there are additional enclosures, one entitled IREP-Initial Plant Study, and an Enclosure 3 entitled Preliminary Idntification of Systems and Components That May be Impacted by Design Changes.

This document was provided to the Board members previously, and --

MR. POLLARD: I should also add, Mr. Chairman, a similar letter was served by the staff in this proceeding. I did not use the letter the staff served because our copy was not reproducible.

MR. CUTCHIN: Mr. Chairman, I am having difficulty identifying the enclosures as the enclosures referred to, because some of the words are cut off at the top of the first page of the attachments. Could UCS spokesmen please give some more identifying words on the first so I can be assured that I have the appropriate attachments?

MS. WEISS: The first enclosure is entitled Primary System Perturbations Into Once-Through Steam Generator.

MR. CUTCHIN: Fine.

MS. WEISS: Is that all?

MR. CUTCHIN: That is all I need on Page 1, but when I go back, the pages are not numbered.

MS. WEISS: As Mr. Pollard said, this is a copy of a staff document, and to my knowledge, the pages of the enclosures were not numbered.

MR. CUTCHIN: Where does Enclosure 2 start?

MS. WEISS: Enclosure 2 starts four pages from the end.

MR. CUTCHIN: Could the UCS spokesman identify --

MS. WEISS: That is entitled IREP-Initial Plant Study. Enclosure 3 is the last page.

MR. CUTCHIN: That is sufficient, Mr. Chairman. Thank you.

MR. BAXTER: The representation is, all enclosures were sent with this letter?

MS. WEISS: Yes. The text of this letter to a different addressee, another B&W plant with all of the enclosures was served on all the parties in this case some time ago.

CHAIRMAN SMITH: This case?

MS. WEISS: This case, yes, by staff, I assume as part of its information dissemination function. And we did not copy that one because the reproduction, the quality was so bad, it was not reproducible. So, we went to the public document room and got another one.

CHAIRMAN SMITH: That is an interesting observation. I do not recall having seen this before.

Moreover, I was the chairman of the Operating License Board at Midland when this letter was issued, and I do not think I received it in that case either. And the service list does not indicate me.

Are you confident that we received this in this case?

MS. WEISS: Yes. We received another copy of the text to a different addressee.

MR. POLLARD: Tomorrow morning I will bring you in the letter which the staff served in this proceeding. I don't know what happened in the Midland proceeding.

MR. CUTCHIN: I am not challenging the authenticity, Mr. Chairman. I just wanted to make sure I had the appropriate pages.

MS. WEISS: I note that the letter notes on Page 3, the fourth paragraph from the end of the letter, it says, "We are sending similar letters to all utilities holding construction permits for plants with B&W nuclear steam supply systems."

BY MR. POLLARD: (Resuming)

Q Mr. Lanese or Mr. Capodanno, have either of you had occasion to review either this letter or any of the other similar letters which went to the other Babcock and Wilcox construction permit holders?

A (WITNESS CAPODANNO) I have not.

A (WITNESS LANESE) No. I have not, either. What I have seen, I believe, is some of the subsequent staff discussion in, I believe it is NUREG-0667.

Q If I could direct your attention, please, to Enclosure 1, a section which begins on the fifth page of Enclosure 1, captioned IV, Role of ICS-MFW, could you read that entire section, please, to yourself, which terminates in the middle of the next page?

MR. BAXTER: Mr. Chairman, there is no question posed yet, but I am going to have a problem. Neither witness has read this document before. Having them review isolated sections, having them respond to questions without having them read the full piece -- It is not a document they have prepared. They have just been handed it.

CHAIRMAN SMITH: I am not aware of any rule of cross examination that would prevent them from examining them on a portion of a document. The examination, of course -- I mean, it is going to have to be definite as to what language they are being examined on, but perhaps if there is going to be much examination on this document, we had better defer it until tomorrow and go to something else so that they can familiarize themselves with it.

MR. POLLARD: My goal, first of all, was to hopefully complete these witnesses today, but we could always change that. Also, as Ms. Weiss points out, I could

perhaps ask these questions without reference to any document.

CHAIRMAN SMITH: Yes.

MR. POLLARD: If the witnesses are unable, or they choose to wish to read the whole document overnight, that would also be fine with me.

CHAIRMAN SMITH: I think that the --

MR. BAXTER: Perhaps I need to wait and hear the first question.

CHAIRMAN SMITH: The approach you are taking of examining them on the points of Item IV when they have it before them has a better assurance of avoiding confusion than if you were to just propound questions to them. Let's give them plenty of time to read the section.

MR. POLLARD: Certainly. The reason we went here was, we were just talking about the integrated control system and its effect on feedwater, and that is why I am focusing on this section of the letter.

MR. BAXTER: We were talking on emergency feedwater and the integrated control system.

MR. POLLARD: And the witnesses also mentioned that there are valves controlled also in the main feedwater system.

MS. WEISS: Just let us know when you are --

MR. POLLARD: Tell us whenever you are finished

studying Section IV and as much of the letter as you choose to. I am only going to ask a few questions on Section IV.

(Pause.)

BY MS. WEISS: (Resuming)

Q Are you ready?

A (WITNESS LANESE) Yes.

BY MR. POLLARD: (Resuming)

Q The second sentence in Section IV states, "However, review of operating experience suggests that the integrated control system often is a contributor to feedwater transients."

Have either of you done any review of the operating experience at B&W plants to be able to agree or disagree with that sentence?

A (WITNESS LANESE) Yes, I have seen some other B&W plant data with respect to overcooling events.

Q And so that data would lead you to agree with that sentence?

A (WITNESS LANESE) Yes, I agree that the ICS is usually a contributor to overcooling events.

Q The next sentence reads, "In some cases, the ICS appeared inadequate to provide sufficient plant control and stability."

From the review that you have done, would you agree with that sentence?

MR. BAXTER: Mr. Chairman, I object as to the relevancy of the questioning. As I understand it, we are dealing with a Board question on the reliability of the emergency feedwater system at TMI 1. We do have an upcoming issue on ICS, its failure modes and effects, but I do not see how this relates to the testimony of the witnesses.

MR. POLLARD: Mr. Chairman, in judging the reliability of the emergency feedwater system, I think it is important to have an understanding of how often the emergency feedwater system might be called upon to operate. In this particular case, the integrated control system does in fact contribute to feedwater transients for which then the emergency feedwater system may need to be relied upon.

CHAIRMAN SMITH: In the direction of overcooling? Don't forget, the witness's agreement with you was that the ICS offers a contributor to feedwater transients of overcooling. And they did not agree with your entire sentence.

MR. POLLARD: The sentences that he agreed with, the first two sentences are not limited to just overcooling transients.

CHAIRMAN SMITH: His agreement with you was limited.

MR. POLLARD: I am sorry. I missed that distinction.

CHAIRMAN SMITH: Maybe I am wrong. Am I right? Your answer seemed to be limited. The question to you was, do you agree with the sentence that ICS is often a contributor to feedwater transients, and your answer was, yes, studies show that ICS is a common contributor to overcooling transients.

WITNESS LANESE: That is correct.

CHAIRMAN SMITH: What is correct?

MR. POLLARD: Then I asked him, did he agree with the next sentence, to which I don't think I got that qualification.

CHAIRMAN SMITH: Well, all right. Even so, that is an extremely broad sentence, and I think --

MR. POLLARD: I am only responding to Mr. Baxter's objection as to the relevancy of this question. I tried to explain the relevancy being evaluating the reliability of emergency feedwater.

CHAIRMAN SMITH: So far, I cannot see how you have linked a challenge to emergency feedwater to the answers provided by this witness. I am seeking to be corrected, though, on it if I am wrong.

DR. JORDAN: Since the witness says it was an overcooling event which would not require emergency feedwater, that was my conclusion, that it did not require emergency feedwawter.

BY MS. WEISS: (Resuming)

Q Was that the purpose of your answer? Was that the reason why you answered the question the way you did?

A (WITNESS LANESE) I understood the nature of this question to be with respect to overcooling transients. However, I would agree that most of the problems that I have seen with ICS is in overcooling events rather than loss of feedwater events when there have been problems with the ICS.

BY MR. POLLARD: (Resuming)

Q At Three Mile Island Unit 1, is it possible for the ICS to cause failures in the main feedwater system which might result in the need for emergency feedwater?

A (WITNESS LANESE) ICS cannot interrupt main feedwater to both steam generators without multiple failures.

Q Well, once again, have you personally evaluated the integrated control system?

A (WITNESS LANESE) No, other members within the control room safety analysis group at GPU have. And I work with them on a daily basis.

CHAIRMAN SMITH: You see, this is where we are going here.

MR. POLLARD: Okay. I will stop. We can go on.

CHAIRMAN SMITH: All right. I indicated we wanted to make a comment before you leave this narrower subject matter.

(Pause.)

MR. POLLARD: Mr. Chairman, we have no further questions on Section IV of this particular document.

CHAIRMAN SMITH: All right.

MS. WEISS: That is the end of this paragraph.

CHAIRMAN SMITH: Then we are going back to your examination of the witness on the question of the dump valves and the fail safe -- fail safe features of them collectively. Although we would not grant your motion to strike, we did indicate that there was a question of, was that reliable, and we do not believe the way the record stands now that his judgment that that is the case is -- meets the test of reliability that we need.

We could go in another direction to see if he received the information under circumstances conducive to reliability or we could go directly to a better source of information. I think the latter would be preferable.

So, the Board would like to have some better evidence on the subject, on the information that he received leading him to that conclusion.

MR. BAXTER: We believe that our witnesses who will be testifying on the integrated control system issue will be able to address that.

CHAIRMAN SMITH: Okay, but is that going to do it as far as the --

MS. WEISS: We are not going to -- I was just going to point out that that is not one of our -- that ICS is not one of our contentions. If we could just know where in the restart report or in any of the documents this modification is discussed -- I don't care if the witness tells me that or Mr. Baxter tells me that -- and then maybe the next point is, how do we get some testimony on.

CHAIRMAN SMITH: In the meantime, that would be fine if it could be done, but the Board can ask the questions on this issue when ICS testimony comes.

MS. WEISS: Yes, sure. I would just like to know if he could tell me today or some time before I leave what section in the restart report or whatever or any other document you describe this modification that Mr. Capodanno was alluding to.

MR. BAXTER: I certainly cannot off the top of my head. I don't know that I have the people here to answer that question either. Before Thanksgiving, certainly.

BY MR. POLLARD: (Resuming)

Q On Page 3 of Licensee Exhibit 15, the paragraph just preceding the beginning of Section 6, the final sentence reads, "The turbine exhaust is vented directly to the atmosphere."

Am I correct there that you are referring to the steam exhaust from the turbine driven emergency feedwater

pump?

A (WITNESS CAPODANNO) Yes.

Q Then therefore whatever level of radioactivity might be in the steam would be vented directly to the atmosphere. Is that correct?

A (WITNESS CAPODANNO) Yes.

Q Is there any protection that would isolate the exhaust or the supply to the emergency feedwater turbine driven pump if the level of radioactivity in the steam became excessively high?

A (WITNESS LANESE) In developing the abnormal transient operating guidelines for Arkansas, B&W identified that path as a potential source of radioactivity releases. At present, we have increased the operator awareness procedurally that that source of steam is a potential source of radioactivity.

We also have main steam line radiation detectors that have been added as a result of that consideration so that the operator would be able to determine if, say, he is supplying the steam to the emergency feedwater turbine driven pump from the A steam generator, and the A steam generator had high activity levels. He would recognize procedurally that he should isolate that generator and attempt to supply steam from the B generator.

Q This radiation detector on the steam line, would

that detect an increase in radiation level in the steam which occurred after the main steam isolation valve was closed?

In other words, let me rephrase it for you. The steam traveling from the steam generator to the emergency feedwater pump turbine, would it pass by this radiation detector if the main steam isolation valve was closed?

A (WITNESS LANESE) I cannot say definitively. As you are probably aware, though, the main steam isolation valves are nearly into the turbine building. I would not see the benefit in having put the radiation monitors in the turbine building.

Q Well, the only reason I asked the question, you indicated that, if I understood you correctly, the operator would use this radiation monitor, and if he saw an increase in the radiation level, he would isolate the steam to the emergency feedwater pump turbine. Is that correct?

A (WITNESS LANESE) Yes.

Q So I am simply askink the question, if the mean steam isolation valve is closed, would the steam traveling from the steam generator to the emergency feedwater pump turbine pass by this detector?

A (WITNESS LANESE) Since that is one of the purposes of the detector, I can only say I assume so.

Q You assume so. But then you rely upon the

operator to do it. There is no automatic function.

A (WITNESS LANESE) That is correct.

Q Is this described in the Three Mile Island Unit 1 emergency procedures, this function for the operator to isolate emergency feedwater turbine driven pump, to your knowledge?

A (WITNESS LANESE) I do not know if it has already been included in the procedures or if it is still under review. The recommendation from technical functions group is that it should be included in those procedures, and in fact, when we had an emergency preparedness drill in which we came across that situation, we did alert the operators to the need to monitor steam from the turbine driven emergency feedwater pump.

So, there is a general awareness with the power companies that that is a necessity.

Q If I understood you correctly, Mr. Lanese, you do not know whether it is now in the emergency procedures or not.

A (WITNESS LANESE) That is correct.

Q You do not -- I don't like to give you too many questions to do on breaks, but could you try and find out if it is now in the emergency procedures and tell me which procedures it is in? Overnight, perhaps?

MR. BAXTER: We can certainly make the procedures

available to you, Mr. Pollard. I don't know whether Mr. Lanese will have time to research them or not. Would you even have a close idea of where to look?

WITNESS LANESE: I would have to go back to the home office and ask someone if they could verify it for me.

MR. BAXTER: We will take the request under advisement.

MR. POLLARD: I am not trying to make a great deal of work. I know we already have some emergency procedures on the record which deal with emergency feedwater, and I do not recall seeing this in those procedures. That was the reason for my question.

(Pause.)

BY MR. POLLARD: (Resuming)

Q If you could turn to Page 7 of Licensee Exhibit 15, particularly Item 6 -- I am sorry. I have a typing error in my cross examination plans. I guess I mean to refer to Item 7 on Page 7.

I did have a typing error, but it was not the item, it was the system. In Item 6, you are talking about there the level transmitted on the condensate storage tank which will give the operator an alarm before the water level in the tanks becomes too low. Is that correct?

A (WITNESS CAPODANNO) This is Item 6?

Q Item 6, Page 7, yes.

A (WITNESS CAPODANNO) Okay.

Q Is that alarm at the time of restart safety grade?

A (WITNESS CAPODANNO) No.

Q But in the long term you are going to make it safety grade?

A (WITNESS CAPODANNO) Yes.

Q In what way is it now not safety grade?

A (WITNESS CAPODANNO) The current design for restart incorporates a common power supply and also it is not redundant in the sense that the final indicating element, the annunciator is a common device for both condensate storage tanks.

Q Now, we are in the section of your exhibit which talks about those modifications which will be completed prior to restart, and when you introduced this exhibit, as I understood it, you changed the second sentence of Item 6 to read, "A common annunciator window will be provided for the CSP lo-lo level alarms."

You are saying at the time of restart that is what is wrong with it. It will still have the common annunciator.

A (WITNESS LANESE) Did you say that is what is wrong with it?

Q Excuse me. That is why it is not safety grade.

A (WITNESS CAPODANNO) Yes, that is correct.

Q I did not mean to imply there was anything wrong

with it.

Now, if you are eventually going to change this so that this alarm is essentially made safety grade, what is your basis for saying that it is safe to restart the plant with the common annunciator?

A (WITNESS CAPODANNO) I believe that this alarm is useful in the sense that it will provide a minimum 20-minute warning. However, there are other alarms currently on the tanks designated as the tech spec or level limit alarms that are redundant, and I would look upon this in the short term as an adequate modification since it will be a conservative design and if all the parts are operated, you will get a 20-minute warning. If less than all three are operating, you will get more than a 20-minute warning.

It is a backup to an existing alarm and for those reasons the operator will be aware of changes in tank level from both alarms.

Q Are these other alarms, are they safety grade prior to restart?

A (WITNESS CAPODANNO) I believe they are.

Q If the other alarms which now exist at least are safety grade, why in the last half of Item 6 on Page 7 do you say a qualified level transmitter, one per tank, and associated alarm hardware will be added as a part of the long-term modifications?

A (WITNESS CAPODANNO) In the long term, the plan is to provide this 20-minute level alarm on a per tank basis, and to do that with components that are qualified to satisfy the definition of safety grade equipment.

Q Okay. The existing alarms, I assume, have associated with them some type of level transmitter or switch. Is that correct?

A Yes, they do. You are talking about the tech spec alarm, I assume.

Q Yes.

A (WITNESS CAPODANNO) Yes.

Q Are those level transmitters fully qualified in the sense that you say a qualified level transmitter will be added?

A (WITNESS CAPODANNO) I would say I am not certain, and the reason I am not certain is that they were most certainly purchased and installed prior to the time of issuance of the current criteria. That is the current IEEE standard which is being used for the new equipment.

Q So then it would be fair to say that you do not know whether the level transmitters which will be there at the time of restart are safety grade or not.

A (WITNESS CAPODANNO) I believe they will be safety grade from the standpoint that the environment that they are in, they are designed to work. In terms of the current IEEE

standard -- I believe it is 1974 edition of IEEE 232 -- there are some aging requirements for components that we are trying to comply with. We make several utilites -- the equipment manufacturers are trying to comply with them, and from that standpoint, we think that definition, those components will be safety grade in the context of the standard I just mentioned.

In the context of what has been in the plant, to my understanding, it was designed to survive in the environment it will be in, I think it will be adequate, and the medium then for providing a reliable indication.

(Pause.)

Q Wouldn't it be reasonable to conclude from your exhibit that the reason you are adding a qualified level transmitter is that the existing level transmitters either are not qualified or you are unable to demonstrate that they are qualified?

A (WITNESS CAPODANNO) First of all, I think we have to make a distinction. There are level transmitters on the tank, and there are level switches. I believe the tech spec alarm comes off the switch. The normal tank indication comes off a transmitter. The transmitter is informational input. I don't think there is any attempt to make that safety grade as I define the conditions for the switch. I believe the switch is safety grade.

Q So then with respect to your review for I&E Bulletin 7901B, are you saying you completed your investigations required by that bulletin for the existing switches?

A (WITNESS CAPODANNO) I am really not sure if those switches are covered in that bulletin.

Q But it is your testimony that you are relying on these switches as a basis for restart without a fully qualified level transmitter?

A (WITNESS CAPODANNO) Again, the tech spec level switches is what we are discussing?

Q Yes, sir.

A (WITNESS CAPODANNO) I said that the -- they provide an indication along with this 20-minute warning alarm, and have been there for use all along.

Q Okay. Let me see if I can review for you the line of questioning and as I understood your answers. I asked you, eventually, you are going to install a qualified level transmitter and the associated alarm hardware, but that would not be done prior to restart, and then I asked you, if that is not going to be done prior to restart, what is your basis for assuming the plant is safe enough to restart? And your answer to me to that question was to point to these tech spec switches.

Then we explored the condition, are the tech spec switches qualified, and I further asked you whether you had completed your review required by Bulletin 7901B for those switches, and you did not know whether the Bulletin covered those switches. So, that brought us full circle to where my question now is, if you are going to use the tech spec switches as your basis for restart, wouldn't you agree that they should be reviewed under I&E Bulletin 7901B?

A (WITNESS CAPODANNO) Well, again, a terminology problem. I do not believe I said that the tech spec switches were an absolute substitute for the 20-minute alarm. I said I felt they worked in parallel with the alarm,

and provide an additional means of indication, and that was my justification for saying that in the short term, I did not feel we needed a higher qualified 20-minute alarm. That is planned for the long term.

Q Is it your general proposition, then, that two alarms, neither of which is safety grade, can compensate for the absense of an alarm of a single transmitter which is safety grade?

A (WITNESS CAPODANNO) Again, we said some time ago that safety grade we define in terms of the function it was trying to provide. I believe that the tech spec alarm in the environment it is in and the function it is trying to provide is safety grade. a

Q What criteria do these tech spec level switches meet as a basis for you stating your belief that they are environmentally qualified?

A (WITNESS CAPODANNO) There is one per tank, so they provide redundancy. I believe the wiring for them is run separately.

Q Excuse me. I asked specifically what criteria do they meet as the basis for your conclusion that you think they are environmentally qualified.

A (WITNESS CAPODANNO) Okay. My understanding is that they are qualified for the outdoor environment where they are located.

Q And what standard or criteria did you use as a basis for deciding that they are qualified?

A (WITNESS CAPODANNO) My criteria or standard is that they are designed to survive in the environment in which they are located.

Q Were they tested to see if they would?

A (WITNESS CAPODANNO) They were purchased some time ago. I really could not tell you under what particular tests they were tested.

(Pause.)

Q Am I correct that what your testimony means is that you are aware that when these tech spec level switches were purchased, the purchase order specified that they should operate in their environment satisfactorily, but that you do not really know whether any testing was done or any particular IEEE standard was applied to determine whether or not that purchase specification requirement was adequately fulfilled?

A (WITNESS CAPODANNO) I have not reviewed any such test results. That is correct.

BY MS. WEISS: (Resuming)

Q And in fact, you don't know whether such testing was done?

A (WITNESS CAPODANNO) Again, I think the same answer I gave earlier. I have not specifically reviewed

test reports.

Q And in fact you do not know whether such reports exist. Is that correct?

A (WITNESS CAPODANNO) I could not swear that they exist. That is correct.

BY MR. POLLARD: (Resuming)

Q If I could direct your attention now to Item 3 on Page 9 of Licensee Exhibit 15, entitled Reduction of The Possibility of OTSG, Overcooling and Overfill Condition, please explain why overcooling and overfill conditions are of concern.

A (WITNESS LANESE) Overcooling is considered an item of design concern because it ultimately can result in a loss of pressurizer level and or initiation of high pressure injection on a 1,600 pound reactor coolant system pressure and subsequent to that the operator is required to then verify that he has an adequate subcooling method and throttle high pressure injection.

As far as overfilling, I think the concern has to be evaluated on a plant by plant basis. Generically, the concern is putting water in the steam lines could have an effect on the steam lines. The lines may not be designed without additional blocking to tolerate the dead weight of the water in the lines, or there may be water hammer effects resulting from the steam-water mixture.

Q So the ultimate concern might be rupture of the steam line?

A (WITNESS LANESE) That is the generic concern. That is right.

Q Do these generic concerns apply to Three Mile Island Unit 1 with respect to overfilling?

A (WITNESS LANESE) My understanding is, we have completed our -- our stress group has completed an evaluation of the steam lines and concluded overfilling of the lines would not result in any failures.

Q Then why are you engaged in reducing the possibility of overfill conditions?

A (WITNESS LANESE) It is a plant operational concern at a minimum. SMUD had such a situation, and they required three or four day shutdown at least while they re-analyzed the event and reported it and verified that, yes, indeed, they were suitable -- the plant was in a suitable condition to restart.

Q You are using this as an example of why you are pursuing reductions of overfill conditions at Three Mile Island Unit 1, that you would not want to have to go through such analyses?

A (WITNESS LANESE) That is at least one example, certainly.

Q Are there other examples?

A (WITNESS LANESE) Well, in general, in an overfill situation, it is something that is not supposed to happen in the plant. You are -- I guess it is really the same example.

Q Have you made any changes at Three Mile Island Unit 1 to reduce the instances of overcooling caused by main feedwater?

A (WITNESS LANESE) We have spent a reasonable amount of time now with B&W re-evaluating plant data with respect to looking at overcooling events from main feedwater. We have revised our procedures, and our conclusions along with B&W are that for feedwater temperatures over approximately 300 degrees, that overcooling as a result of addition of main feedwater is not a concern.

While you may overfill, you will not see a substantial overcooling of the reactor coolant system. Again, as a result of some of those studies, the technical functions group of GPU has made recommendations to the plant regarding revision of procedures. I do not believe those procedures have been fully implemented yet.

Q Have there been any changes made to hardware to reduce the instances of overcooling caused by main feedwater?

A (WITNESS LANESE) In the long term, we have the commitment to isolate main feedwater on steam generator level of 82 and a half percent in the operating range.

Q Have there been any changes -- Let me ask a first question. Is it possible for failures in the integrated control system to cause overcooling?

(Pause.)

A (WITNESS LANESE) As I said with respect to main feedwater, we have determined that main feedwater really is not a source of overcooling.

Q What about with respect to emergency feedwater?

A (WITNESS LANESE) Emergency feedwater? If there were a failure to throttle emergency feedwater after it reached its desired level set point, you would overcool the plant. That is correct.

CHAIRMAN SMITH: Overfill the what?

WITNESS LANESE: Overcool the reactor coolant system.

BY MR. POLLARD: (Resuming)

Q Do you know of any changes that have been made to prevent ICS failures which can cause these kinds of overcooling events?

A (WITNESS LANESE) I think those changes would be in the availability of power supplies, both the hand and auto power supplies, and ultimately the independent controller for ICS and emergency feedwater. In the long term, of course, we will be independent of the ICS and the cavitating venturis will also limit the potential for

overcooling.

Q Is there any schedule now for how long the long term is?

A (WITNESS LANESE) I believe long term means the first refueling outage following restart.

CHAIRMAN SMITH: And that would be, inasmuch as you were down for a refueling, that would be a four-year -- or how long would that be?

WITNESS LANESE: Approximately a 12-month fuel cycle. Twelve months from the time we restarted the plant.

BY MR. POLLARD: (Resuming)

Q On Page 10 of Licensee Exhibit 15, and continuing on Page 11, how many of the items identified as 1 through 8 will be done prior to restart, and which ones?

A (WITNESS CAPODANNO) Item 1, safety grade automatic system start, will be achieved prior to restart. Item 2, system flow indication in the control room, the parenthetical note indicates that it will be done as a restart modification.

Your question was, which ones will be done prior to restart?

Q Yes.

A (WITNESS CAPODANNO) Items 1 and 2, prior to restart as safety grade.

Q Oh. Are you done? All the rest will not be done

prior to restart?

A (WITNESS CAPODANNO) They are not being done as we have identified previously prior to restart as fully safety grade in every instance, or some of these are identified as solely long-term modifications.

Q When you said that Number 1 would be done prior to restart, were you referring there solely to the automatic initiation from loss of reactor coolant pumps and loss of main feedwater pumps, but you were not referring to the other automatic initiation functions of low steam generator level, and --

A (WITNESS CAPODANNO) The other signal would be feed steam delta p.

A (WITNESS LANESE) The answer is, yes, I was referring to the former two, not the latter two.

Q Now, the other items, 3 thrugh 8, will those be done also at the first refueling outage following restart?

A (WITNESS CAPODANNO) Yes.

CHAIRMAN SMITH: Do some of these -- do any of these modifications require operating -- plant operation for their design or some type of assessment? You don't know when that plant is going to restart. How did you happen to pick -- how is it -- these modifications have to be done at shutdown?

WITNESS CAPODANNO: Some of them do, most

definitely, yes. I am not sure I understand what you are getting at.

CHAIRMAN SMITH: I guess I gave you three questions and two observations. How does it happen that 3 through 8 are all scheduled for shutdown for fuel reloading?

WITNESS CAPODANNO: Some of these, such as Item 3, have been constrained by the availability of equipment from equipment manufacturers. Others, such as Item 4, would require disabling of the emergency feedwater system plus the problems of obtaining equipment from manufacturers, and I believe that is typical of these Items 3 through 8.

CHAIRMAN SMITH: Are these items that were required in other B&W plants, too -- I don't mean, too, but were they also -- Were they required in other B&W plants?

WITNESS CAPODANNO: Some were. Some, I am not sure. For example, the condensate storage tank alarms I am certain were required of all the owners. I think the addition of cavitating venturis, perhaps not.

WITNESS LANESE: I think it would be more correct to characterize the items as ones which will be required of other B&W plants.

CHAIRMAN SMITH: None of them require observations during operation before they can be designed, or other calculations made?

WITNESS LANESE: We are not dependent upon plant

operating data in the future in order to design these systems, no.

DR. JORDAN: Three, now, is one of the items that is called for in the lessons learned. That was the item we referred to earlier, wasn't it?

WITNESS CAPODANNO: Yes.

DR. JORDAN: And it does mean automatic emergency feedwater control?

WITNESS CAPODANNO: I am sorry. I think I was incorrect there. I believe the lessons learned addressed auto start and flow indication. Item 3 is addressing flow control.

CHAIRMAN SMITH: These items we have been discussing all day are in the June 28, 1979, letter from the licensee, and were incorporated into a notice of hearing, and thus made short-term requirements under that order. I mean, some of them, this is the pattern, and as a matter of fact, the restart report seems to be in the same sequence as set forth in that letter.

DR. JORDAN: I guess, as you said, the restart report did not require safety grade emergency feedwater flow control.

WITNESS CAPODANNO: I believe the restart report does. The item I was referring to was NUREG-0578. I thought that was your question.

DR. JORDAN: Yes. I am sorry. I was referring to 0578. I used the wrong term, namely, the lessons learned. And you say under lessons learned Item 3 is not required.

WITNESS CAPODANNO: That is correct. Items 217A and 217B in NUREG-0578 address respectively auto initiation and feedwater flow indication.

DR. JORDAN: Item 3, is that required in one of the orders then?

WITNESS CAPODANNO: Yes, it is.

DR. JORDAN: All right.

CHAIRMAN SMITH: That is required in the letter of June 28, 1979.

WITNESS CAPODANNO: Yes.

BY MR. POLLARD: (Resuming)

Q Mr. Lanese or Mr. Capodanno, did you have the opportunity to check on the question of the recirculation valve status at the time of restart, the recirculation valves for the emergency feedwater pumps? Will they still fail open on loss of control air?

A (WITNESS CAPODANNO) Yes, they will.

MS. WEISS: At this time, I would like to move into evidence UCS Exhibit 9, the two-page table entitled Acceptance Criteria for Instrumentation and Control Systems - Table 7-1, from Section 7.1 of the NRC standard review plan.

CHAIRMAN SMITH: Any objections?

MR. BAXTER: Yes. At the very least, I would like the Board to defer ruling until I have the opportunity to review Section 7.1 of the standard review plan. My concern is whether it is meaningful out of context.

CHAIRMAN SMITH: Okay. So we will defer the ruling. Somebody has to have the responsibility, however, of bringing it back to our attention. It will be your responsibility, Mr. Baxter.

MS. WEISS: Thank you very much.

At this time, we have no further questions of these witnesses.

CHAIRMAN SMITH: Okay. I guess we will go to Mr. Adler.

Are you prepared, Mr. Adler?

MR. ROBERT ADLER: Yes. I think most of our questions were aired already, but we still have a few left. It should not take very long.

BY MR. ROBERT ADLER:

Q I have a couple of questions concerning the strainers. They relate to the questions that Dr. Little raised on Friday. Can I refer you to Page 10 of Exhibit 15?

You indicate that the strainers were removed, and I believe you testified to Dr. Little that the strainers are no longer required. Is that correct?

A (WITNESS CAPODANNO) Yes.

Q In the case where you are using emergency river water as a source of feedwater, please refer to Figure 2 of that exhibit. You indicate the presence there of large mesh strainers. My question is whether it is possible that there is debris that would pass through the large mesh strainers that previously would have been caught by the strainers that are being removed and that might adversely affect the operation of the pumps.

A (WITNESS CAPODANNO) I do not believe so. There is debris that could come from river water that would be small. I am not certain of the size of those large mesh strainers. They are usually on the order of an eighth to a sixteenth of an inch in size. Something more like sand or silt that might pass through those strainers. As long as it is in suspension, which I think it would be at that point, I do not believe it could have an immediate detrimental effect on emergency feedwater pumps.

Q Can you indicate what type of debris might affect the operation of the pumps?

A (WITNESS CAPODANNO) When the startup strainers are installed, they are really intended to prevent entry into the pump of most any kind of material that you could expect, and typically you could expect pieces of metal, pieces of wood, pieces of welding dams, which are devices

inserted inside the piping system to allow inert gas to be installed while welding a piping systems is done, those kinds of things, some of which are hard metallic objects.

Q Relatively large objects?

A (WITNESS CAPODANNO) Relatively what?

Q Large?

A (WITNESS CAPODANNO) Yes, and or in the case of metal pieces hard.

Q On Page 10, you list three major component values which can contribute to system unavailability, and the third is potential plugging of EFW Pump Section Strainers. So, I presume when you removed the strainers, that type of debris that would plug the strainers would pass through the pumps.

A (WITNESS CAPODANNO) As we mentioned, I think, again, this needs some explanation. B&W in the reference report on Page 9 indicated that plugging of strainers could be a problem, and that is a probabilistic assessment based on some NRC supplied data. In making draft modifications, we identified that as one problem they had identified and removed the strainers.

That does not necessarily mean that we agree that there would be debris in the system now that could either plug strainers if they were there or do damage to the pumps.

Q On Page 4 of your direct testimony, in the last paragraph there, you refer to your analysis of operational

errors, and the procedures that have been instituted to take care of those potential errors. Can you specify the errors that you are referring to?

A (WITNESS CAPODANNO) I was referring to operational errors such as closing of valves that should be open. That was the primary reference. I believe I also mentioned the other day that having switches in a defeat mode that should not be in a defeat mode is another possible operating error.

Q Are you familiar with the procedures that have been instituted to prevent that type of occurrence?

A (WITNESS CAPODANNO) I believe I have looked at some in a summary fashion.

Q Can you explain the potential consequences, the worst potential consequence of, let's say, closing a valve?

A (WITNESS CAPODANNO) If it was a single valve in a system, you would still have emergency feedwater available -- excuse me. In a loop, you would have emergency feedwater available from the other loop. I don't see an automatic worst potential consequence therefore --

(Pause.)

Q Can you tell me what the analyzed basis is for your determination that two hours is an adequate period for the EFW train being able to perform its functions independent of off-site AC Power?

A (WITNESS LANESE) We have performed some of our own analysis of the loss of off-site power, actually, station black ut, in which there is no AC power available either on-site or off-site. In that period of time, you would still have a steam bubble in the pressurizer. You would not have begun to draw steam into the reactor coolant system. And so for at least two hours you have a very stable plant condition.

Beyond two hours, as you begin to draw steam into the loop, it is going to become more difficult to predict what happens subsequent to that, although the consequences are not automatically severe.

MR. ROBERT ADLER: Mr. Dornsife has some additional questions.

BY MR. DORNSIFE:

Q If I understood your testimony correctly, you said that prior to restart there will be two safety grade initiation signals for the emergency feedwater system. Is that correct?

A (WITNESS CAPODANNO) Yes.

Q They were the main feedwater differential pressure and the reactor coolant pump trip, correct?

A (WITNESS CAPODANNO) Inoperability of four reactor coolant pumps or loss of main feedwater flow.

Q In light of the fact that the main feedwater pump

delta p pressure across the pump is sensed in the turbine building, does that affect the safety grade of that signal?

A (WITNESS CAPODANNO) No, I do not believe it does, for the reason that the electrical design does several things. It first of all uses qualified components, and although they are in the turbine building, the electrical design also includes therefore some isolation device to protect the electrical system that is not in the turbine building from any failures within the turbine building, and the system is further designed to fail safe so that if for some reason something in the turbine building should affect these components, it would indicate a loss of feedwater.

Q So, in other words, if you lost the signal from the transmitter, it would indicate a loss of feedwater?

A (WITNESS CAPODANNO) That is correct.

Q Wouldn't, however, the same considerations being in a non-seismic building apply to the signals that are going to these main feedwater valves for main steam isolation rupture? I mean, wouldn't they not be safety grade because of their seismic qualifications?

A (WITNESS LANESE) The way the plant is laid out, one feedwater loop has valves in the turbine building and the other loop has all the valves in the intermediate building which are seismic, so there is only one loop which has valves in a non-seismic area.

Q But those particular valves would be subject to, say, a common mode failure, because of seismic --

A (WITNESS LANESE) That would be correct.

Q The other automatic initiation signal is the reactor coolant pump -- unavailability of --

A (WITNESS LANESE) Maybe I should also add while that is true, that is also an analyzed event, and we have demonstrated acceptable consequences for a single steam generator blowdown with a failure to mitigate feedwater flow to that generator.

Q So it would take both main feedwater systems operating and feeding both generators blowing through thier common line to cause a beyond design basis accident?

A (WITNESS LANESE) No, it would not be both feedwater systems. You would isolate one steam generator.

Q Okay. The other automatic initiation signal, the reactor coolant pump trips, is it not true that that system is safety grade in that maybe the initiation or the transmitters or the signals that it is receiving are safety grade, but in fact prior to restart on many events the pumps will require a manual trip, so from that standpoint they are not safety grade?

Let me go back and try to rephrase it. Is it not true that in some events, as was previlously stated in the testimony on other contentions, that for some loss of

coolant accidents, the operator prior to restart would manually require tripping the reactor coolant pumps?

A (WITNESS LANESE) He would manually trip the reactor coolant pumps when he reaches 1600 pounds initiation and there are other loss of coolant events in which he does that when he losses the subcooling margin.

Q So therefore prior to restart it would not necessarily -- the signal that would require starting the emergency feed pump, the emergency feedwater system would not necessarily be a signal but an operator action of tripping those pumps?

A (WITNESS LANESE) Yes. I think we have already indicated that there are some situations in which we are depending on the operator to initiate emergency feedwater within 20 minutes. That is correct.

Q Based on that statement that you just made about operators initiating emergency feedwater in 20 minutes, is there any isolation valve on the TMI 1 emergency feedwater system that are similar to the valves that were on the TMI 2 system that were isolated by the operator preventing the block valves were isolated -- preventing emergency feedwater flow? Is there similar layout here, that that could be a common failure?

A (WITNESS CAPODANNO) There is a discharge gate valve at the pumps. Is that what you are referring to?

Q No, motor operated valve, that during testing both valves could be closed, as was postulated, that cause the unavailability of emergency feedwater during the TMI 2 accident. Is there a similar type of arrangement here that would be vulnerable to that type of a failure?

A (WITNESS CAPODANNO) I am not sure I understand you, but there is -- I said there is a manual valve that can obviously be closed or open.

Q I am not speaking manual valves. The TMI 2 system in order to test the emergency feedwater system, there were block valves that were closed in order to recirc back to the condensate storage tanks, and my understanding is, they were in addition to the regulating valves. They were not the regulating valves.

Now, apparently, from my review of this system, those valves are not on the system. Is that correct?

A (WITNESS CAPODANNO) That is correct. There is no power operated block valve.

Q But you could still close the regulating valve and perform the same type of function. In fact, that is probably the way you test the system, right?

A (WITNESS CAPODANNO) I believe the gate valve is the one that is closed, and then the pump is tested by pumping through the recirc path.

Q Based on what you said about operators initiating

emergency feedwater for certain transients, would it not be possible that the steam generators could blow dry by the time the operator would have initiated emergency feedwater?

A (WITNESS LANESE) Yes, it would be possible.

Q Would it also not be possible with the steam generators blown dry that the main steam isolation -- main steam rupture detection system would sense there would be a break in the steam generator?

A (WITNESS LANESE) Yes, that is possible.

Q Would that be possible to occur in both steam generators, if both were to blow dry?

A (WITNESS LANESE) If emergency feedwater and main feedwater were interrupted, both steam generators in a way in which no initiating signal was generated, then it would be possible for both generators to blow down below 600 pounds.

Q Would that then cause initiation of the main steam rupture system -- detection system for both trains?

A (WITNESS LANESE) Yes, it would.

Q How then would the operators when they decided -- when they finally got the emergency feedwater system, start emergency feedwater flowing to that particular steam generator that they would choose?

A (WITNESS LANESE) He would have to bypass the rupture detection signal.

Q And is that something that is fairly easy to do? I mean, how would the operators know that indeed that was the case? Is there any -- Is there easy indication to indicate that that is indeed the case, and how difficult is it to bypass that signal and open the regulating valves?

A (WITNESS LANESE) I do not recall the location of those indicators on the TMI 1 control room panels.

Q But it would probably be something similar to bypassing, probably to the high pressure injection.

A (WITNESS LANESE) That is my understanding --

Q Something of that nature.

A (WITNESS LANESE) That is my understanding of the design, yes.

Q Do you think there would be adequate indication that indeed the operator should bypass that system?

A (WITNESS LANESE) I do not see any basic conflicts in his recognizing that he can bypass the system.

Q Would you repeat that?

A (WITNESS LANESE) I do not see any conflicts that would prevent him from bypassing the system under those circumstances. He recognizes he has lost or is losing subcooling margin, and then he needs to restore the heat sync.

Q The last question I have then is, is this particular instance covered by procedures?

A (WITNESS LANESE) There is a procedure for loss of flow to one or two steam generators.

Q Does it indeed tell him to look for blowdown of steam generators and in fact the rupture detection system actuating causing this particular problem, that he would need to bypass this safety system?

A (WITNESS LANESE) I have not read the procedure in a long time, so I cannot address that question.

Q Do you think it should be covered by procedure?

A (WITNESS LANESE) Yes, it certainly should.

MR. DORNSIFE: Thank you. I have no further questions.

CHAIRMAN SMITH: Mr. Cutchin?

MR. CUTCHIN: Thank you, Mr. Chairman. I have a very few questions. I will be referring to Licensee's Exhibit 15, and starting at Page 6 of the text.

BY MR. CUTCHIN:

Q Gentlemen, either of you may answer these questions.

On Page 6, in Item Number 2, in the second sentence, you use the term "safety grade redundant indication." On Page 7, in the last sentence on the page, you use the term "safety grade" when referring to hardware. And on Page 10, you use the term in the second line of Section F, "single failure proof safety grade design," and I

guess this causes me some confusion, and I am not sure what it does for the record.

Does not the term "safety grade" when applied to a system design include considerations of redundancy, single failure proof, environmentally qualified, seismically qualified?

The problem I am having is, when you use the term "safety grade" as you apply it to these different things, and you use modifying words like "single failure proof," "safety grade redundant indication," so, could you help me, and let me ask the questions one by one?

As you use the term "safety grade redundant indication" on Page 6, why do you need the term "redundant," and what does the term "safety grade" mean to you when applied to indication?

A (WITNESS CAPODANNO) I think you are correct in that the word "redundant" is in itself redundant. Again, what we meant was -- and as you mentioned, environmental qualification, separation, components that are redundant. There is an A and B loop component. That is what we meant. And perhaps we got a little wordy there by saying "safety grade redundant."

Q Can I assume that the words on Page 10 as applied to design, the term "single failure proof safety grade design," is the term there redundant also?

A (WITNESS CAPODANNO) Yes, sir.

Q One more question. On Page 9, you use the term "Class 1E powered." Can you, if it is possible, relate the two terms "Class 1E" and "safety grade?" Is there any correspondence at all between those two terms, or do they mean something entirely different?

A (WITNESS CAPODANNO) No, they are basically the same in that again we are talking about redundancy. In this case, power supply. In the other case, redundancy of mechanical components. We are addressing physical separation of power supplies. We are addressing certain levels of quality as identified in electrical hardware standards, some of which in fact use the term 1E.

The "safety grade" - "1E" correlation is one for one, keeping in mind you may be talking about mechanical versus electrical in some instances.

MR. CUTCHIN: Thank you. No further questions.

(Whereupon, the Board conferred.)

EXAMINATION BY THE BOARD

BY DR. JORDAN:

Q There has been a large number of questions, and probably in view of the hour I am going to ask just a few, one or two questions tonight, and then reserve -- you will have time for thinking about it overnight, the possibility of a few questions tomorrow.

Can you recap for me a little bit? Prior to restart there will be some occasions when operator action or operator control -- I mean -- I did not say it properly.

As a short-term action for restart, are there still some instances where an operator control will be required, and does that in itself mean that safety grade has not been achieved?

A (WITNESS CAPODANNO) As we have mentioned, the regulating valves under certain circumstances could be operated by the operator from the control room. I also mentioned the other day that under some other circumstances it might be necessary for the operator to line up the river water source for cooling water for emergency feedwater.

I do not believe in either instance that that means it is automatically not safety grade. I take safety grade to apply to components, pieces of hardware.

Q I see. If an operator is controlling a safety -- engineered safety system, doesn't the -- isn't there a single failure built in in that the operator himself can be the failure, and is that indeed not a likely single failure event?

A (WITNESS LANESE) I do not believe that it is a likely single failure event, given the additional training, the additional analyses, the additional control room panel layouts that have been implemented since the TMI 2 accident.

I think he has a very basic goal in that he knows -- one operator is responsibile for this, that he is responsible for establishing a secondary system heat sync, and he has the indication available that tells him whether he has it or not, especially with respect to emergency feedwater flow level indication, pressure, and primary system saturation margin.

I think the first part of that question was, aren't we susceptible to operator errors.

Q You surely must be.

A (WITNESS LANESE) Certainly we are, yes.

Q I am just wondering how reliable you are placing -- what degree of reliability you are placing on the operator himself, and it seems to me to say that an operator is more reliable, for example, than a control grade piece of equipment is maybe subject to some doubt. And certainly a control grade piece of equipment which was controlling and important engineered safety feature would not be an acceptable practice.

But you say an operator is an acceptable practice, and it means therefore you are assuming he is much more reliable.

A (WITNESS LANESE) If we talk not in terms of single failure but talk in terms of the availability of this system, the operator is only going to have to take manual

control if first the ICS has failed to perform its function.

Q But this is something that we know we have to plan on, because it has happened so many times before. This is an event that must be planned for.

A (WITNESS LANESE) You have to consider it will happen again, certainly.

Q Yes.

A (WITNESS LANESE) Nevertheless, I do not think that the operator's goal is all that complex. The operator is responsible for the secondary system, is responsible for maintaining a secondary side heat sync.

Q Secondary side what?

A (WITNESS LANESE) Heat sync.

Q Yes.

A (WITNESS LANESE) And it really is that straightforward. He should not have to dry steam generators, dry depressurized steam generators. He should be maintaining level at the proper set point, and even in the TMI 2 accident what did him in, I think, was that he had an indication that emergency feedwater flow had been initiated. He had pressure instead of flow. And even in that situation within eight minutes he recognized that was not correct. Then he reinitiated emergency feedwater flow.

There are distinctions between some of these actions which are hard to figure out or not very obvious and

some which he is used to performing on a daily basis. Providing a heat sync through the steam generator is one of the most basic functions that the operator has. And I think he is highly reliable in those situations.

Q Other than the operator, have you carefully looked at the system to see how many single failures from outside the system could result in a common mode failure of the system itself. How extensive has been your analysis of common mode failures defeating the emergency feedwater system?

A (WITNESS LANESE) Did you say aside from the ICS?

Q Yes.

A (WITNESS LANESE) Aside from the operator?

Q Aside from the operator and ICS, are there not a number of other common mode failures that might lead to defeat of the entire emergency feedwater system? I think you have mentioned, in fact, in your testimony that there were other common mode failures.

A (WITNESS LANESE) I think we referred to the high energy line breaks in the intermediate building. Beyond those, I would characterize it as a relatively simple system that has diverse sources of control power and of mode of power. And I cannot think of any other common mode failures.

Q Is this system almost unique ther in that its reliability -- aren't most protection systems subject to

common mode failures? Haven't, in fact, indeed, have not most protection system failures been common mode?

A (WITNESS LANESE) I think the difference with this system is, you have a turbine driven pump and two motor driven pumps and that turbine driven pump is working on independent principles, independent design from the motor driven, so you are not dependent on the same instrumentation, say, to control that pump as controls the others, again, other than the ICS commonality.

Q Can you not conceive of a system or an instance where an operator is recalibrating the level instruments and calibrates every one of them wrong? Has this not happened in the past?

A (WITNESS LANESE) Certainly. That would have the potential for eliminating one of the initiating signals.

Q How is that?

A (WITNESS LANESE) It would have the potential for eliminating one of the initiating signals.

Q Not all? If he uses a meter on the wrong scale, calibrates them all with the same meter?

A (WITNESS LANESE) For example, the loss of main feedwater signal is dependent on a differential pressure signal. The loss of water reactor coolant pumps is not.

Q Yes.

A (WITNESS LANESE) So there would not be that sort

of common mode failure introduced. He could not calibrate both systems using the same meter and have both of them fail. They work on different principles.

Q If the operator works on the meters or the switches or whatever, can't he mess them both up at the same time? Isn't that -- in fact, if he messes up one, isn't he most likely to mess up the other one at the same time? If he does one of them wrong, he is likely to do both of them wrong?

A (WITNESS LANESE) There is the maintenance type error that would result in the loss of one of the initiating signals.

Q Both of the intiating signals?

A (WITNESS LANESE) I would not think that would be very likely in this situation, again, because they are diverse forms of initiation. One is measuring differential pressure. Another is measuring the power to the pumps and indicating that the pumps are either running or not running.

Q Yes. But upon loss of the main feedwater, you do not wait until the pumps stop before you initiate emergency feedwater. It is just enough to have lost either one, isn't it?

A (WITNESS LANESE) No.

A (WITNESS CAPODANNO) Either main feedwater pump?

Q If you lose your main feedwater --

A (WITNESS CAPODANNO) If you lose both main feedwater pumps -- if there was only one --

Q No, that is right, but if you lose both of them, surely they must have similar type gauges or signals on each feedwater pump, main feedwater pump. The loss of both of them does start, of course, the emergency feedwater. Is that right?

A (WITNESS CAPODANNO) Yes.

Q Now, can you not conceive of a system where both of them are lost but you fail to get the signal to start emergency feedwater because, as I say, the operator has messed up one? He can mess up both.

A (WITNESS CAPODANNO) I think there are a couple of things that are going to have to happen.

Q I don't see why -- I don't see any diversity in that case.

A (WITNESS CAPODANNO) What I am getting to is that if you are checking an initiating instrument like a pressure switch, normally test instruments are calibrated, so you would have to assume, first of all, that the calibration of that instrument was in error. The second thing, which I do not know is or is not true, but you would also have to assume that the testing sequence for instruments told the operator to go test all the initiating instruments for loss of main feedwater at the same time, and presumably with the

same device.

If the situation were such that he was not procedurally doing it that way, then you would not recalibrate all four pressure switches at the same time, and I really do not know right now which way it works.

Q Well, I guess all I am perhaps doing is arguing a philosophy of my own, and I believe that a common mode failure is the most likely failure, but the question we of course are here to deal with is what is the reliability, whether it is common mode failure, failure of components, and I believe you said that that was in your opinion more likely a simultaneous failure of components than common mode failure.

A (WITNESS CAPODANNO) I think what I said was that I thought at this point with the changes to the system, you would expect some component error to occur more frequently than some operator error that would defeat the system.

Q I will return to some of this tomorrow, but I have one or two clarifying questions. Do you know whether the loss of saturation meter proposed for the TMI 1 will trigger any of the emergency safety features? Will it be used in itself as a trigger?

A (WITNESS LANESE) Not before restart. At present our plans would be that saturation either by itself or in combination with 1600 pounds in the reactor coolant system

in the long term would trip the reactor coolant pumps.

Q But there are many cases -- occasions, I believe it was said, when the operator observes whether he has adequate saturation before taking some action. And if that is the case, wouldn't it be better to have the action either be automatically taken or automatically prohibited if that is the proper direction, by the lack of saturation rather than having an operator observe and then taking the action? Is it because you do not have adequate trust in the saturation meter? That is what I am getting at.

A (WITNESS LANESE) I think in general we at least within the control and safety analysis group of GPU believe it is a good signal, and we are continuing to evaluate the application of that signal as an initiation signal. It is not likely that anything would be complete before restart.

Q I see. You are considering the possibility of connecting it into the control and safety system?

A (WITNESS LANESE) I am certain it would not be installed before restart. I doubt we would finish our review before restart. We are predisposed to use a signal like that, yes.

(Whereupon, the Board conferred.)

BY MR. JORDAN: (Resuming)

Q One of the documents I read recently said that they had observed that the PORV operates about 50 percent of

the time in a gagged condition in the B&W plants. Is that the case at TMI 1, or will that be the case?

A (WITNESS LANESE) No, it has not been in the past. I would not expect it to be in the future.

Q Under what circumstances is it operated in a gagged condition, and why? Do you know why it is that this particular member of ACRS staff determined that it was in a gagged condition in 50 percent of the cases? What is the reason why it should be gagged?

A (WITNESS LANESE) It is a test of my memory, but I believe the problems were with valve leakage at other plants. And we have in fact changed the valve out for that reason.

Q What?

A (WITNESS LANESE) We have changed the valves sometimes out to prevent leakage, to prevent problems with leakage during operation. We were aware that it would become a problem and the valve was changed. That is my recollection, at least.

Q But it was not changed in TMI 2 before the accident?

A (WITNESS LANESE) That I cannot remember.

DR. JORDAN: The Chairman has observed the time is running on, and I would like to review over the evening, and I will have a few questions tomorrow morning.

CHAIRMAN SMITH: All right. Nine a. m., everybody.

(Whereupon, at 6:04 p. m., the hearing was recessed, to recovene at 9:00 a. m. of the following day.)

NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

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in the matter of: Metropolitan Edison Company (Three Mile Island Unit 1)

Date of Proceeding: November 18, 1980

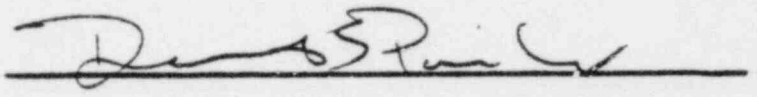
Docket Number: 50-289 (Restart)

Place of Proceeding: Harrisburg, Pennsylvania

were held as herein appears, and that this is the original transcript thereof for the file of the Commission.

David S. Parker

Official Reporter (Typed)



(SIGNATURE OF REPORTER)