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 Urit 1) :

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25 North Court Street,
Harrisburg, Pennsylvania

Friday, November 14, 1980

Evidentiary hearing in the above-entitled matter was resumed, pursuant to adjournment, at 8:46 a.m.

BEFORE:

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

DR. WALTER H. JORDAN, Member

DR. LINDA W. LITTLE, Member

8011240043

APPEARANCES:

On behalf of the Licensee, Metropolitan Edison Company:

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THOMAS A. BAXTER, Esq.
DELISSA A. RIDGWAY, Esq.
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On behalf of the Commonwealth of Pennsylvania:

ROBERT ADLER, Esq.
Assistant Attorney General,
505 Executive House,
Harrisburg, Pennsylvania
WILLIAM DORNSIFE,
Nuclear Engineer

On behalf of Union of Concerned Scientists:

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

JAMES TOURTELLOTTE, Esq.
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Office of Executive Legal Director,
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C O N T E N T S

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P R O C E E D I N G S

CHAIRMAN SMITH: Before we went on the record this morning, we had a discussion about scheduling, and in particular, the scheduling of November 24. UCS has requested that that be an off day, because they need office time. Licensee has requested that we proceed for efficiency and to expedite the hearings.

The Board observed that we believe that UCS has made good use of office time in preparation of the gross examination plans. That has itself resulted in some efficiencies, and it will take this into account in determining whether we meet on the 24th or not.

All right. Are you ready?

MR. BAXTER: Mr. Chairman, I have a preliminary matter for the record.

We have had discussion at various points of the need for written testimony to be filed and timely notice of parties of evidence that is going to be presented, and I would like to call one matter to the Board's attention along that line.

I was handed yesterday by Mr. Pollard a letter dated November 13, 1980, from Ms. Weiss to the Board enclosing three documents which UCS proposes to offer as exhibits accompanying Mr. Pollard's testimony, which I expect to be presented next week on UCS Contention Number

10. This is Agenda Item Number 4. According to the Board's scheduling memoranda and orders, as I understand it, this evidence should have been filed with the parties on September 25, 1980, pursuant to an extension of time granted to the NRC staff and intervenors on UCS Contention Number 10.

The three documents are all dated 1975. They are not being produced as as result of any inquiry by the Board which has been the product of some of the other late evidence that has been presented in the last two weeks.

I have already filed my cross examination plan on Mr. Pollard's testimony in this area and consulted with my technical people on the cross examination of Mr. Pollard for next week.

I [illegible] going to object to the exhibit because of their brevity. Therefore, there is no need for a Board ruling on this matter. I simply wanted to call it to your attention, because I do not want it to be taken as a precedent that exhibits that should have been filed earlier can be accepted at this late date, and giving us so little notice without any justification for it.

MR. TOURTELLOTTE: Mr. Chairman?

CHAIRMAN SMITH: Mr. Tourtellotte?

MR. TOURTELLOTTE: One other matter. This morning, I served the responses by hand to UCS interrogatories of September the 25th. I left a copy with

the Board members as well as UCS and the other parties present. It will be mailed today. I note on the cover sheet that I have the date September 30th, but I believe that was September the 25th that those interrogatories were posed.

Otherwise, this is the package that will be served today, and I brought it up for UCS, for their convenience.

CHAIRMAN SMITH: Anything further?

MR. CUTCHIN: Yes, Mr. Chairman.

Yesterday, Dr. Jordan asked the staff to take a look at its list of Exhibits 29 through 40 to see if there were any additional ones that should be marked or introduced. The staff has taken a look at the staff believes that the exhibits that were put in by the licensee cover all the bases, and there are none of those that we believe need to be put into the record.

CHAIRMAN SMITH: Anything further preliminarily?

(No response.)

CHAIRMAN SMITH: All right. Ms. Weiss?

MS. WEISS: Mr. Pollard is going to do this questioning.

DR. JORDAN: I was wondering again if it would be helpful to ask Mr. Capodanno to briefly review the operation of the emergency feedwater system. The diagram and the exhibit he supplied with the testimony is useful and

helpful, but I still feel it might be worthwhile to spend a few minutes on the diagram, pointing out the major features of the revised system and how it has changed.

Is there any objection?

MS. WEISS: That is fine.

DR. JORDAN: Do you think it would be helpful?

MS. WEISS: Yes.

DR. JORDAN: All right.

Whereupon,

GARY R. CAPODANNO,

LOUIS C. LANESE, and

JOSEPH A. TORCIVIA

were recalled as witnesses by the Board, and having been previously duly sworn by the Chairman, were examined and testified further as follows:

EXAMINATION BY THE BOARD

BY DR. JORDAN:

Q Would you be willing to do that, please?

A (WITNESS CAPODANNO) This figure shows the emergency feedwater system as it is configured, and you have made mention of some of the changes. The changes really don't show up in this schematic. I can describe them when we get to specific features, if you wish.

Q I see. This is the system prior to the changes that were made for restart.

A (WITNESS CAPODANNO) Yes.

Q All right. Briefly run us through this, then, pointing out the major components and then the changes so that we will be sensitive to it.

A (WITNESS CAPODANNO) Okay. In the emergency feedwater system itself, the major components are located in the middle of the page. They are the three pumps labeled EFP 1, EFP 2A and B. Above Pump P1 is the feed pump turbine that drives Pump Number 1. Above those -- I should say above and to the left and right of those are two boxes labeled SG A and B. Those are the respective A and B steam generators.

At the bottom of the page, major components are labeled Condensate Storage Tank B on the left and A on the right, and then slightly above those and in the middle is Condenser Hot Well. So, I will start from the bottom of the page and describe the flow path.

When this system is in use, it initially takes suction from these condensate storage tanks.

Q From the condensate storage tanks?

A (WITNESS CAPODANNO) Yes. Water flow would be to the valves labeled 10A and B adjacent to the condensate storage tanks, and as the diagram is on the page, it would be upward on the page into what is referred to as the pump suction header. It is the line that contains valves labeled

EFV 1A and 1B. That provides a common inlet for the water to all three pumps, and then the flow is through those pumps through their discharges into this common discharge line, which again is a horizontal line on this diagram containing valves labeled EFV 2A and B.

The flow then goes from the discharge header into the steam generators through valves that are labeled EFV 30A and B.

Now, the way the system was originally designed was, the turbine driven pump, that is, Pump Number 1, would be initiated, start to operate on either a loss of all four reactor coolant pumps or loss of both main feedwater pumps, and that pump is turbine driven, so what occurred in that instance was, steam supply valves would open up to supply steam to run the turbine labeled EFP turbine on this drawing and operate Pump Number 1.

The steam supply comes from the steam generators through what is termed the steam leads. Those are the lines that go vertically up from the steam generators and eventually terminate in the oblong box labeled Turbine. The steam supply comes from the steam leads and initially goes through the valves labeled NSV 13A and 13B, which are located in the top center of this diagram.

Q I see the 15A and the 15B, but I can't find the 13A.

A (WITNESS CAPODANNO) It is directly above. If you just go up vertically from the turbine symbol, you will see an array of four valves and a rectangular configuration.

Q Now I see it. Yes, 13A and 13B, I do see there, showing blank is normally closed?

A (WITNESS CAPODANNO) Yes, sir.

Q So the source of steam then is from the steam generator through the horizontal line. On the B side is MSV 2B?

A (WITNESS CAPODANNO) Yes, sir.

Q All right, and then through a check valve?

A (WITNESS CAPODANNO) That is correct.

Q Then, which is the normal path. Is it up at that point to the two-inch line?

A (WITNESS CAPODANNO) Yes, it is

Q I see. So that either steam generator can be used and one is chosen.

A (WITNESS CAPODANNO) Yes. The original design was, there is preferential logic for the A generator. That is, if you've got good steam pressure on the A generator above 100 pounds, the 13A valve would open and the 13B valve would remain closed.

Q I see.

A (WITNESS CAPODANNO) Then in the logic senses that is not enough pressure in the A generator, then the B would

come open to supply steam.

Q If the pressure was not adequate in Steam Generator A, then that valve would be closed and the other one would be opened. Is that the way it would work?

A (WITNESS CAPODANNO) Yes, sir.

Q That is the way the logic would work?

A (WITNESS CAPODANNO) Yes.

Q By sensing the pressure?

A (WITNESS CAPODANNO) Yes.

Q All right. Now, you say that has been changed.

A (WITNESS CAPODANNO) Yes. If I may, I will go through the rest of the steam flow path.

Q I think that is probably wise.

A (WITNESS CAPODANNO) Again, describing the original design, assuming that steam generator A had adequate pressure, valve MSV 13A would open. Steam flow would then be vertically down on this diagram through the device labeled MSV 6, and it has a PCV next to it indicating pressure control valve. And then steam is admitted to the turbine. That valve functions to control the steam at the unit to that turbine to regulate throttle pressure.

Q I see that PCV is a control valve.

A (WITNESS CAPODANNO) Yes, sir.

Q And determines the speed of the turbine?

A (WITNESS CAPODANNO) No, it does not determine the

speed. It just regulates the steam supply pressure. This turbine is designed to run on a nominal 200 pounds pressure of steam. And then it has mounted on the turbine unit itself a speed governor.

Q I see. And it exhausts into the atmosphere?

A (WITNESS CAPODANNO) Yes, sir.

Q Okay.

A (WITNESS CAPODANNO) So with the original plant design and the initiation scheme I have described, we would then have the turbine driven pump running, supplying steam to the steam generators, going back to the water flow path I described earlier through the MSV -- excuse me, EFV 30A and B valves. Those valves modulate to control flow into the steam generators, and they worked off a level control signal.

There is level instrumentation on the steam generator, and through the integrated control system a signal was sent to these valves to modulate them open or closed, to maintain adequate level, liquid level in the steam generators.

Q Now, which valve is that?

A (WITNESS CAPODANNO) Again, in vertical lines about midway up the drawing, labeled EFV 30A and B.

Q 30A and 30B. I see them. All right. So those are normally operated by the ICS?

A (WITNESS CAPODANNO) Yes.

Q All right.

A (WITNESS CAPODANNO) Now, again, staying with the original design, the two motor driven pumps, those numbered EFP 2A and B were available to pump, but they were not automatically initiated in the original design. The operator in the original design could manually start these motor driven pumps.

Again, going back to the bottom of the drawing, I mentioned earlier that the condensate storage tanks served as a source of water, and that is the normal source of water.

Q Yes, and there are two separate tanks.

A (WITNESS CAPODANNO) Yes.

Q One serves one of them, and one the other.

A (WITNESS CAPODANNO) In a normal line-up, it can be made that way. There is common piping at the supply to the pumps, so that --

Q Either one could.

A (WITNESS CAPODANNO) You could cross-feed so you could have them both lined up to feed, and you would have the ability with what is termed the sexualizing valves in the header to isolate parts of the system from other parts of the system.

Q Yes. I see. Okay.

A (WITNESS CAPODANNO) As I mentioned, the condensate storage tanks are the primary source of water.

In addition to that, the hot well, which is the rectangle located midway between the two condensate storage tanks, is also a source of water for the emergency feedwater system.

Q I see.

A (WITNESS CAPODANNO) That source can be lined up to supply water to the pump section by opening valves labeled on this drawing either COV 8 or COV 12.

Q Yes.

A (WITNESS CAPODANNO) The reason there are two valves is, one of them is normal flow path with normal power supplies, and the other one, COV 12, is a motor-operated valve with emergency power supplied to it, so that in the event the hot well was to be used, and for any reason the Number 8 valve could not be operated, then the 12 valve is available.

Now, turning to Figure 2, this is a schematic that represents another source of water for the emergency feedwater system, and the connection between these two diagrams from Figure 2 to Figure 1 is immediately above the box labeled Condenser Hot Well, and there is a line that says From Emergency River Water Source.

Q Yes.

A (WITNESS CAPODANNO) So that source is what is depicted on Figure 2. This river water source is the set of emergency river water pumps that serves to supply water to

other emergency cooling systems in the plant, namely, the reactor building cooling system. And there is a connection off that water supply into the emergency feedwater system, so that if it is ever required, emergency feedwater can be fed from the river water system.

Q Yes. I have forgotten what the source of power for those pumps is.

A (WITNESS CAPODANNO) The river water pumps? They are IE-powered, emergency powered pumps, and again, they start on a safety features actuation signal. So, they could be available and diesel-powered.

Q I see. They come straight off the diesel supply, the diesel generators?

A (WITNESS CAPODANNO) Yes.

Q Okay.

A (WITNESS CAPODANNO) In order to get feed of emergency feedwater from the river water source, there are two valves on Figure 2 labeled EFV 4 and 5. These valves have to be opened. They are motor operated valves, but they are locked closed, as indicated by the LC designation next to the valve.

Q I see.

A (WITNESS CAPODANNO) So this is the situation where somebody has to physically unlock the valve. There is also in the way the plant procedures work that these valves

are racked out, which means that the power supply breakers are kept normally open. That means that if you wanted to run these valves on electric power, you would have to close the breakers.

However, there are hand wheels on these valves, so at the time the operator is taking the lock off the valve, he is in that area next to the valve. He could also open them manually. The reason they do this is simply, since it is a backup source, it is undesirable to allow any inadvertent actuation and put river water into the steam generators. So this precaution is taken.

Now, as far as the changes that are being made to the system, first of all, in the area of actuation, whereas the motor driven pumps were not automatically actuated --

Q I couldn't understand.

A (WITNESS CAPODANNO) I am sorry. In regard to actuation of the system, the motor-driven pumps, as I mentioned, were not automatically actuated previously.

Q Yes.

A (WITNESS CAPODANNO) One of the changes being made is to actuate the motor-driven pumps automatically also, so-called auto initiation, so that the same signals, reactor coolant pump loss and main feed pump loss, now start the motor-driven emergency feedwater pumps also.

MR. TOURTELLOTTE: So it is loss of the main

feedwater pump that starts automatically these? Is that it?

WITNESS CAPODANNO: That is right. All three emergency feedwater pumps will now start on loss of main feedwater pumps.

BY DR. JORDAN: (Resuming)

Q Yes, and how do you detect loss of main feedwater?

A (WITNESS CAPODANNO) There is pressure-sensing instrumentation across the main feedwater pumps. That is from the suction side to the discharge side. And if that senses a load differential pressure, it indicates that the emergency feedwater pump is either not operating or it is operating at such a low discharge pressure that it is not able to produce any sufficient flow.

Q And then a coincidence --

MR. BAXTER: Excuse me, Mr. Capadanno. Did you mean the main feedwater pump is operating at low pressure? You were just talking about the pressure.

WITNESS CAPODANNO: Yes. The pressure-sensing instrumentation is across the main feedwater pumps.

BY DR. JORDAN: (Resuming)

Q I see, and there is a coincidence signal there, so that it takes loss of both.

A (WITNESS CAPODANNO) That is correct.

Q All right.

A (WITNESS CAPODANNO) And again, the other auto

initiation signal for emergency feedwater is loss of all reactor coolant pumps, and that signal is now also used to start the motor-driven emergency feedwater pumps.

Q I see.

A (WITNESS CAPODANNO) So that first change is in the area of auto initiation. Another change that has been made to this system is in terms of the ability to control flow. That is the EFV 30A and B valves.

Q Right.

A (WITNESS CAPODANNO) As I mentioned earlier, they normally control through the integrated control system. With the changes that have been made to the plant and some other features that have always been in the plant, these valves can be operated under a number of adverse situations, those situations being loss of the ICS signal. If that is completely lost, there is now what is called a manual loader provided in the control room so that the operator can modulate these valves directly from the control room, even if the integrated control room is completely unavailable.

A second consideration is that these valves are air operated so that if for some reason the air supply was lost, they could not be further moved. The existing plant design includes a normal air supply from the normal instrument air system in the plant. That system can be powered from emergency diesels. But it is shed from the

diesels. It is an engineered safeguards actuation.

So, with the original plant design, it would then require that the operator would have to reload the instrument air compressors onto the diesels to continue the air supply. That situation does not represent an immediate loss of air, because there is an air reservoir in the instrument air system, so there is a certain amount of capacity built in.

However, you would have to initiate air compressors at some time to maintain that air supply. The change that was made to the plant and installed, completely installed prior to the [illegible] 2 accident was to put in a backup air supply. This is a separate air compressor that is powered from the diesel buses and remains on the diesel buses regardless of whatever occurs in the plant.

That air supply also has a reservoir in it with supplied air, whether off-site power was available or not, and whether or not there was any kind of safeguards actuation.

Another feature that has been in the plant is an air receiver also tied into this air supply system to the valves, the 30A and B valves, such that they would fail open on loss of air. That is, this reservoir is normally kept charged, and the air is not withdrawn from it. But if for some reason the entire air supply was lost, there is enough

charge in the smaller reservoir to force the 30A and B valves full open.

So, with the existing design that is a part of the restart, we had a normal instrument air supply, that is, a normal plant air supply. We had a backup air compressor supply and we had a reservoir that was available to drive the valves open on the loss of those to air supplies.

An additional feature that has been added for a restart or as part of the restart effort, however, it what has been termed a two-hour backup air supply.

Q The what? The two-hour backup?

A (WITNESS CAPODANNO) Yes.

Q Thank you.

A (WITNESS CAPODANNO) What that consists of is yet another air supply -- actually, it is a gas supply, nitrogen gas provided to the same gas quality as instrument air is, that is, dried gas, very, very little moisture in it, and that supply is maintained in gas bottles and through a valving arrangement will come on to supply motive gas, functioning exactly as instrument air does, to operate the 30A and B valves. That is, to allow them to be modulated for a period of at least two hours.

Q Is this a single source air supply?

A (WITNESS CAPODANNO) The backup?

Q Yes.

A (WITNESS CAPODANNO) No, it is one per train.

Q Two tanks?

A (WITNESS CAPODANNO) I am not certain of the number of tanks. That depends on final calculations of quantities. But it is one or more nitrogen cylinders to supply each side.

Q I see. So it would be a commercial nitrogen cylinder?

A (WITNESS CAPODANNO) Yes.

Q I see.

A (WITNESS CAPODANNO) Now, those changes allow us to have motive air to the valves and allow operation of the valves, whether or not the normal integrated control system is available. In addition to that, in order to give operator guidance as to what to do when he is controlling these valves 30A and B, additional level instrumentation is being added to each steam generator, two instruments, that is, redundant instruments, emergency power supply to supply to each steam generator.

So, again, if there is an ICS or power failure, these instruments are still available and those instruments in conjunction with the controls, additional controls available to the operator would allow him to regulate flow to the steam generators and observe levels in the steam generators.

Going back to the condensate storage tanks for a moment, another feature that has been added there -- well, actually, let me back up a step. Existing in this condensate storage tank is level indication. Now, also existing on the condensate storage tanks now is an alarm, a so-called tech spec level alarm.

You will note that the diagram shows on the condensate storage tanks and says 150,000 g., tech spec, indicating that the technical specifications require at least 150,000 gallons of water in those tanks. There is an alarm that has always been on the tanks that indicates that at some quantity of liquid above 150,000, that you are encroaching on the 150,000 gallons. That is a so-called tech spec alarm.

There is also an existing level indication on the condensate storage tanks. What is being entered for restart is what is termed the 20-minute alarm, and that is when the tank level gets to the point that when all emergency feedwater pumps are running, this alarm will indicate that there is 20 minutes left to the point of exhausting the capacity of the tanks.

Going back to the steam supply on the feed pump turbine, in order to assure that we have an adequate supply of steam and to minimize any potential for overspeed on the feed pump turbine due to failure on the pressure feed valve,

MS 6, that valve is being changed. It is not physically being altered, but its stroke is being limited, so that it will provide adequate steam and adequate pressure, but that if it should ever fail open, it will not fail open to the point that it will try to supply more steam than the turbine can handle without overspeeding.

Part of that protection is provided by these relief valves labeled MSV 22A and B. So, the change to that control valve and the change in the relief valve hardware lowers the set points of those relief valves. So, with the set points lowered, we protect to a lower pressure. We still have adequate capacity to relieve the steam supply that can occur on failure of MSV-6, because that valve is being gagged to open only to a certain point, such that it will pass no more steam than the relief valves can handle.

Q I see. You told me that MSV 6 was controlled by the integrated control system.

A (WITNESS CAPODANNO) No, that is the pressure control valve for the steam supply, and it is self-regulating. There is a line off the semi-circular indication from the top of the valve back to the steam line that indicates that it senses steam line pressure and regulates off of that direction.

Q I see. Okay.

A (WITNESS CAPODANNO) Another feature I might

mention as long as I am talking about that valve, slightly to the left and down from MSV 6 is a valve labeled ASV 4. That is an auxiliary steam supply that can also be used to run the feed pump turbine from the plant auxiliary boilers.

Q I lost that one. I see USV 6, the one I just asked about.

A (WITNESS CAPODANNO) Yes. A little bit below MSV 6 and to the left.

Q And to the left.

A (WITNESS CAPODANNO) Yes. It says ASV 4.

Q ASV 4. Yes, I see it.

A (WITNESS CAPODANNO) And it is labeled Aux Steam Supply.

Q Yes.

A (WITNESS CAPODANNO) That is a steam supply from the auxiliary boilers.

Q I see. Is the auxiliary boiler normally on? It is oil fired, presumably.

A (WITNESS CAPODANNO) Yes. There are two of them, oil fired. They are run during startup. They can be run to test equipment. They are not always normally operating, however, so obviously an initiation of this steam source is dependent upon either their being operated or getting them started to supply steam.

Q And that is part of the original system, then?

A (WITNESS CAPODANNO) Yes.

Q Okay. If the operator takes control of the level in the steam generators, how does he do this? Is this something he watches the meter, watches the gauge, the level gauge, and turns a valve?

A (WITNESS CAPODANNO) Yes, there is a device called a raise-lower switch. In fact, there are two of them. As I mentioned in the normal ICS supply, there is also the ability to take manual control of the valves via a raise-lower switch.

Q I see.

A (WITNESS CAPODANNO) Part of the modification, this second control that has been added that is idependent of ICS also has a raise-lower device in it.

Q So what he does is to set it for a certain rate, and if that matches the steam requirements, then it stays there. If he finds the level creeping up, he lowers the rate?

A (WITNESS CAPODANNO) That's right, and the control panel layout has these controls and indication adjacent to one another, so that as he is modulating the control he is also looking at the steam generator levels.

Q There is a panel in the control room for doing this?

A (WITNESS CAPODANNO) Yes. I might also mention

that all of the valves in the system, all power operated valves have control and position indication, so there is steam generator level indication, there is this raise-lower switch in the control, and there is position indication that is open-closed indication, on all the valves, power operated valves in the system.

Q I recently heard some concern about possibly overfilling of steam generators. Have you thought about that matter or considered it?

A (WITNESS CAPODANNO) Yes. In fact, I believe that was raised at some point by a question on the restart report, and in answer to that question, there was included in the restart report an analysis by B&W on the potential for overfill. I believe it is a conservative analysis, and the results of that analysis show that there is a period of about ten to 17 minutes before overfill would occur, and that given those, at minimum, two level indicators that would be available per steam generator to the operator, and that he has that indication and the control --

Q And an alarm?

A (WITNESS CAPODANNO) There is also a high level alarm. I believe if there was an ICS failure, I think that alarm is defeated, however.

Q When the operator takes control and raises the level to 95 percent, that is not 95 percent of completely

filled. Is that right? Am I wrong in saying that the operator does under some circumstances take control and raise the level to 95 percent?

A (WITNESS CAPODANNO) I believe he can. I think Mr. Lanese can answer that better than I.

A (WITNESS LANESE) That is correct. It is not 95 percent of the full level of the steam generator.

Q So there is quite a range still to go.

A (WITNESS LANESE) That is right.

Q All right. Is that --

A (WITNESS CAPODANNO) Yes, I think that covers the major features of the system and major changes that are being made to it.

BY DR. LITTLE:

Q Mr. Capodanno, on Page 10 of your exhibit, you notice that one of the component failures which could contribute to system unavailability would be potential plugging of the emergency feedwater pump suction strainers. Are these the strainers shown in Figure 2?

A (WITNESS CAPODANNO) No, the strainers are shown in Figure 1. If you look at each of the pump symbols, just below each pump symbol is a device labeled Strainer. It says Typical on the leftmost one.

Q Yes.

A (WITNESS CAPODANNO) And then there is one

indicated for each of the three pumps. Those strainers have been removed.

Q What was their initial function?

A (WITNESS CAPODANNO) Their initial purpose is so-called startup strainers, to ensure that the time the fabrication of the piping systems are complete and what systems are started up, and there may be debris such as slag or scale or anything else in the system.

Strainers like this are typically installed to catch that debris and protect the pumps. The pumps might be run, the strainers removed and replaced several times to ensure that any debris is collected and removed from the system. Subsequent to that, once you are sure there is nothing left in the system from the construction effort that would be objectionable, the strainers can be removed.

Q So their removal is not going to have any adverse effect?

A (WITNESS CAPODANNO) That is correct. It will not have an adverse effect once they are removed.

Q They are removed because they are no longer necessary.

A (WITNESS CAPODANNO) That is correct.

Q All right.

DR. JORDAN: One more thing. You do refer in your reference to a report, Auxiliary Feedwater Systems

Reliability Analysis, BAW 1584. Has this been made into an exhibit? I would like to see a copy of that report.

MR. BAXTER: Fine. We will provide you with one.

DR. JORDAN: Mr. Pollard or Ms. Weiss, do you have questions now on explaining the operation of the system? If you have, now would be a good time, and then go to your regular cross.

CROSS EXAMINATION BY UCS

BY MR. POLLARD:

Q The only question I have, is it correct that Figure 1 on your exhibit is equivalent -- the equivalent information is shown on Figures 302-081 and 302-011 in Section 9 of the restart report?

A (WITNESS CAPODANNO) The information regarding steam supply to the feed pump turbine is shown on Drawing 302-011. I am sorry. What was the other reference?

Q 302-081.

A (WITNESS CAPODANNO) Again, yes, that is correct. For the emergency feedwater portion, information is shown on Drawing 081.

MR. POLLARD: Dr. Jordan, the other thing I would like to have them explain before we start is, on 302-081 is a portion of the system that is used for cooling of the pumps or cooling of the bearings and so on. I think that would also be helpful if he could explain how the pumps are

cooled.

DR. JORDAN: Very well. Let us get that drawing.

(Pause.)

MR. POLLARD: Also, for the record, could we note that the drawing we are referring to is 302-011, and it is labeled Revision 22, and 302-081 is labeled Revision 17.

WITNESS CAPODANNO: Did you want me to describe the cooling system now?

MS. WEISS: Yes.

WITNESS CAPODANNO: On the Drawing 081, in the top right corner, there is a schematic labeled Emergency Feedwater Pump Bearing Cooling. These pumps are self-cooled. That means that the discharge water from the pump itself is used to cool the pump bearings, and what this diagram is indicating is, from the three pump symbols, those circular symbols at the bottom coming off of there indicated from the discharge of the pump a water supply that is fed to the pump bearings, and the same applies to each of the three pumps.

After passing through the bearing housing to cool the bearings, this water is returned ultimately to the condensate storage tanks.

BY MR. POLLARD: (Resuming)

Q On your Figure 1 in your exhibit, coming out the discharge on each pump is shown what appears to be a small

open and a half inch or two inch recirculation line. Is this also for cooling the pumps, and is that different from that you just explained on 302-081?

A (WITNESS CAPODANNO) Yes. This schematic in the upper right of Drawing 081 shows a particular water supply to pump bearings. The thing shown in our figure which also appears on the lower left of Drawing 081 is the pump recirculation or minimum flow line, and it is correct, that is provided to assure minimum flow through the main body of the pump to provide cooling, so that you would not have an isolated flow and result in overheating.

MR. POLLARD: I have no further questions on general explanation of the system.

CHAIRMAN SMITH: Okay. You can proceed with your cross examination then.

BY MR. POLLARD: (Resuming)

Q As we have done with other witnesses where we had joint testimony, if we could have the author of the testimony answer first, and then if someone else cares to add, that would be fine.

Of course, the first section is a dual authorship. I don't know who the principal author is.

A (WITNESS CAPODANNO) I am sorry. Are you referring to one of the responses to a particular question?

Q Yes. I am sorry. I am going to go through your

testimony in order. The first question, Board Question 6A, has two authors identified.

I think the first thing I would like to start with concerns pursuing our discussion of last evening. I would like to know what your definition is of safety grade.

A (WITNESS LANESE) I think in the most general terms a safety grade is one that is designed to reliably function for the particular safety function that it has to perform. And that would include qualification with respect to the environmental consequences of an event. It would include reliable power source. It would include appropriate quality assurance and quality control and the manufacture, installation of the system.

If appropriate, separation of the system, physical and electrical separation, would be included in that as well, and perhaps a more general answer is that it has to meet the appropriate general design criteria that would apply for the event in which it needs to function.

Q Then as a basis for judging whether or not the system can reliably perform its function, the test would be whether or not it meets the appropriate general design criteria. Is that correct?

A (WITNESS LANESE) Yes, that is correct.

Q And it would also perhaps involve meeting 50.55A, which incorporates the requirements of IEEE Standard 279?

A (WITNESS LANESE) I would have to see 50.55A again to answer that question.

Q Well, you can read it if you wish. All it says is that protection systems must meet IEEE 279. I know Mr. Baxter doesn't like -- The question is not that complicated.

MR. BAXTER: The regulation has an implementation section to it.

WITNESS LANESE: That is what I was referring to, the implementation.

BY MR. POLLARD: (Resuming)

Q It is specifically 50.55A, Codes and Standards (H).

A (WITNESS CAPODANNO) Are you looking at the same page we are? Can you reference the page where it appears?

Q Not when you have my book, I can't.

MR. BAXTER: It is around Page 350.

CHAIRMAN SMITH: Don't confuse 55A and 55(A). Page 345.

MR. BAXTER: 351.

MS. WEISS: It is Page 351.

WITNESS LANESE: I think I have it.

CHAIRMAN SMITH: What is it on 351 that we are going to be talking about?

MR. POLLARD: In the righthand column there is a paragraph labeled (Protection Systems).

WITNESS LANESE: I guess I would have two comments

about that. The first is that the definition of a protection function is fairly specific, and in my understanding represents reactor protection system and engineered safeguards.

So, from that point of view it may not apply. As far as the implementation, it says the applicable version of 279 in effect at the time of the docketing of the construction permit, so it may not also apply for TMI 1 under those conditions.

On the other hand, we generally compare ourselves to the requirements of 279. I think when I talked about redundancy and diversity and separation I was referencing the general type guidance that you would expect a safety related system to be.

BY MR. POLLARD: (Resuming)

Q We, of course, have another contention which is going to get into this applicability or not. All I am asking for the time being is, within your written direct testimony, on Board Question 6, when you use the phrase "safety grade," and if the equipment you are talking about when you use the phrase "safety grade" includes equipment within your definition of "protection system," does that then mean in your direct testimony that it also meets the requirements of IEEE 279?

A (WITNESS LANESE) I still have the problem of

"protection system" in that I think it implies engineered safeguards. Putting that aside, I would expect that we meet 279 with respect to redundancy sources of power supply, diversity, timeliness of initiation.

Q Are there some requirements of 279 then that you may not meet when you use the term "safety grade?"

A (WITNESS LANESE) I cannot remember all the requirements of 279, which is why I just wouldn't say on a blanket basis we meet it. I think we meet the intent.

Q I guess we will just have to wait until we get to something specific.

A (WITNESS LANESE) Fine.

Q Within your definition of the phrase "safety grade," will the emergency feedwater be safety grade prior to restart?

A (WITNESS LANESE) With respect to loss of feedwater transients, with respect to small break LOCA mitigation, yes.

Q Does that mean, then, there are some accidents for which emergency feedwater would not be safety grade?

A (WITNESS LANESE) Prior to restart, I think that is correct. I think that is what we have identified in the attachment to Exhibit 15 when we addressed the general design criteria.

Q Now, for the loss of feedwater transient in the

small break LOCA accidents, when you say, "Emergency feedwater will be safety grade prior to restart," do you include in that statement the instrumentation and controls for emergency feedwater meet IEEE Standard 279?

A (WITNESS LANESE) I think the answer is yes, with the understanding that for small break LOCA, the operator may take manual control, recognizing that there is ICS control of the feedwater regulating valves. Should there be a failure of that signal, he would take control.

A (WITNESS CAPODANNO) I might add that the components are being supplied for the modifications I described earlier for restart, that is, to provide independence from the integrated control system, are basically safety grade components.

Q When you say "basically safety grade" --

A (WITNESS CAPODANNO) There are some transmitters which to my understanding of the qualification requirements to industry codes and standards may not at this time be met. I think I am referring particularly to IEEE 323, where my understanding is to date no equipment manufacturer has been able to fully meet that standard, and GPU and other utilities are engaged in a qualification program on equipment right now.

The equipment being supplied is otherwise qualified, and as a result of that qualification program,

the hardware we are procuring will either be qualified or we will know in conjunction with the manufacturers how to modify it to make it qualified in all respects.

Q When you mention IEEE Standard 323, which version are you referring to?

A (WITNESS CAPODANNO) I am really not certain. I am referring, however, in particular to the aging requirements, the actual date or the addition date. I am not certain of that.

Q All right. Then in your testimony, in your written testimony, there is a sentence that states, "The emergency feedwater system will not be fully safety grade before the restart of TMI 1."

A (WITNESS LANESE) Again, that is not fully safety grade with respect to other events as identified in the attachment to the Exhibit 15.

A (WITNESS CAPODANNO) I think the point here that is identified in the attachment is that there was an I&E Bulletin 79-01B regarding qualification of electrical equipment. That has been and is being addressed, and all the results are not in on that. Consequently, in our attachment to our exhibit, we have identified that condition.

Q Mr. Lanese, when you say it will not be fully safety grade for the events identified in the exhibit, could you please tell me which events you are referring to in the

exhibit?

I am referring to Licensee Exhibit 15, if that is what you are referring to.

A (WITNESS LANESE) In general, it would be high energy line breaks in the intermediate building.

DR. JORDAN: High energy line breaks where?

WITNESS LANESE: In the intermediate building. And I think also if you look at the note on GDC 2, it indicates that a seismic event still has to be investigated further for the system.

BY MR. POLLARD: (Resuming)

Q Just to save time, could you tell me what section that is in the exhibit?

A (WITNESS CAPODANNO) It is Table 1, which is attached to Exhibit 15. It is Page 1 of 5 of that table.

A (WITNESS LANESE) It is right after the Figure 2.

Q Thank you.

Are there any other events other than those listed in that table for which the system will not be safety grade prior to restart?

A (WITNESS LANESE) No.

DR. JORDAN: For my information, is there a general design criteria that is applied specifically to emergency feedwater systems? I notice GDC 34 applies to residual heat removal. But is that only the low pressure

heat removal system? Is that your understanding?

WITNESS CAPODANNO: I don't believe any of the GDC's, at least for fluid systems, are written with specific identification of systems in mind. The term "residual heat removal" is referring to removing post-shutdown heat.

Because the criteria have to be expansive enough to cover those PWR and BWR designs, I think the idea of establishing criteria rather than specific systems identification is what is intended.

DR. JORDAN: I see. Well, of course, immediately after shutdown, the only means of removing residual heat is through the heat exchangers and the emergency feedwater system, normally. So, I guess I concluded that therefore the GDC 24 applied.

WITNESS CAPODANNO: Well again, since it is establishing a broad-based criteria for nuclear power plants, in the case of B&W systems residual heat removal is done by what they term the decay heat removal system. That is a long-term cooling system that is distinct from emergency feedwater.

DR. JORDAN: Well, I guess the main thing in GDC 34 that catches my eye is, assuming a single failure criteria, and I gather from your saying the system meets IEEE 279 that it meets the single failure criteria also.

WITNESS CAPODANNO: Yes, it does meet single

failure criteria.

WITNESS LANESE: Two comments, please, Dr. Jordan. I don't think we said we met 279. I think we said that we normally compared ourselves to it. I don't think we are prepared to make the statement without having reviewed it again.

DR. JORDAN: Yes, I remember, now. That is fine. Thank you.

WITNESS LANESE: The other comment is that normally after reactor trip you do not depend on emergency feedwater to remove heat.

DR. JORDAN: How is that? I didn't hear.

WITNESS LANESE: After reactor trip, the emergency feedwater system is not the normal source of removing heat from the reactor. It is main feedwater through the startup control valves. And that is a differentiation between an auxiliary feedwater system and an emergency feedwater system.

DR. JORDAN: Yes. Oh --

WITNESS LANESE: An auxiliary feedwater system would be used under normal conditions to remove heat either during startup or possibly after reactor trip. Ours is indeed an emergency feedwater system, in that it would only be used if the normal sources of feedwater were not available.

DR. JORDAN: All right. I guess there has been a

fair amount of confusion to this point in the hearing, and I thought the only difference was, the staff used one set of terms and licensee another. But by auxiliary feedwater system, then, in your case, you are referring to the main feedwater system --

WITNESS CAPODANNO: Dr. Jordan, if I may, there is, I think --possibly historically there was a very definite distinction made. As an example, combustion engineering PWR plants make use of a feedwater system which we call emergency and they have termed auxiliary.

DR. JORDAN: I see.

WITNESS CAPODANNO: In those plants, that system is used to supply feedwater for startup and shutdown.

DR. JORDAN: Yes.

WITNESS CAPODANNO: And I believe historically the term "auxiliary feedwater" was used. B&W designs, our emergency feedwater system functions only when the normal feedwater system is unavailable.

DR. JORDAN: I see. Startup and shutdown, you use the main feedwater system.

WITNESS CAPODANNO: That is correct, and over a period of time the terms "auxiliary" and "emergency" have been mixed. As an example, in the reliability report that you made reference to earlier, one of the very early introductory comments in that report says that the term

"auxiliary feedwater" will be used for B&W plants where traditionally that has been referred to as emergency feedwater.

At this point, the terms are used interchangeably.

MR. BAXTER: Dr. Jordan, I think we established that with Mr. Jones in his testimony introducing the B&W analysis. He used the two terms interchangeably.

DR. JORDAN: Yes, I remember that he did, but this triggered my interest, that in this case there might be or have been at one time a difference. That is fine. Thank you. Go ahead.

BY MR. POLLARD: (Resuming)

Q Prior to the changes that you made to the emergency feedwater system which you described to Dr. Jordan earlier, was the emergency feedwater system safety grade, or has it become safety grade as a result of the changes?

A (WITNESS LANESE) I believe previously it would be considered important to safety, and as a result of lessons learned, I suppose, in other B&W LOCA analysis, it would be considered safety grade in the future.

Q I will have to ask the question again, having read that. Prior to making the changes, was the emergency feedwater system safety grade?

A (WITNESS LANESE) Our interpretation of the system was that it was important to safety.

Q It was not therefore safety in the present sense?

A (WITNESS LANESE) That is correct.

Q Would you agree that if there were an accident with loss of main feedwater, and total loss of emergency feedwater, that you would be unable to meet the requirements of 50.46 without using bleed and feed?

A (WITNESS LANESE) I don't think 50.46 is applicable. As a criterion, because we are talking about a multiple failure situation. 50.46 does not address that situation.

Q Let's assume that we have lost main feedwater, and assume that we have no emergency feedwater. Can the reactor core be adequately cooled following an accident such as a small break LOCA without using bleed and feed?

A (WITNESS LANESE) I think the answer that we gave in response to 6A still stands, that you would require feed and bleed to cool the reactor core, again, with the understanding that that total loss of main and emergency feedwater isn't a design basis.

Q Would you agree that it would be a design basis accident if emergency feedwater was not safety grade?

A (WITNESS LANESE) No, I think I would not necessarily.

Q Can you explain why not, please?

A (WITNESS LANESE) I think if it were not important

to safety and not classified as important to safety, I would agree, but not safety grade. Safety grade is a more narrow description of the function of the clearance of the system.

Q I think it is going to be important, then, for you to explain to me the difference between the phrases which you used, "safety grade" and "important to safety," that is, to explain very specifically which requirements are not met if a system in your words is classed as important to safety, which would have to be met if the system were classified safety grade.

A (WITNESS LANESE) I think current regulations, current Reg. Guides, applicable versions of IEEE 279 would apply to the safety grade system. Important to safety implies the more general applicability of the general design criteria, and I think there is more latitude interpretation of what they mean.

Q What I would like you to do is to tell me specifically which regulations, which regulatory guides, which provisions of IEEE 279 would not have to be met if a system was important to safety, but would have to be met if it was going to have to be safety grade.

DR. JORDAN: I am a little puzzled by the question, in that the witness has not said, if I remember right, that the system was one that was important to safety. I think he said that the emergency feedwater system

was safety grade. So, what is the import of the question?

MS. WEISS: Maybe we need to clarify that. The original question which started this line was, would you agree prior to the accident that emergency feedwater was not safety grade? And he finally agreed.

The next question was -- assuming -- and then we talked about bleed and feed -- would a loss of all feedwater be a design basis accident if emergency feedwater were not safety grade? And that is the question which I think -- and the response was, the witness came back and made a distinction between "important to safety" and "safety grade" with respect to the answer to that question.

Maybe we should ask him to repeat that, and start the line of questioning again.

WITNESS LANESE: If the system did not have a Class 1E power source, if it did not have the safety grade initiating signals that it now has, if it did not have the quality assurance and quality control that it has had, if it did not have the surveillance requirements on the system, then I would say that you would have to consider it not being available, and that it would be a design basis event.

I think the bottom line is that it is designed to be suitably reliable and to have enough safety designed into the system that it does not require the postulation of a different design basis event.

BY MS. WEISS:

Q Let me ask you a couple of questions. You came in yesterday and at the beginning of your testimony you expressed your agreement with the staff's definition of safety grade as defined in Mr. Conran's testimony in UCS Contention 4 -- 14, excuse me. Was that the definition of safety grade that you used at the time you wrote your direct testimony?

A (WITNESS CAPODANNO) If I may, first of all, I don't think we said we agreed with it in its entirety. We used it as a basis. Secondly, we did not have that available to us at the time we wrote the testimony. But we felt that it provides documentation of some of the bases that we had come to independently.

Q Okay. Now, let me ask you this. What was your definition of the term "safety grade" which you used in your testimony at the time you wrote that testimony? What definition were you using?

A (WITNESS LANESE) I would like to clarify one thing first. I was not aware of Mr. Conran's definition of "safety grade" prior to writing the testimony.

Q We understand that. I want to know what your definition was at the time you wrote your testimony.

MR. BAXTER: I believe Mr. Lanese testified earlier this morning what his definition of "safety grade"

is. I heard him go through a description of the features of such a system. He didn't quote Mr. Conran's testimony. He referenced it. I think the question is repetitive.

MS. WEISS: If so, I did not understand the distinction. I think it needs to be very clear.

DR. JORDAN: I thought also that he had answered.

CHAIRMAN SMITH: Well, as a courtesy to Ms. Weiss, it can be done again.

WITNESS LANESE: I think "important to safety" is a general term that describes the requirement of a system --

BY MS. WEISS: (Resuming)

Q Mr. Lanese, I asked you the definition of the term "safety grade" at the time you wrote your testimony.

A (WITNESS LANESE) Thkat is right. That is what I am getting at.

Q Okay.

A (WITNESS LANESE) So, "important to safety" is the more general term. I would interpret a safety-grade system as one that meets the current regulatory requirements for a safety grade system, applicable Reg. Guides, applicable IEEE standards.

Q And that is the definition you used in your testimony?

A (WITNESS LANESE) When I said it was not fully safety grade for some events, that is right. I think I

really mean that we have a system that is important to safety.

Q Do you use the term "system important to safety" in your direct testimony?

A (WITNESS LANESE) No, I use "safety related."

Q That is a distinction that does not appear in your direct testimony. Is that correct?

A (WITNESS LANESE) That is correct.

Q Did you talk to your lawyers after your testimony was written and after you saw Mr. Conran's testimony and arrived at this distinction between "important to safety" and "safety grade" equipment?

A (WITNESS CAPODANNO) No. In fact, in early August there was an in-house GPU document that was authored by our engineering department and QA departments that gave very much the definition that Mr. Lanese has described regarding "important to safety" and what we are calling "safety grade," and that was the basis which we started from in preparing this testimony.

Q Let me ask you then why that distinction doesn't appear in this testimony.

A (WITNESS CAPODANNO) The distinction between "important to safety" and the subset of it?

Q The distinction between "important to safety" and "safety grade."

A (WITNESS LANESE) At the time we were writing the testimony, I don't think we thought the distinction was important.

Q But you now do think the distinction is important?

A (WITNESS LANESE) Since you have raised the issue in this context, yes, in defining the difference.

Q What made you think the distinction was important? Was that from discussions with your attorneys?

A (WITNESS LANESE) No.

MR. BAXTER: I object to the questioning, Mr. Chairman. I think the witness raised the question of "important to safety" as an aid in answering the questions on what "safety grade" means. He evidently feels it is helpful to explain what he means by that term. So, I don't know what mysterious --

CHAIRMAN SMITH: Well, this is for the witnesses and not for counsel to explain. It is traditional cross examination, and she has a right to it.

MR. BAXTER: She has a right to probe conversations between counsel the witness?

CHAIRMAN SMITH: Absolutley. Well, that is not a blank check, but if she is going to try to establish that a definition was changed for the convenience of the litigation, that is appropriate.

WITNESS LANESE: Counsel made me aware that Mr.

Conran had written a definition of "safety related" and "important to safety," and "safety grade." I read it for the first time last night. It verifies my understanding of what I had always considered a system that was safety grade, a system that was important to safety.

MR. POLLARD: Let's try and go back to where we were, and let me see if I understand where we were.

BY MR. POLLARD: (Resuming)

Q Is it correct that your testimony is, before you made the changes that you just described this morning which will be in place prior to restart, that the emergency feedwater system was not safety grade?

A (WITNESS LANESE) Yes.

Q And did I also understand you correctly that assuming the emergency feedwater system is not a safety grade system, the total loss of feedwater would be a design basis accident for the plant?

A (WITNESS LANESE) No, that is still not what I was trying to say. While I agree that it was in certain respects not safety grade, it meets those applicable general design criteria for the loss of feedwater events and for the small break LOCA events in which the systems would potentially be required.

DR. JORDAN: You are speaking now of the systems redesigned for restart?

WITNESS LANESE: That is correct.

DR. JORDAN: That wasn't quite your question, was it?

MR. POLLARD: No, that was not my question.

BY MR. POLLARD: (Resuming)

Q Prior to the changes, you have just testified the system was not safety grade.

A (WITNESS LANESE) Correct.

Q My next question is, before the changes with emergency feedwater system not safety grade, wasn't it true that a design basis accident under those circumstances would be total loss of main feedwater and emergency feedwater?

A (WITNESS LANESE) No. Again, because it was always considered a system important to safety, it had a suitable degree of reliability, and while I agree that you might have to consider a temporary loss of emergency feedwater, there would not be a sustained loss of emergency feedwater.

Therefore, it would not be a design basis for the plant.

DR. JORDAN: In that connection, I believe you do say later in your testimony that the changes made have not greatly influenced or increased the reliability of the system. Am I correct in my memory?

WITNESS CAPODANNO: That is correct. What we have

addressed in that response, since you have raised it, is the fact that we are looking at, among other things, the requirements of the restart order with the specific statement to the effect of the increased timelinees of the system.

We feel that the changes we have made to in fact increase the timeliness of the response of the system do increase the ability of the system to withstand certain failures. When you get into reliability issues themselves, I think that is something that would take a bit longer discussion, and you might care to address that later, or now.

But our feeling was --

DR. JORDAN: I don't want to go into the reliability now, but I do want to mention, I presume counsel did tell you -- you weren't here some couple of weeks ago, when I said that partly with respect to my Question 6, I was concerned whether loss of feedwater should be a design basis event, and in that respect, I was concerned as to whether the reliability, even though it met the general design criteria and met the single failure criteria, whether that was adequate to still classify it as a design basis event.

So you see that the questions are aimed very much at what is on my mind, and I don't know whether you knew that or not. But I thought you had not really addressed 6K -- misunderstood what I had in mind.

WITNESS CAPODANNO: Your concerns were subsequently relayed to us.

DR. JORDAN: Fine.

BY MR. POLLARD: (Resuming)

Q I would like to try one more question if I could. We will make it hypothetical, so I can make it very specific, and if you could just give me a yes or no and then explain, let me assume we have a plant in which the main feedwater system and the emergency feedwater system are not capable of withstanding even an operating basis earthquake, much less a safe shutdown earthquake.

Would you agree that in such a plant, total loss of main feedwater and emergency feedwater would be a design basis event or design basis accident?

A (WITNESS LANESE) Yes, I would.

(Pause.)

Q I am reading now the first paragraph on Page 2 of your testimony. I am sorry. That is a continuation of the paragraph on Page 1. Could you clarify that paragraph a little bit for me, to distinguish between what the operator has to do versus what is automatic? It appears to be, you first say he might have to do it manually, but then you say it will be done automatically. It is somewhat confusing.

A (WITNESS LANESE) There are two automatic initiation signals for emergency feedwater. One is the loss

of all four reactor coolant pumps. The second is a complete loss of main feedwater. What I was trying to say is that there could be two situations, assuming reactor coolant pumps continue to run through this event, then the only automatic initiation signal would be from the loss of main feedwater.

So, really, there were several conditions. If main feedwater was running, we would expect to be putting in water to the steam generators, anyway. And if it was not, then you would expect auto initiation of emergency feedwater.

Even if that were not to occur, the operator would still be able to take manual action to initiate emergency feedwater.

BY MR. POLLARD: (Resuming)

Q You would agree that in order for the emergency feedwater system to perform its safety function, more is needed than just initiation, that you also have to have proper control of the regulator valves. Is that correct?

A (WITNESS LANESE) Ultimately, you need to be able to control flow to the steam generators.

Q And at present those regulator valves in their normal mode are controlled by the ICS.

A (WITNESS LANESE) That is right, with the capability to independently manually control flow.

Q And the ICS is not safety grade. Is that correct?

A (WITNESS LANESE) That is correct.

Q Is it important to safety within your meaning?

A (WITNESS LANESE) No, it is not.

Q So, then, in a sense, the emergency feedwater system is only safety grade when you disconnect the normal control from it and substitute the operator?

A (WITNESS LANESE) Safety grade. That is correct.

Q Maybe I had better ask the other question then. What about, it is only important to safety within your meaning if you also disconnect the normal control and substitute the operator?

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

Q In the next paragraph of your testimony, you talk about an event which occurred at Oconee. Please describe briefly for me what happened at Oconee?

A (WITNESS CAPODANNO) My understanding is that there was an ICS failure at Oconee which resulted from the failure of a device called a static transfer switch to make a transfer from the normal ICS power supply to a regulated power supply. And that as a consequence of that there was some interruption of power to the ICS system.

Q What happened as a result of that?

A (WITNESS CAPODANNO) I am only generally aware of what consequences might occur. I don't believe I could give

you a detailed description of the results. As I understand it, however, some operator action was taken to restore the power. The exact conditions and changes in condition that the plant went through, I could not recite those to you.

Q The Board question was, is loss of emergency feedwater following a main feedwater transient accident, an accident which must be protected against with safety grade equipment, would such accident be caused or aggravated by a loss of non-nuclear instrumentation such as occurred at Oconee?

Now, if you have not gone back and examined what the consequences were of the power supply failure at Oconee, how can you answer the Board's question?

A (WITNESS LANESE) We have looked at our ICS, and there is no failure mechanism in our ICS that will cause a loss of normal and emergency feedwater. In the same context, with respect to LOCA, the ICS failure would not prevent additional water to at least one steam generator, that is, partially as a result of the change in the failure modes to the 30 valves.

Q Did you examine the integrated control system for these type failure modes before the Oconee incident occurred or after?

A (WITNESS CAPODANNO) I think there was an overlap in time frame, since the restart effort engineering-wise has

been going on since the second quarter of 1979 to the present, and I am not certain of the date of the Oconee incident, but I believe it fell within that time frame.

Consequently, we were looking at the emergency feedwater system and postulated failures. We didn't specifically address the type of component failure that occurred at Oconee for initial evaluation. What we did was make the assumption that ICS failed. That is to say, whether a relay or a switch or some other device might have caused that failure, we didn't consider that, because we felt the more logical thing to do was to look at the end result, which would be a failure of ICS, and we addressed failures of ICS.

Q When did the Oconee incident occur?

A (WITNESS CAPODANNO) As I said, I am really not certain of the date. My recollection is, it fell in that time frame I just described.

Q Well, if it wasn't the Oconee incident that caused you go to back and examine ICS, what was the motivation?

A (WITNESS CAPODANNO) Well, going back even prior to the TMI 2 accident, GPU Met Ed had been investigating and making changes, some of which I described earlier, which were installed in the plant for the emergency feedwater system.

Subsequently, in response to the TMI 2 accident,

and in response to the restart order, both the NRC and ourselves raised issues regarding emergency feedwater. We made some proposals to the NRC for changes. They raised others. That collective effort resulted in a list of modifications to be made.

So, in addition to the earlier efforts which preceded the TMI 2 accident, we also were investigating other changes to the system subsequent to the accident. As I mentioned earlier, part of that overall effort was to investigate the results of ICS failures.

Q Now, in your testimony, you say this review of the integrated control system is a preliminary review. Is that still your testimony?

A (WITNESS CAPODANNO) I think the correct way to characterize it at this point is, it is an ongoing review. There has been some review done by others, that is to say, not myself, other engineering sections.

Q At this point --

MR. BAXTER: Were you finished with your answer, Mr. Capadanno?

WITNESS CAPODANNO: No, I was not.

So that from the time we wrote the testimony until now, further work has been done, and still further work is planned.

BY MR. POLLARD: (Resuming)

Q If further work is still planned in this review, do you have any basis now for believing that the ongoing review will not discover any other adverse interactions?

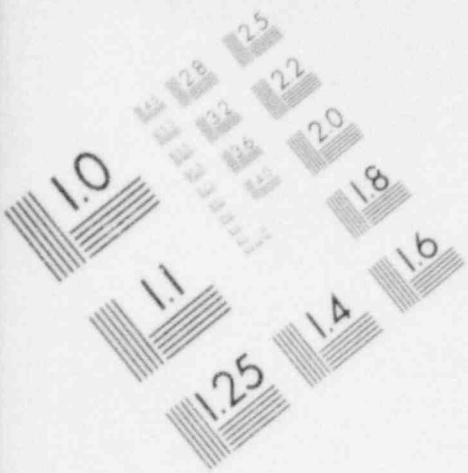
A (WITNESS CAPODANNO) My understanding is, to date, depending upon the situation that you postulated occurring as a failure within ICS, the failure will either have no impact at all or will have a relative impact in that it won't suddenly result in a loss of feedwater or loss of emergency feedwater.

It does cause some devices to change position, such as valves. Valves under some conditions fail half-open.

DR. JORDAN: I don't want to shut off any questions on this, but I do believe there is a portion of the hearing that will be involved with the failure mode and analysis of the ICS system, which will include, presumably, its effect on the emergency feedwater. Am I right in this?

MR. BAXTER: There is a particular contention, from Mr. Sholly on this submission required by the Commission's order on the failure modes and the effect of ICS analysis.

DR. JORDAN: All right. I guess while we are at that point, however, in the questioning by Mr. Pollard, a failure of the non-nuclear instrumentation system results in a failure of the integrated control system. Is that correct or not? And I am asking for information entirely.



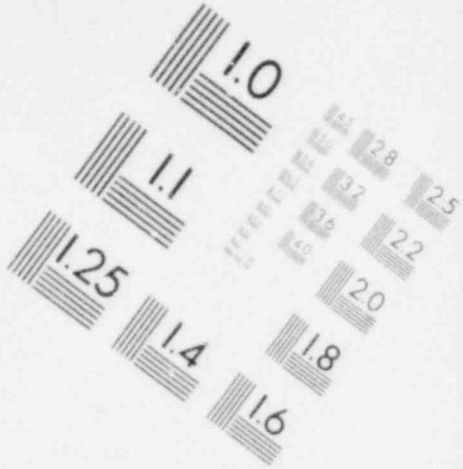


IMAGE EVALUATION
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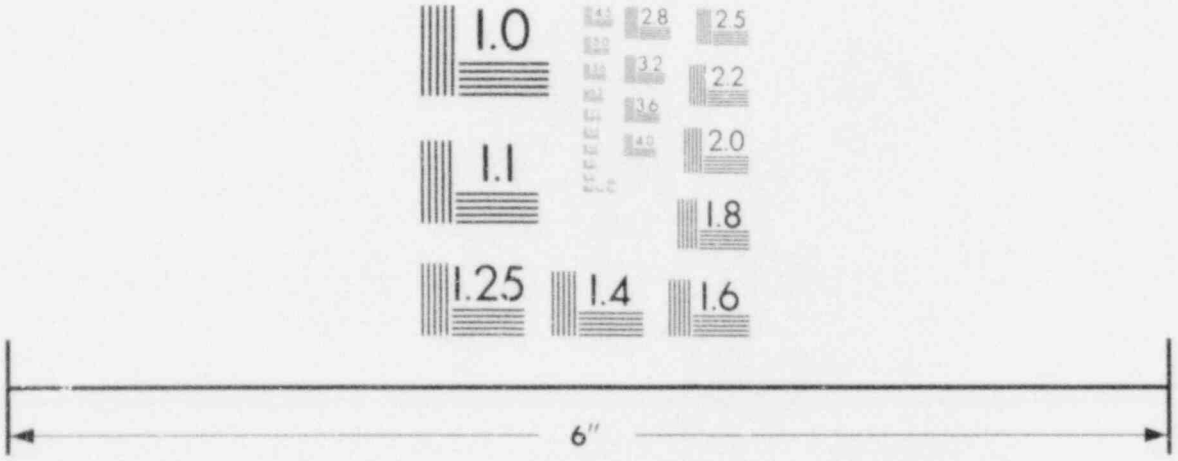
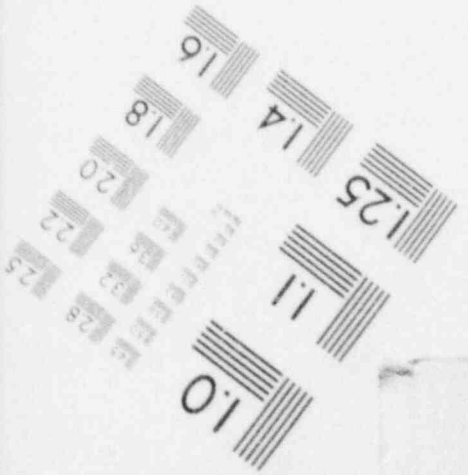
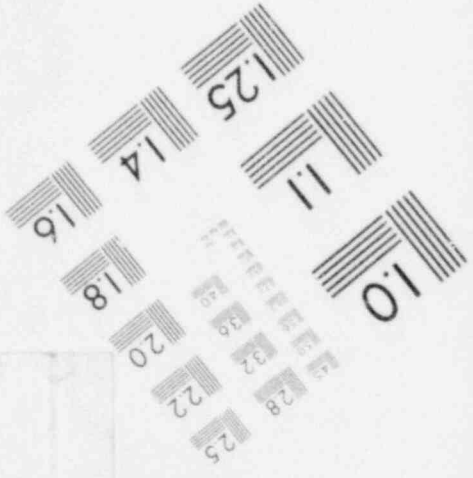
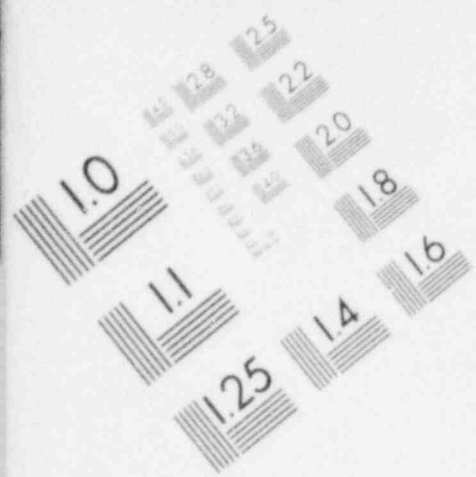


MICROCOPY RESOLUTION TEST CHART







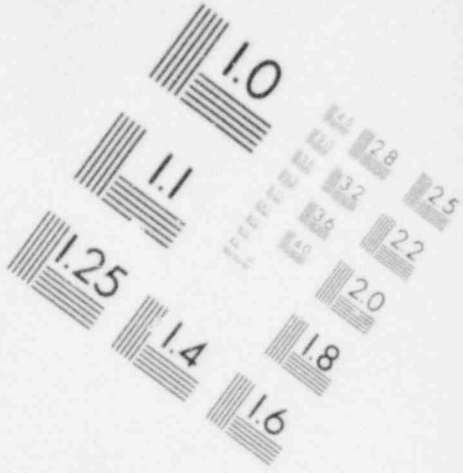
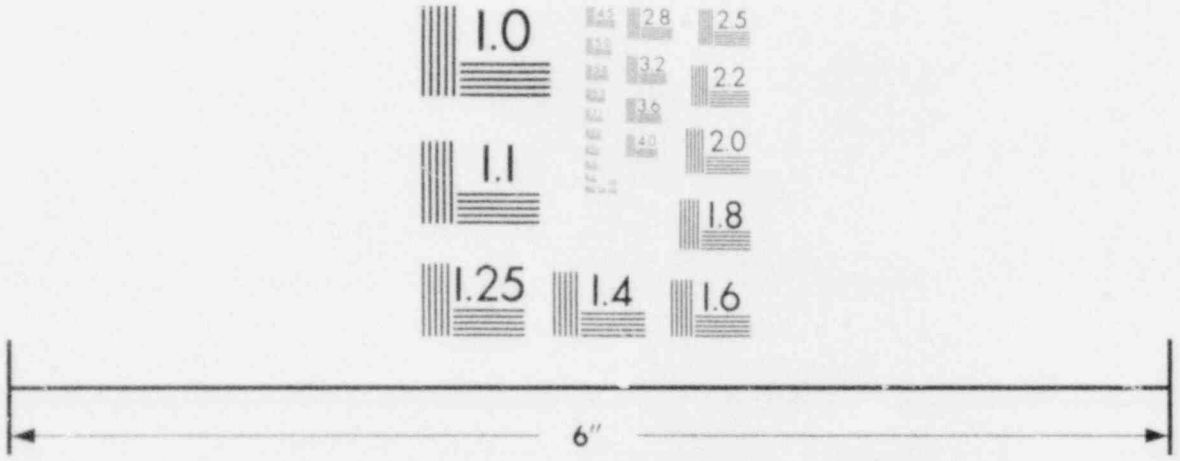


IMAGE EVALUATION
TEST TARGET (MT-3)



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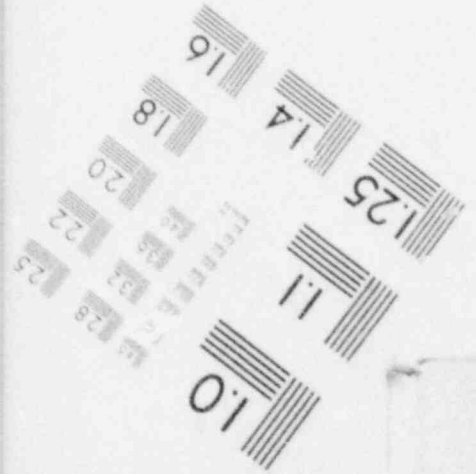

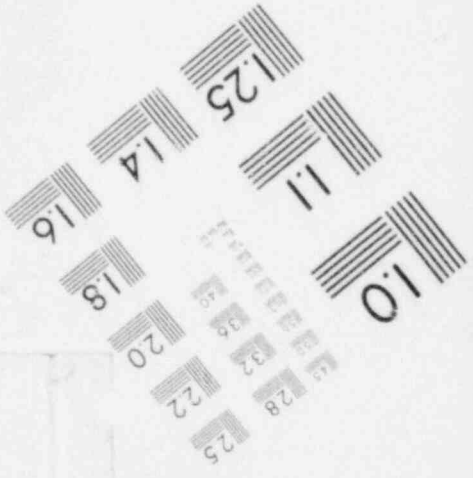

WITNESS CAPODANNO: My understanding is this, that at least from the standpoint of power supply, ICS/NNI receives the same power supply. So, I am aware to that extent that if that is the failure postulated, you lose power to both ICS and NNI.

DR. JORDAN: The ICS is powered by the non-nuclear instrumentation?

WITNESS CAPODANNO: Well, they are distinct systems in the sense that ICS is an integrated control for flow of feedwater reactor power. Non-nuclear instrumentation is controlling other plant systems. I cannot give you a real detailed definition of the distinction. My comment was in reference to the electrical power supplied to that control system.

DR. JORDAN: Where does the ICS get its power? Is that off the Class 1E system?

WITNESS CAPODANNO: No, not directly. It is through a network that is battery-backed. That is, it cuts a DC power supply that is converted to AC, and as I mentioned a little bit earlier, there is also a transfer, an automatic transfer that occurs if there is any loss of that battery power to a regulated AC power supply.

DR. JORDAN: Similar to some of the instrumentation that must be safety grade in the control room, isn't some of that instrumentation also powered from

the DC batteries by means of converters?

WITNESS CAPODANNO: Yes. I believe it is, yes.

BY MR. POLLARD: (Resuming)

Q Is it correct the way the system is presently -- Let me try again.

Is it true the way the system will be designed at the time of restart that a failure either in or affecting the integrated control system could result in total loss of feedwater for some period of time?

A (WITNESS CAPODANNO) No, that is not correct.

Q Can a failure in the integrated control system result in a failure of flow to at least one steam generator?

A (WITNESS CAPODANNO) No.

Q If you would look, please, at your Figure 1 in the exhibit, as I understood your testimony, Valves EFV 30A and 30B were controlled by the integrated control systems. Is that correct?

A (WITNESS CAPODANNO) Yes. Under normal operation, that is correct.

Q Now, with a failure in the integrated control system, isn't it possible that that failure could close EFV 30-A?

A No, my understanding is that either the failure leave the valve alone, that is, it doesn't cause it to change position, or will result in the valve failing to a

half-open position.

Q Loss of electrical power, as I understand it, causes the valve to fail to the half-open position. In evaluating electrical circuits, though, you must also not only consider loss of power; is it not correct that you also need to consider short-circuit failure of individual electronic components?

A (WITNESS CAPODANNO) I think that would be accurate.

Q Are you familiar enough with the design and the electronics in the integrated control system to be able to say that you are sure that no electrical failure of any type within the ICS could not result in the ICS sending a signal to close EFV 30A?

A (WITNESS CAPODANNO) No, I am not. I don't believe I intended to say that.

Q All right. Let me try my original question again then. Is it possible for a single failure in the integrated control system to result in closure of EFV 30A?

A (WITNESS CAPODANNO) My response, and I will repeat it again, is, to my knowledge I was addressing, first of all, power failures. That is the thing I am aware of. Beyond that, in the context of the additional components in the system that you described, I really do not know the answer.

Q Does anybody on the panel know the answer?

A (WITNESS LANESE) No.

A (WITNESS TORCIVIA) (Nods negatively.)

Q It would seem to me that surely there must be some false signals getting crossed up that would result in the integrated control system thinking there is too much water going into the steam generator, and taking the wrong action. I can't conceive of a piece of equipment that doesn't do that.

A (WITNESS CAPODANNO) I don't exclude the possibility. I just simply can't testify that I have accurate knowledge if that would occur or through what mechanism it would occur.

DR. JORDAN: Wouldn't it be a reasonable assumption for the moment to assume that it might occur?

MR. POLLARD: That is how I was going to phrase my question next.

DR. JORDAN: Could you give him that?

MR. POLLARD: Well, I am really surprised actually that --

DR. JORDAN: I think it would be reasonable for you to make that assumption. If it is wrong, it will be corrected, but let's assume for the moment that is the case.

MR. POLLARD: As you pointed out, we are going to have other panels here later to talk about this.

DR. JORDAN: Yes, there will be a session on the failure of the integrated control system and the possible effects of that, and I believe there has been a review of that system by the Oak Ridge National Laboratory, and this is one of the exhibits that we have received from staff or licensee. Is that correct?

MR. BAXTER: Yes. The staff has provided as a reference both the B&W -- the integrated control system modes as it affects analysis and the Oak Ridge National Lab review, and this comes under one of Mr. Sholly's contentions.

DR. JORDAN: Good.

MR. POLLARD: What I would like to do is, if we could take a break now, we were going to try and find some of this information.

MS. WEISS: See if we can find the diagrams so we can nail down the answer to this question one way or another.

MR. POLLARD: If we could have a break now, it would be convenient.

CHAIRMAN SMITH: All right. Let's take our midmorning break of 15 minutes.

However, before Mr. Toutellotte and Mr. Trowbridge leave, when we were discussing the emergency planning meeting this morning, I neglected to inquire as to whether you recommend that the Board issue an order requiring the intervenors in the emergency planning contentions to

participate, or if you feel it is unnecessary, having been in touch with each of those people.

We would also like to know if a representative of FEMA is planning to attend.

MR. TOURTELLOTTE: Yes, a representative from FEMA will be here, and I think it is a good idea to have the order simply because if someone changes their mind between now and then and decides not to show up, I think it would be detrimental to the overall hearing. I think it would be good for the parties to all understand the importance of being there and participating

So, I would recommend the issuance of the order. Also, we didn't arrive at any particular time, so whatever the Board could do in suggesting a time --

CHAIRMAN SMITH: How about 1:00 p.m., the 24th?

MR. TOURTELLOTTE: Yes, that is fine.

CHAIRMAN SMITH: This is the time selected by the Board to be a time that normally would be occupied by any intervenor in hearing time in any event.

Would it be possible -- I will try to get that order out this afternoon when I return to the office in Bethesda, but it would be possible for somebody on you staff to advise those affected intervenors that the Board will be issuing an order for participation at that time?

MR. TOURTELLOTTE: Yes, Mr. Chairman. If you will

notify -- if you could notify Mr. Gray as to the exact time when that order issues, he will take it from there and notify the other intervenors.

CHAIRMAN SMITH: Okay.

All right, we will break until 20 minutes to 11:00.

(Whereupon, a brief recess was taken.)

MS. WEISS: We were not able to find a diagram of the integrated control system in the time available, and I don't think that one is in the restart report. If it is still necessary to ask these specific questions, we will try to find one over the weekend.

BY MR. POLLARD: (Resuming)

A Mr. Capadanno, referring to your testimony in response to Board Question Number 6-B, on Page 3, you state that "The extent to which other safety grade and non-safety grade systems' failures can affect this function has been evaluated." Then you say, "Included within this evaluation have been the electrical power supplies, non-nuclear instrumentation."

Then, on Page 4, in the middle paragraph, you state that "As indicated in the accompanying exhibit, TMI 1 Emergency Feedwater System, the emergency feedwater system can operate and meet its design function with loss of instrument air, loss of AC power, and loss of non-nuclear instrumentation."

Do I understand those parts of your testimony to mean that in evaluating the failure modes of particularly the ICS, the only failure mode you really looked at was loss of power?

A (WITNESS CAPODANNO) I think not entirely. We took the approach that ICS and its ability therefore to control had been lost for whatever reason. The comment then addresses the fact that there is additional control, i.e., the manual loaders that I mentioned earlier, that will allow us to continue to operate the emergency feedwater system so that we are indeed independent of the effects of an ICS failure.

If the ICS did not stroke a valve, the operator has the ability through the modification, that is, the addition of this manual loader, to operate that valve.

Q You did not specifically try to determine, then, whether the integrated control system in a failure could cause the regulator valves to go full open or to go full closed?

A (WITNESS CAPODANNO) Again, in looking at ICS as a system that fails, we did not -- I did not go through and try and determine whether the valve would fail full open, partially open, or partially closed.

My understanding, as I mentioned earlier, is, certain ICS failures have no effect on valve position.

Others result in valves failing half open, and in the context of this written testimony we therefore say that either given the inability of ICS to do anything, that is, to either cause a valve to open or close, or in the situation where the ICS failure might result in a valve going partially open, we have independent control available to allow the operator to drive that valve further open or further closed as required.

Q So I understand the answer to my question to be, you did not look at the ICS to determine whethe failures in its circuitry could cause the control valve to go closed or to go full open?

A (WITNESS CAPODANNO) That is correct. We, as I said, took a specific condition, ICS failure, without getting into specific subsets of that condition.

DR. JORDAN: Can you say that there is manual override of the ICS signal?

A (WITNESS CAPODANNO) Yes. In fact, from my particular familiarity with power failures on ICS, you can have a normal power failure. The system will transfer to a backup power supply. The operator has the ability to control from that.

If for any reason you choose to postulate that that fails, then you are into the modification that I described, the so-called manual loaders, which is the

restart modification, so that again in the context of what we read here, what we intended to say was that ICS was assumed to fail without getting into whether a wire or a relay or some other device caused that failure, and that given that failure occuring in any of its possible modes, we have the ability to still maintain control of the system.

Q During the break, I re-reviewed the panel's qualifications, and I notice that Mr. Torcivia has a bachelor of science degree in electrical engineering. I would like to ask you, Mr. Torcivia, did you in preparing this testimony evaluate the design of the integrated control system at all?

A (WITNESS TORCIVIA) No, sir.

Q Have you ever evaluated the integrated control system?

A (WITNESS TORCIVIA) No, sir. My expertise involves the power involved in controlling -- the power involved in controlling the equipment and not necessarily the instrumentation or the integrated control circuits themselves.

CHAIRMAN SMITH: I am sorry. What was your expertise, sir?

WITNESS TORCIVIA: That involved in the power which feeds various devices and controls, but not necessarily the control itself, such as integrated control

circuits or instrumentation.

CHAIRMAN SMITH: Were you here on that loss of power question, that last question?

WITNESS TORCIVIA: That is correct.

BY MR. POLLARD: (Resuming)

Q I notice from your qualifications you say you have extensive experience in process control and instrumentation for industrial plants. On the basis of your experience, in the types of instruments and controls used for processes where we are measuring things such as steam flow and feed flow and steam generator level and trying to have an instrument which then controls the position of a regulator valve, in your experience, would you consider it a usual situation that a failure in such a control system could in fact signal such a regulatory valve to go full-closed or full open, depending on the failure?

A (WITNESS TORCIVIA) Let me first preface that by indicating that within my position at General Public Utilities, I do not involve myself in process controlled equipment or anything of that nature, although my expertise in the past has been somewhat involved in process controlled equipment.

Therefore, in answering this question, it does not imply that it does apply to this particular ICS system or to this particular circuitry.

If I understand your question correctly, you are indicating that a failure of the ICS system or any control which is associated with a motor operated valve, that the valve can fall in place wherever the failure happens to develop.

Is that correct?

Q Yes, I think so.

A (WITNESS TORCIVIA) There is one possible exception in that at times there are sealing circuits developed which will, once the circuitry is initiated, it will continue to operate it so long as the power is there, regardless of what external effect other control circuits may have on it. And that may be possible.

CHAIRMAN SMITH: Before you go on, Mr. Torcivia, apparently, your expertise is a power supply engineer, basically.

WITNESS TORCIVIA: The power which is involved in supplying electrical equipment such as motors, transformers, lighting, and things of that nature.

CHAIRMAN SMITH: And we have already observed that the Board's reference to the St. Lucy decision, which was a station blackout question, was misunderstood. I think it may be possible, and we will open it for discussion, to excuse Mr. Torcivia from appearing if he is not on any other question, which it doesn't appear that he is, because this

testimony does not in the slightest address the Board's concern.

So, we would be open to suggestions that he not be required to appear here next week. Of course, he is quite welcome, but he probably would not have been here if the Board's question had been understood the way we intended it.

MR. BAXTER: I appreciate the suggestion, Mr. Chairman. I do think, even if it is not directly responsive, that the information Mr. Torcivia has supplied on Pages 13 and 14 of the testimony on the reliability of off-site power supplies is at least indirectly helpful and relevant to other issues before the Board.

I would appreciate it, and it would be very much appreciated, I am sure, by Mr. Torcivia, if to the extent that UCS or the Board has questions on that limited section of the testimony, if it wouldn't be too disruptive, to ask those this morning, and Mr. Torcivia would not have to come back next week. That would be very much appreciated.

MR. POLLARD: We have no questions on Mr. Torcivia's testimony at all.

CHAIRMAN SMITH: We would not have required anybody to produce this information in response to Board 6K.

MR. BAXTER: All I am indicating is that I would like to keep the testimony in the record, and if the Board has questions, we would welcome them today.

DR. JORDAN: I don't see, a quick glance, and I didn't mark any previously -- so that I think it would be, so far as I am concerned, he could be excused, and if he is not needed by the panel for any of the other questions, I think we could do that, and UCS -- well, let's see, how about the other, either the staff or the state?

CHAIRMAN SMITH: Do you have any questions?

MR. ROBERT ADLER: No, we had no questions for Mr. Torcivia.

CHAIRMAN SMITH: Mr. Cutchin, would you object to excusing Mr. Torcivia, or do you have any questions?

MR. CUTCHIN: I have no questions of him, sir, and would have no objection to his being excused.

MR. BAXTER: Thank you, Mr. Torcivia. You are excused.

MS. WEISS: I wonder if he could just sit here until we get finished with this line, and then leave. Mr. Pollard is about to hypothesize a situation. He might be ablke to help.

CHAIRMAN SMITH: Well, the understanding is that he doesn't have to return next week, so whatever he can contribute today.

DR. JORDAN: Let's keep him here today.

WITNESS TORCIVIA: Thank you.

BY MR. POLLARD: (Resuming)

Q I have forgotten whether it was Mr. Caopdanno or Mr. Lanese, but am I correct that at least one of you said that the emergency feedwater system will be safety grade at the time of restart for loss of feedwater transients and small break LOCAs, is that correct?

A (WITNESS LANESE) That is correct.

Q And as I understand your exhibit, although I am not sure it is yet covered this morning, is it correct that if there is a leak in one steam generator, that the way the emergency feedwater system is designed, it will automatically terminate flow. emergency feedwater flow to that steam generator?

A (WITNESS LANESE) That is correct. That is the steam line rupture detection system, and pressure would have to go below 600 pounds in the generator.

DR. JORDAN: It is not a leak necessarily. It is a loss in pressure, is that right? If the leak produced a loss in pressure with sufficient magnitude to result in a loss of pressure, then the feedwater would be switched.

WITNESS LANESE: That's right.

DR. JORDAN: All right.

BY MR. POLLARD: (Resuming)

Q And that type of an accident is within design basis for the plant, is that correct?

A (WITNESS LANESE) That is correct.

Q Under such a situation, then, if the emergency feedwater system was automatically actuated, it would either right away or sometime later be attempting to deliver feedwater only to one steam generator.

A (WITNESS LANESE) That is true.

Q In this situation, assuming that there is an electrical fault within the integrated control system which could cause the feed regulator valve for that steam generator which is still receiving water to go closed, would you agree, then, that a single failure in the ICS would result in no feedwater being delivered to either steam generator?

A (WITNESS LANESE) I cannot address the single failure of the ICS.

Q That was my assumption, that a failure in the ICS would cause feed regulator valves to go closed.

A (WITNESS LANESE) There would at least be an interruption of emergency feedwater. The steam line rupture detection signal resets when steam generator pressure goes back above 600 pounds, so you do not necessarily lose emergency feedwater to the initially depressurized generator continuously.

Q But for some time period.

A (WITNESS LANESE) Yes, for some time period you could.

Q Turning now, Mr. Capodanno, to your testimony on Question 6B, in the first paragraph, the sentence I have already read, you refer to an evaluation which was done to determine what other safety grade and non-safety grade systems failures could affect emergency feedwater.

Who did this evaluation?

A (WITNESS CAPODANNO) It was a joint effort on the part of several engineering sections to review different systems.

Q Several engineering sections of what?

A (WITNESS CAPODANNO) I am going to mak sure I understand you.

Are you referring to the paragraph on page 4 with regard to other systems that support or could affect emergency feedwater?

Q No, I'm sorry, I should have directed you to the first paragraph in your answer on page 3.

A (WITNESS CAPODANNO) The first paragraph on page 3.

Q In response to Question 6B.

A (WITNESS CAPODANNO) Yes.

Q The sentence states, the extent to which other safety grade and non-safety grade systems failures can

affect this function has been evaluated.

My question is, who did this evaluation?

A (WITNESS CAPODANNO) Again, the same answer.

Q Well, I didn't understand you. Can you be more specific as to who did the evaluation?

A (WITNESS CAPODANNO) Well, within our engineering section, as is I think typical --

DR. JORDAN: This is GPU.

WITNESS CAPODANNO: Yes, sir. There are engineering groups for mechanical engineering, electrical engineering, instrumentation and control engineering, where systems that we looked at can be involved. Those sections were consulted.

BY MR. POLLARD: (Resuming)

Q Were you personally involved in this evaluation?

A (WITNESS CAPODANNO) To some extent, yes.

Q To what extent?

A (WITNESS CAPODANNO) Well, as we mention later on on page 5, there was review of certain mechanical systems for --

Q Excuse me. Did you say page 5?

A (WITNESS CAPODANNO) I'm sorry, page 4.

MS. WEISS: Please keep your voice up. It is hard to hear you.

WITNESS CAPODANNO: In the second paragraph on

page 4, we make mention of systems such as instrument air, we talk about the ability of the pumps to be cooled. I believe -- yes, those, reference to cooling, lubricant and instrument air, those are the ones I had some direct involvement in.

BY MR. POLLARD: (Resuming)

Q And when was this evaluation done?

A (WITNESS CAPODANNO) In preparing the testimony, my part was -- I looked at what existed in the plant systems, and that was my evaluation, to see what the other systems that are referred to there would or would not do. So this was done in September, I believe, of this year.

Q With respect to the second paragraph on page 3 in your answer to Board Question 6B, you list electrical power supplies, non-nuclear instrumentation, instrument air supply, and heating and ventilation systems.

A (WITNESS CAPODANNO) Uh-huh.

Q Which of those listed components are non-safety grade?

A (WITNESS CAPODANNO) The instrument air supply itself is nonsafety grade, and we have established in the context of non-nuclear instrumentation, ICS NNI was what we were referring to there.

Q I'm sorry, again I couldn't hear your answer.

A (WITNESS CAPODANNO) In regard to the term

non-nuclear instrumentation, that encompasses what we have discussed previously, the integrated control system, NNI.

Q And that is non-safety grade?

A (WITNESS CAPODANNO) I'm sorry?

Q That's non-safety grade?

A (WITNESS CAPODANNO) Yes.

And secondly I mentioned the instrument air supply as being a non-safety grade system.

Q What about electrical power supplies?

A (WITNESS CAPODANNO) In regard to the emergency feedwater system, those are Class 1E systems.

Q What about heating and ventilation systems for the areas within the plant where emergency feedwater components are located?

A (WITNESS CAPODANNO) Those are also safety systems.

Q At the top of page 4 of your testimony, the sentence starts, "Single active failures."

Could you please define for me what you mean by the term "active failure"?

A (WITNESS CAPODANNO) This statement addresses the HVAC system, and I was addressing active failures of components such as pumps, valves, things that have to change position in order to achieve whatever the function should be, open or closed, start or stop.

Q Are the heating and ventilation systems powered

from a diesel generator?

A (WITNESS CAPODANNO) Yes, I believe they are.

Q Are they redundant?

A (WITNESS CAPODANNO) Yes, the cooling in that area has separate coils and is redundant.

Q By in that area you mean all plant locations where equipment from the emergency feedwater system is located?

A (WITNESS CAPODANNO) Yes, that is in the intermediate building.

DR. JORDAN: Which building?

WITNESS CAPODANNO: Intermediate building.

BY MR. POLLARD: (Resuming)

Q And continuing in that paragraph you have a sentence which states, "Under conditions of loss of all AC power, the environmental temperature limits for the turbine driven emergency feedwater components will not be exceeded for a period of eight hours.

Is the eight hours a design requirement, or does that just happen to be what they can withstand?

A (WITNESS CAPODANNO) Well, the statement is a periods of over eight hours.

Q Excuse me.

A (WITNESS CAPODANNO) And it is based on an evaluation of the heat input to the building on the assumption that there is no heat removal from the building.

Q Let me ask the question a different way. Was it necessary to demonstrate that the components' temperature limits would not be exceeded for a period of over eight hours?

A (WITNESS CAPODANNO) No. The eight hours is not of significance from that standpoint. What it represents simply is that if you add a certain number of Btus to a given volume, you will achieve some temperature after a certain time. In this case it happens to be eight hours.

Q And then the next sentence states, "Under these same conditions, the motor driven pumps could not be operated."

Why not?

A (WITNESS CAPODANNO) The assumption is there is no AC power available, that is, no diesel power, no off-site power. That is the context in which we understood that we should be addressing the question.

DR. JORDAN: I see. The second sentence under conditions of loss of all AC power, you included onsite as well as offsite, so it is a station blackout.

WITNESS CAPODANNO: That is correct.

DR. JORDAN: I had not appreciated that.

BY MR. POLLARD: (Resuming)

Q Referring to the last paragraph on page 4 of your testimony, where you talk about operational errors, the

Board had asked in what respect is the emergency feedwater system vulnerable to operator errors? I would like you to tell me, please, what are all the operator errors that would disable the system?

A (WITNESS CAPODANNO) Is that question what are all the errors?

Q What are all the operator errors that could disable the emergency feedwater system?

A (WITNESS CAPODANNO) The errors that we are referring to here include valves that could be closed, that is, manual valves that might have been closed by an operator that should be open for operation of the system. It could include controls in the control room that might be in a defeat position that should be in an operable position.

Q Are those all of the operator errors that could disable the system?

A (WITNESS CAPODANNO) Yes. Again, we took this in the context of things an operator could do such as having valves closed, manually closed that should be open. This addresses human manipulation rather than some kind of automatic actuation.

Q Is it possible for an operator error to result in disabling the circuit breakers for the motor driven pumps?

A (WITNESS CAPODANNO) A breaker could be racked out by an operator.

Q And as I understood your explanation earlier, the only valves which have position indication in the control room are those that are power operated. Is that correct?

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

Q So, for example, if we refer to Figure 1 in your exhibit, that if the suction valves for all three emergency feedwater pumps were closed, the operator would not have indication of that in the control room. Is that correct?

A (WITNESS CAPODANNO) Are you referring to the valves labeled EFV 16A?

Q 16B and --

A (WITNESS CAPODANNO) And EFV 6, I believe.

Q 6, yes.

A (WITNESS CAPODANNO) Okay. Again, are you asking if they were closed, whether there would or would not be control room indication?

Q That is correct.

A (WITNESS CAPODANNO) It is correct that there would not be control room indication. However, as I indicated, there either is completed or is in the process of being completed -- I am not sure which in every instance -- procedures to assure proper valve line-ups, and some of that information has been identified in response to NRC questions in some of the supplements to the Restart Report where valve

sets that have to have specific positions are identified, and in addition, draft technical specifications have also been submitted. The intent of each of these is to assure that valves such as these are maintained in their proper positions.

Q That last paragraph on page 4 of your testimony, when you say "See Licensee testimony in response to UCS Contention 10 and Sholly Contention No. 3 on safety system bypass and override," can you please specifically tell me what part of that testimony, or page, or question?

A (WITNESS CAPOLANNO) I would have to take a look at it.

Q Well, please do, and please, for the next sentence as well.

(Pause)

A (WITNESS CAPODANNO) I have surveyed this response to UCS Contention 10 and Sholly Contention No. 3. What we were responding to, or identifying, I should say, on page 4 is simply that there is additional information here that also has bearing on operation of valves. We didn't intend to imply that this particular set of testimony was a detailed presentation of specific procedures or specific operator actions, merely that we saw some relation between what is contended and the response to it, and the emergency feedwater system itself. There are some statements in here

about operators taking certain actions to operate valves, and this particular set of testimony further addresses some issues about automatic versus operator action.

So our point was that there is a relation between the two, and I think your question was addressing perhaps specifically procedures. I am not certain. But if that is the intent, that is not really what we were trying to say by this parenthetical reference.

Q So the parenthetical reference merely means there is some information that is related to operator errors in general and the procedures that are going to be used to hopefully improve the situation.

A (WITNESS CAPODANNO) Yes. The Contention is addressing -- I am referring now to UCS Contention 10 and Sholly Contention 3 -- seems to be addressing the need for a greater or lesser extent of operator actions versus automatic actions.

Q Well, am I correct, then, with respect to the Board Question 6B, which asks in what respect is thew emergency feedwater system vulnerable to operator errors, your sole response to that consists of one sentence on page 4 which states, "Operational errors that might affect the functioning of the emergency feedwater system have been evaluated, and procedural changes have been instituted to assure proper surveillance and operation of the system to

preclude loss of function."

A (WITNESS CAPODANNO) I think as a direct statement in response to the question, yes. The additional information given in response to the question also identifies either that certain conditions that might be postulated can be overcome, or refers you to the exhibit to understand what conditions that could be postulated can be overcome.

Q Well, the sentence I read to you does not refer to the exhibit. Is that correct?

A (WITNESS CAPODANNO) That is correct.

Q In reviewing your professional qualifications, Mr. Capodanno, could you point me to any portion of that which relates to you personally having in the past been involved with developing operator procedures or judging the adequacy of those procedures?

A (WITNESS CAPODANNO) In the past I have not been specifically involved in developing procedures.

Q What about judging the effectiveness of procedures?

A (WITNESS CAPODANNO) Again are we referring to past employment?

Q Any time.

A (WITNESS CAPODANNO) In the past, prior to working with GPU, I had no direct involvement with procedures.

Q Did you have any direct involvement since you

worked with GPU?

A (WITNESS CAPODANNO) Some, review of procedures to provide comments.

Q Could you give me some estimate of what percentage of your professional working time for GPU has been spent reviewing operator procedures?

A (WITNESS CAPODANNO) The current configuration function of the GPU Nuclear Group, which is the encompassing organization of which I am a part, has responsibility for development of procedures as well as other engineering tasks. What is occurring is a transition in absorbing various engineering departments from within the GPU Service Corporation as well as what was formerly in Metropolitan Edison Company. There is a transition going on to have engineering personnel in what was the Service Company, now the GPU Nuclear Group, be involved with review of procedures. That has not been fully formalized, and by and large, procedures are generated by others. There has been one instance in regard to a special operating procedure where I was involved in review of it to provide some comments.

MS. WEISS: Mr. Chairman, would you please direct the witness in the future to try to confine himself to answering the question. He never did get around to answering that one, and we will repeat it. If he feels he

needs to explain, he can explain afterwards.

BY MS. WEISS:

Q The question was, what percentage of your professional working time while at GPU has been spent in reviewing operator procedures?

A (WITNESS CAPODANNO) It is small. It would be less than 1 percent.

BY MR. POLLARD: (Resuming)

Q Now, it is correct that at Unit 2 prior to the accident they had procedures for operators as well, is that correct?

A (WITNESS CAPODANNO) Yes.

Q And now, in preparing for restart, you have developed new procedures, is that correct?

A (WITNESS CAPODANNO) The company has. I don't think you mean me personally.

Q Excuse me, yes. New procedures have been developed to support restart.

A (WITNESS CAPODANNO) Yes, or modifications of existing procedures.

Q Was the reason new procedures were developed because you found that the old procedures were inadequate?

A (WITNESS CAPODANNO) Again, as I said earlier, I have not had enough involvement in these procedures to really answer that question. I think that, however, if you

want an opinion, that the procedures have been expanded, perhaps, in some areas to be more explicit. I don't know that I can characterize them as inadequate.

Q But it is correct tha GPU has always had procedures. This is nothing new in terms of having procedures for operators.

A (WITNESS CAPODANNO) That is true.

DR. JORDAN: I don't understand. Does GPU have procedures or do they have guidelines for procedures for the operating companies?

WITNESS CAPODANNO: I am using GPU as an all-encompassing term. The operating companies have procedures.

DR. JORDAN: Okay.

MR. POLLARD: I'm sorry. I also, Mr. Chairman, was referring to Met Ed, and I think I got into using GPU.

DR. JORDAN: I misunderstood. Good.

BY MR. POLLARD: (Resuming)

Q Moving on to your answer to the Board Question 6C, Mr. Capodanno, the Board asked what has been the experience in other power plants with failures of safety grade emergency feedwater systems if they have such systems in other power plants.

Am I correct that in preparing your testimony you looked only at B&W plants?

A (WITNESS CAPODANNO) That is correct.

Q And do any of those B&W plants that you looked at have safety grade emergency feedwater systems?

A (WITNESS CAPODANNO) My understanding is that the Davis-Besse plant identified on page 6 of the testimony has a safety grade emergency feedwater system.

Q You examined feedwater failures, as I understand in your testimony, only up to March 28th of 1979, is that correct?

A (WITNESS CAPODANNO) Yes.

Q Why didn't you go beyond that date?

A (WITNESS CAPODANNO) The amount of data involved here, as we said in the introductory sentence, is exhaustive, and in order to get some significant amount of that data, we made use of the NRC's LER output. What was available to us was through that date. My understanding is not clear as to whether or not the remainder from March 28, '79 to the present is also available, but we requested that through our licensing group, and that is what was provided to us.

Q So you didn't really ask for anything beyond March 28 of '79.

A (WITNESS CAPODANNO) We asked for the available information on this computer summary. It came back terminating at March 28, 1979. And as I said, I am not

clear as to why it does not go beyond that point.

Q Do you think that is just a coincidence, then, that that happened to end on the day of the TMI 2 accident?

A (WITNESS CAPODANNO) I really don't know.

Q In tabulating the failures that you have in your testimony, you apparently have tabulated, as I understand, those failures which no emergency flow could be or could have been instantaneously delivered to the steam generators.

Dids you discover any failures which may have disabled only half of the emergency feedwater system, or one train?

A (WITNESS CAPODANNO) I don't recall at this point. I would have to re-review that computer listing to answer your question.

Q In other words, you interpreted the Board question to be only asking you about total loss of feedwater?

A (WITNESS CAPODANNO) We were unclear as to the intent of the question. We tried to explain that you could do an exhaustive review, considering the number of plants, and the different designs in plants, and we really were not sure how to answer the question. And so we did what we thought was an answer to what was being asked.

A (WITNESS LANESE) Could I just add to that? These were all not necessarily losses of feedwater. Some of them were corrected before the system was demanded to function.

Q Yes, I understood that.

When you got your LER output in accordance with your request from the NRC, did you have more LERs than you have listed in your testimony?

A (WITNESS CAPODANNO) Yes. There are more than.

Q How many operating B&W plants are there?

A (WITNESS CAPODANNO) I believe it is on the order of six.

Q And how many plant years of operation do those six plants represent?

A (WITNESS CAPODANNO) I cannot answer that question.

Q Do you have some idea of what is the total number of reactor years of experience in the United States with nuclear power plants?

A (WITNESS CAPODANNO) Again I --

Q A ballpark figure. Would it be about 500 reactor years of experience?

A (WITNESS CAPODANNO) Well, some plants have been operating since the '60s. Some have come on line in the '70s. You know, I really don't know if I play with the arithmetic what that would come out. It might be on the order of 60 plants times 10 years, it might be on a number like you have suggested.

CHAIRMAN SMITH: You are talking interchangeably, plants and reactors.

MR. POLLARD: Yes. I also have the tendency to use plants and reactors interchangeably. I will try to be more specific.

BY MR. POLLARD: (Resuming)

Q Do you think that in finding five events where no emergency feedwater flow could have been instantaneously delivered to the steam generators might be significant if the number of reactor years of experience represented by those B&W plants is relatively small, and by that I mean perhaps 100 reactor years?

A (WITNESS CAPODANNO) I think in order to answer that you have to look at when some of these events occurred, and my understanding is that some of these events occurred before the plants actually were operational. It occurred up in the startup and test phase.

Q Do you have any idea of the statistical significance of the number of emergency feedwater failures which you reported in your testimony?

A (WITNESS CAPODANNO) No.

Q Do you agree that four out of the five which you report in your testimony were due to operator error?

A (WITNESS CAPODANNO) Yes.

Q And so would you agree that with respect to those failure modes that you reported in your testimony, operator error was the dominant failure mode?

A (WITNESS CAPODANNO) For those identified, yes.

Q Do you have an opinion as to whether changing a system from non-safety grade to safety grade would have a significant impact on the rate of operator errors?

A (WITNESS CAPODANNO) I believe it may very well decrease the number of operator errors. I think one of the instances cited here concerns a design that has a single bearing cooling water system to the pumps. By contrast, the TMI 1 system has independent cooling. So if you were to postulate an error of, say, an operator misaligning cooling valves on a system that was designed as either important to safety or even safety grade if it were being built today --

Q Which event are you referring to?

A (WITNESS CAPODANNO) Pardon me?

Q Which event are you referring to?

A (WITNESS CAPODANNO) It is the second one under Davis-Besse. It says personnel error in line-up of bearing cooling water.

Q What from that event description leads you to conclude that the bearing cooling water system was not redundant?

A (WITNESS CAPODANNO) I have seen other documentation which I cannot recall specifically which said that was not the case.

Q I thought you told me earlier that Davis-Besse was

the only plant that had an emergency feedwater system.

A (WITNESS CAPODANNO) That is my understanding, but by the same token, I am not the designer, nor do I have detailed knowledge of it. Consequently, from other documentation I have read, it has been identified as a safety grade emergency feedwater system.

Q Would you agree that if it had only a single bearing cooling water system, that it could not possibly have been safety grade?

A (WITNESS CAPODANNO) I think under the definition we have given for redundancy, separation, etc., yes.

MR. POLLARD: The Board will note that we have a typing error in our cross examination plan referring to the staff's testimony.

BY MR. POLLARD: (Resuming)

Q In response to the Board's Question 6I of the staff -- you didn't look for it, 6I, the question was "Will the reliability of the emergency feedwater system be greatly improved upon conversion to safety grade, and is it the Licensee's and staff's position that the improvement is enough such that the feed and bleed backup is not required?"

MR. BAXTER: Do you have a copy of that testimony, Mr. Capodanno?

WITNESS CAPODANNO: The NRC Staff testimony?

MR. BAXTER: Yes.

WITNESS CAPODANNO: Yes, I found it.

BY MR. POLLARD: (Resuming)

Q I'm sorry, I have already directed you to the wrong place. Let me direct you to the right place.

If you have the staff's testimony, you can turn to page 11, and the paragraph labeled F reads, "Based on the emergency feedwater system design and the modifications to be implemented as described in the TMI 1 Restart SER, NUREG-0680, we believe that further additional hardware changes will not significantly improve emergency feedwater reliability. The common cause failure mode, as a result of operator error, still remains as the dominant source of system unreliability This failure mode is being further minimized with improvements in the human factors aspects of the plant, i.e., improved operating and emergency procedures, improvements in instrumentation, and continous operator training."

My question is do you agree with the staff that the common cause failure mode as a result of operator error still remains as the dominant source of system unreliability?

A (WITNESS CAPODANNO) No, I don't.

Q What do you think the dominant failure mode is?

A (WITNESS CAPODANNO) I am not quite sure what you mean by dominant. Since reliability is introduced, are you talking about a specific type of reliability with numerical

values generated and so on?

Q Are you generally familiar with reliability analyses?

A (WITNESS CAPODANNO) No, but the term gets used in several contexts. If it is being used specifically as a reliability analysis, I understand what a reliability analysis is. In a more general sense, the word can also be used, and I am not quite sure how you are phrasing your question.

Q Could you please read that sentence in the staff's testimony, ands as that sentence reads, are you saying you don't understand what they mean by the dominant source of system unreliability?

A (WITNESS CAPODANNO) My interpretation would be that they have evaluated that against some other condition that might affect system operation. What I am trying to get straight is whether or not this context of your question implies that the staff ran a reliability analysis and from that they have made this statement.

Q Well, then, we will define what we mean by reliability. Let's assume that reliability means the probability that the emergency feedwater system will be unable to carry out its function for loss of feedwater transients and small break loss of coolant accidents, that is, the probability that it will fail to do those functions.

What do you think will be the principal contributor to the probability that the system will be unable to perform that function?

A (WITNESS CAPODANNO) At this point it would more likely be the case of a component problem of some type.

CHAIRMAN SMITH: Would you repeat that, please?

WITNESS CAPODANNO: I said I believe it would be a component problem of some type.

BY MR. POLLARD: (Resuming)

Q Can you give me some examples?

A (WITNESS CAPODANNO) Some information I have reviewed in the past makes reference to such things as valves that didn't operate or valves that were improperly manufactured. I believe that at this point, with the changes in the system design and changes in the system procedures, that it may be a more likely occurrence of a compnent giving some problem with the emergency feedwater system.

Q Can I refer just briefly, please, to Figure 1 of your exhibit?

Am I correct that in the long term, after restart, that you intend to modify further the emergency feedwater system such that there will be parallel valves installed where it is now shown to be EFV 30A and EFV 30B?

A (WITNESS CAPODANNO) That is the intent, yes.

Q Would that be a type of component failure that would be present at restart that would not be present in the eventual long term that is concerning you about this reliability or that you identify as the principal contributor to its unreliability?

A (WITNESS CAPODANNO) Yes. In the long term, the addition of those valves is to provide further ability of the system to withstand a component failure.

CHAIRMAN SMITH: I don't believe that he answered the question, nor do I believe that the question was an appropriate one to begin with. However, because the question assumed the premise that he had a concern about component failure, but that is not what has been his testimony.

MR. POLLARD: That is why I tried to rephrase it, that the component failure was the principal contributor.

CHAIRMAN SMITH: Right, but your ultimate question premised a concern of this witness of component failure.

MR. POLLARD: That is the part I think the transcript will show that I rephrased.

CHAIRMAN SMITH: I understand. All right, I did not quite pick up the second clause as rephrasing the first clause.

DR. JORDAN: I have a question on the answer.

Is the modification going to be to add another

valve in parallel with the present EFV 30 A and EFV 30B, or will it be to have a different operator on the valve?

WITNESS CAPODANNO: The valves will be added in parallel to the existing valves.

DR. JORDAN: That means that if those valves were to fail open, the operator would have no control.

WITNESS CAPODANNO: No. In addition to the valve in parallel with the 30 valves, there would be a set of block valves also in parallel. There is a figure in the supplement to the Restart Report that shows that in more detail.

DR. JORDAN: Very well.

WITNESS LANESE: I think we may need some additional clarification on the reasons for putting the valves in also, and what we mean by improving the reliability of the system by making it safety grade. I think the predominant deficiencies in the system now with respect to high energy line breaks in the intermediate building, and the primary purpose for putting those valves in is for these other events. It is again not primarily because of LOCA, because of feedwater events.

In addition, the use of cavitating venturis in the system in the long term puts some different requirements on the system. So I think when we are talking about improving the availability of the system after an event, we are

talking about the impovement of the availability primarily because of the high energy line breaks.

DR. JORDAN: Because of what?

WITNESS LANESE: The high energy line breaks, a feed line break accident specifically. And also we need to qualify that equipment for the steam line break environment in the intermediate building.

DR. JORDAN: Okay, I'll come back to that. I guess I didn't quite understand it, but go ahead. I don't want to take your time now.

BY MR. POLLARD: (Resuming)

Q On page 6 of your testimony, the paragraph immediately preceding Board Question 6G states that the Licensee has committed to perform functional testing of the emergency feedwater system at TMI 1 prior to restart, and to demonstrate the adequate operability of the system to meet its design function.

Could you please describe for me this functional testing?

A (WITNESS CAPODANNC) There are identified in the Restart Report commitments to do a flow test on the emergency feedwater pumps, to establish flow to the steam generators. I believe there are also commitments to test the initiation logic, that is, the automatic actuation for emergency feedwater, and to test valving.

Q When you say test the valving, what does that involve?

A (WITNESS CAPODANNO) On the EFV 30A and B valves.

Q And specifically what kind of test?

A (WITNESS CAPODANNO) I believe there is a commitment for testing those valves as to operability.

Q In what respect operability, just simply to see if they will open or close?

A (WITNESS CAPODANNO) Yes, and they are also going to be used during the flow test to regulate the flow to the steam generators.

A (WITNESS LANESE) That system will also have a start-up test that will include initiation of emergency feedwater, introduction of emergency feedwater into the generator, and a test to show that it will control level at the required set point for a loss of offsite power, and a demonstration that natural circulation will be maintained in the system. So it is really a -- it should be a mock-up of, say, a loss of offsite power, possibly a reactor trip and then a loss of offsite power. We are still working on the details of that test. But ultimately we will take the system through its full requirements to establish natural circulation flow by means of emergency feedwater.

Q These tests that you described, Mr. Lanese, did you call those startup tests?

A (WITNESS LANESE) Yes.

Q Well, either the functional testing that Mr. Capodanno talks about in his testimony or the startup tests, are they going to test the loss of non-nuclear instrumentation power supplies and the operator transferring to the manual control?

A (WITNESS LANESE) Not as a part of these tests, but I cannot address if that is going to be performed in another startup test. I am only aware of the startup test with respect to emergency feedwater at this point.

Q Isn't that part of the emergency feedwater?

A (WITNESS LANESE) This test will not assume failures of the NNI ICS. Whether other tests will be initiated by losing NNI ICS I'm not sure at this point.

Q Well, let me just ask a general point. Is it Met Ed's intention prior to restart to test every aspect of the emergency feedwater system which is talked about in your testimony in this proceeding as necessary for a restart?

A (WITNESS LANESE) I think we are going to test those aspects of the system that we feel requires a demonstrated availability or operability.

Q So you think you would, even though you don't know the exact test, as a matter of position by Met Ed, you would in fact have a test that would involve loss of power to the non-nuclear instrumentation and see if the operator can

transfer control and still control the valve?

A (WITNESS LANESE) I can only answer in general terms. Anything that we feel would need to be demonstrated to show the availability of the system would be tested. Since I am not involved in the NNI ICS, I cannot make a judgment on whether that requires an in-plant test.

Q Is this transfer by the operator upon loss of non-nuclear instrumentation in your view an important provision?

A (WITNESS LANESE) Yes, it is.

Q So then you personally at least would recommend that such a test be done.

A (WITNESS LANESE) In some manner. We have to demonstrate to ourselves that that capability is indeed installed properly in the plant.

MR. POLLARD: Mr. Chairman, we are, as you can see on our cross examination plan, at a break point, if this is convenient.

CHAIRMAN SMITH: Okay. This seems to be a good place.

But before we adjourn -- all right, then, we will adjourn and what is our schedule for next week? It is the routine schedule. Right, we meet --

MR. POLLARD: We were going to ask, of course, to do the same, 10:00 o'clock.

CHAIRMAN SMITH: Well, you see, this is not a simple request. It has ripples all over the place. When you at the last minute make that request, it changes the travel plans of everybody involved, and if you want to make that the regular practice, then we will address it, but don't make these changes casually because they make a big difference in the travel plans, we have to change flight reservationsd, and everything else has to be changed.

MS. WEISS: I thought that I had asked last week that at least every week that we are here that it be 10:00 o'clock.

CHAIRMAN SMITH: I did not understand that to be the case.

MS. WEISS: I thought that is what I said.

CHAIRMAN SMITH: That one hour may not seem like a big deal, but it does back up all the way to when the hotel reservations have to be changed, the airline reservations are changed, and it is very late to do that.

So, your request now is that on the days with UCS that we begin at 10:00 on Tuesdays instead of 9:00?

MR. BAXTER: And run until 6:00 o'clock?

CHAIRMAN SMITH: And run until 6:00.

Does anybody object to that?

I would like that we could keep our regular schedule and come in late.

All right, we will meet at 10:00 then.

MS. WEISS: And I understood -- did I understand the Board to have ruled that the 24th of November will be a day for meeting on emergency plans and not a hearing day?

CHAIRMAN SMITH: No, we have not ruled on that.

well, we have ruled that the 24th will be a day for meeting on emergency plans, but we have not ruled that it will not be a hearing day. I think perhaps we should rule, if possible, now, so that parties can make as much notice. Just give us a moment.

We'll do it off the record so that we can adjourn now ands meet at 10:00, and then we will come back and announce it.

MS. WEISS: Thank you.

(Whereupon, at 11:59 o'clock a.m., the hearing in the above-entitled matter recessed, to reconvene at 10:00 o'clock a.m., Tuesday, November 18, 1980.)

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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 14, 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.

Alfred H. Ward

Official Reporter (Typed)

Alfred H. Ward

Official Reporter (Signature)