NUCLEAR REGULATORY COMMISSION **ORIGINAL**

In the Matter of:

METROPOLITAN EDISON COMPANY :
(Three Mile Island Unit 1) : DOCKET NOS. 50-289 (Restart)

DATE: January 8, 1981 PAGES: 9722 - 10,004

AT: Harrisburg, Pennsylvania

TR02 0/1

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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25 North Court Street,
Harrisburg, Pennsylvania

Thursday, January 8, 1981

Evidentiary hearing in the above-entitled matter was resumed, pursuant to adjournment, at 9:03 a.m.

BEFORE:

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

DR. WALTER H. JORDAN, Member

DR. LINDA W. LITTLE, Member

Also present on behalf of the Board:

MS. DORIS MORAN,
Clerk to the Board

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C O N T E N T S

C O N T E N T S

P R O C E E D I N G S

CHAIRMAN SMITH: Are there any preliminary matters?

DR. JORDAN: Before Mr. Pollard or Ms. Weiss continues their questions, they brought out yesterday in their questioning that rather, I guess, surprised me a bit, and I want to make sure that I heard correctly without going into the reasons thereof.

Did you say that non-safety grade loads may be connected to the 1E buses independent of the requirements of Reg Guide 1.75 if they are shed upon the accident signal and are not reconnected prior to stabilization?

Whereupon,

ROBERT FITZPATRICK,

called as a witness by counsel for Nuclear Regulatory Commission Staff, having previously been duly sworn by the Chairman, resumed the stand, was further examined and testified as follows:

THE WITNESS: That is correct.

CHAIRMAN SMITH: I understand we are within striking distance of transcript page 10,000 this morning, so you may want to consider whether you are going to rush off to Washington.

(General laughter.)

CROSS EXAMINATION -- Resumed

BY MR. POLLARD:

Q Yesterday you were making a distinction between the direct effects of fault current versus the indirect effects of fault current in determining how to apply Reg Guide 1.75, or in determining whether or not the provisions of Reg Guide 1.75 have been met.

Can you tell me what criteria you used for deciding whether an effect of the fault current is direct or indirect?

A Yes. Yesterday I made two distinctions, to my recollection, direct, indirect and not related, and I called the undervoltage trip not related to the fault current, but to the fault. In terms of indirect, that I addressed yesterday as, for example, an indirect relationship to the fault current would be, say, the grounding relay that Mr. Torcivia was talking about, where that is coupled to the fault current through a current transformer, and only nominal current would run through that circuit tripping that relay, so that that does not receive any signals or go through any conditions that is not within its ratings of normal operation, and that would be, I believe, a basic criterion to look at indirect and direct effects of the fault current.

Q As I recall, you said that the heat generated by the fault current would be a direct effect?

A Yes, the thermal effect.

Q Suppose that heat caused a fire. Would the fire be a direct effect?

A It certainly would.

Q Would the damage caused by that fire be a direct effect?

A Yes, indeed.

Q But detecting of a fault is not a direct effect when you use it for undervoltage?

A That's right. I am saying the undervoltage is caused by the fault, not by the fault current. I would be more than happy to go into detail to explain that.

Q If you could explain for me the distinction that you have just made just now between fault current and fault.

A I would be happy to do that.

For the parties and the Board I would like to first define a couple of things to hopefully make more understandable my explanation, and the three things I would like to define first are what we would call a black box, a current source, and a voltage source, and then go on from that to explain the undervoltage.

First of all, in engineering, many times we will take an item and we don't care particularly what is inside the item itself, just what the input and the output might be, and we will call that a black box. A typical example of that might be a television set. Any of us who go to a store to buy one, we don't care exactly how it is connected up inside. All we care about is that we plug it in, we give it a signal from an antenna, and we get an audio-visual output.

If I want to talk about televisions, I could, as an example, call that a black box with an input and an output.

I would like to move on to a current source, and I would like to call the current source itself a black box. It gets some energy input, and the output of a current source would be constant current, a constant current, independent of what impedence might be placed on its output terminals. And in order for a current source to supply a constant current over varying impedences, and to be in accordance with Ohm's law, it must vary its voltage to drive a constant current through the impedences, whereas a voltage source -- a black box is called a voltage source which, in this case we could put in the black box a diesel generator -- a voltage source gives you essentially constant voltage within its physical limitations, independent of the impedence applied to it, and the current varies according to whatever the impedences are.

The distinction is here we have a voltage source and we have X number of impedences hung off the 4160 bus and the 480 volt bus. The short we are talking about here really is reflected into a model of this system. It is just so much impedence. The impedence of those loads at the 4160 bus coming down through the transformer to the 480 volt bus and down to the fault, that becomes a simple voltage divider. And the voltage across the various parts of those impedences falls out independent of what current is flowing through there. You have X amount of voltage on your source, and it is going to drop across all those impedences. The current flow will be a result of the magnitude of the impedences.

But when you have a voltage source and then an impedence, any currents that follow, follow from the impedence, and the voltage divides across the impedences directly proportional to the impedences. Therefore, in this case, we have current as a result of a voltage through impedences. It is a fallout of the impedence system itself, not the current causing the voltage. We have the voltage, and it is dividing across the impedences. That is the distinction I am making, where this is not related to the fault current.

DR. JORDAN: The voltage that is not related, namely, is the voltage at your constant voltage source.

THE WITNESS: Yes, and it will divide across the impedences directly proportional to the size of those impedences.

DR. JORDAN: The voltage across each impedence is certainly very much related to the current.

THE WITNESS: No, sir, the current follows from the fact that you have a voltage source and X amount of impedence. The current is a follow from that. It is not the current making the voltage and the impedences. It is the voltage across the impedences, and the result is the current, whereas if it were the other way around with a current source, then that would be a direct result of current. That is the distinction I am trying to make. The current is following from the voltage source, and the impedence is across that voltage source, not the other way around, and therefore it is not a result of the fault current but the fault itself being some kind of low impedence placed into the circuit.

DR. JORDAN: Yes, I hear you.

CHAIRMAN SMITH: Is an effect of what you are talking about that downstream of the fault you have less current?

THE WITNESS: In electrical engineering jargon, downstream of the fault, if it is a true fault, there is nothing. That is what the fault is, a short circuit of anything below that in the circuit. In this case it would be the pressurizer heaters. Once you have a fault in the circuit, the pressurizer heaters are just essentially removed from the circuit. They receive no energization at that point.

CHAIRMAN SMITH: Is that how fault has been used in the context of this issue, a total short?

THE WITNESS: Yes, a total volt at the three-phase short takes the pressurizer heater elements themselves totally out of the circuit.

CHAIRMAN SMITH: We have been borrowing your easel. Have you taken it back?

MR. POLLARD: Yes, I packed it up this morning.

CHAIRMAN SMITH: You decided no more Intervenor funding of the Commission?

(General laughter.)

MR. POLLARD: We could sell it to you for the price we paid.

(General laughter.)

DR. JORDAN: You took the classic drawing, too.

MR. POLLARD: I saved it, and I shall return it if you wish to have it. I have no use for it.

BY MR. POLLARD: (Resuming)

Q It is the undervoltage which results on Bus 1P from pressurizer heater fault. Is that caused by the fault?

A Yes.

Q Is it an effect of the fault?

A Yes, it is.

Q You are saying it is not an effect of the fault current? Is that the distinction you are trying to make?

A Yes, I just went through that.

Q I know you just went through it. I am trying to make sure I understood you.

So then in your view, use of an undervoltage relay to trip open the breaker to isolate a fault meets the provisions of Reg Guide 1.75?

A It can. I am saying it is potentially the equivalent of the SI signal. You then have t look at the circuits involved specifically, as Mr. Torcivia handed out that sheet, that curve the other day of voltage versus time. You have to then make sure that you can use that. I am saying it is a viable choice, but then you have to actually be able to demonstrate that you have got an event that gives you enough low voltage for enough time to pick up these devices.

In essence, yes, it is a viable means, given that you can demonstrate its use for the circuit involved.

Q Does the design of the undervoltage relay circuit for the pressurizer heaters at Three Mile Island Unit 1 meet the provisions of Reg Guide 1.75?

A It does. As Mr. Torcivia said on the stand a few days ago, there are certain -- there may be certain faults, something less than faults that would put more impedence into the circuit than just a three-phase volted fault f -

which this undervoltage trip would not isolate the heaters from the circuit. But I think it is only fair to expand on this a bit, to put this in a proper perspective.

The reason my testimony never addressed this undervoltage trip was -- and the SER mentions it more or less in passing -- is the fact I never gave the Licensee credit for this particular trip. All of a sudden, now, they meet or do not meet Reg Guide 1.75. The Licensee in their prepared testimony, which I didn't see prior to preparing mine, and in yours, Mr. Pollard's testimony where Mr. Pollard took the opposite view of the Licensee, this is where this has really been brought to prominence, this particular item.

The reason I am -- I brought it up as a rebuttal to begin with. The most important reason for me is in using this, not for Three Mile Island, but in using this as a viable signal in the day-to-day activities of the Power Systems Branch. If someone comes in and wants to use that, I am saying they are able to do it. In terms of giving Three Mile Island Unit 1 credit for it, the evaluation did not hinge on this. The other designs, the other B&W plants that all had to do the same modification do not have an undervoltage trip. They rely on overcurrent and an SI signal, just as in Lessons Learned. This design goes beyond what any other B&W operating reactor has done.

The other aspect of this undervoltage trip which hasn't come out -- and I would like to refer to the SER on page C-8 --

Q What page?

A C8-8, the first sentence of the first full paragraph, I would like to read that. "In order to provide further protection of the emergency power system, the circuit breakers which connect the pressurizer heater loads to the emergency buses will be automatically tripped upon emergency bus undervoltage or an emergency safety features actuation." And then the next sentence --

CHAIRMAN SMITH: You should slow down.

THE WITNESS: I'm sorry.

That reference again was page C8-8, the first full paragraph on the page. I just read the first sentence, and the second sentence would be: "This precludes the possibility of a misaligned heater bank becoming part of the diesel generator sequenced load upon a loss of off-site power." That is the other thing that the undervoltage trip does for me. No matter if an operator puts it on the bus by whatever procedure he wanted it on there, if he forgets to take it off, things go back to normal. We are all running back fine and the heaters are sitting there, should the diesel generator be called upon due to an undervoltage loss of voltage on the bus and that heater is still there, it is then taken off by this undervoltage trip. There are a lot of good things about the undervoltage trip just besides it does in some cases back up the fault protection. But it is not a basis in my evaluation of the acceptability of this design that it was a requirement and an absolute backup to meet Reg Guide 1.75.

BY MR. POLLARD: (Resuming)

Q You referenced this section of the Safety Evaluation Report in your direct testimony. Did you prepare the sections of the Safety Evaluation Report referenced in your testimony?

A Yes, with the help of two others, but it is basically mine.

Q Referring to the sentences you just read on page C8-8, particularly the second sentence where the SER states, "This precludes" -- and I emphasize the word "precludes" -- "This precludes the possibility of a misaligned heater bank becoming part of the diesel generator sequenced load upon a loss of off-site power." And the "This" refers to either the undervoltage or the engineered safety features actuation, is that correct?

A No. The English may indicate that, but the possibility of the misaligned heater bank being a sequenced load is taken care of by only the undervoltage trip.

Q Am I correct that as soon as the diesel generator breaker closes, the undervoltage will clear?

A That's correct.

Q And if the undervoltage has cleared, as soon as the diesel generator breaker closes, please explain how that precludes connecting the heaters to the bus during the diesel generator sequenced load.

A Yes. The loss of voltage which would start a diesel generator would leave that bus de-energized approximately ten seconds, which is more than sufficient time to trip on the undervoltage.

Q I understand. So that trips the main feeder breaker, and my question is once the diesel generator breaker closes, and the undervoltage signal clears, what precludes reclosing the main feeder breaker before the diesel generator sequenced loading is completed?

A Nothing explicitly precludes it other than the operator's reaction time. He probably could not do it that fast. There is no physical portion of the design which would preclude doing it.

Q You would agree that that portion of the SER is not entirely accurate? It does not preclude reclosing of the circuit breaker prior to completion of the diesel generator sequenced loading.

A No, I don't agree with you that that is an inaccurate statement of the SER. The SER doesn't say anything about the operator being able to put it back on. It says it precludes it being there when the diesel generator starts its loading sequence.

Q It doesn't say that, Mr. Fitzpatrick. It says it precludes the possibility of a misaligned heater bank becoming part of the diesel generator sequenced load.

DR. JORDAN: Isn't it the sequenced load that you are relying on?

THE WITNESS: The thrust of this sentence is that it would not be on the diesel during the sequence. Mr. Pollard had the right sense of the sentence, that it would be tripped off. It is not a sequenced load, but it would be an unwanted load, an unanalyzed load during the sequencing of all the other loads. The automatic undervoltage trip would take it off the bus, and the only way it could get back on would be a very fast operator deciding immediately that he had to have this and throwing it back on during this -- I think it is about a 25 second interval when the diesel has finished its loading.

BY MR. POLLARD: (Resuming)

Q I am correct that if an operator happened to be near the breaker, there is nothing about the undervoltage circuit that would preclude him from closing the main feeder breaker during this 25 seconds of sequenced loads?

A That is correct.

Q If we could continue on the same paragraph, the last sentence states, "Furthermore, in accordance with Position 4 and Clarification 6 above, this automatic load setting capability is effected through Class 1E circuit breakers at the emergency switch gear."

Now, position 4, which is on C8-3 of the SER, states, "Pressurizer heater motive and control power interfaces with the emergency buses shall be accomplished through devices that have been qualified in accordance with safety grade requirements."

Is the phrase "safety grade requirements" synonymous with the phrase "Class 1E requirements"?

A It is in the context I used it, yes.

Q Are the main feeder breakers safety grade breakers?

A To the best of my knowledge they are. I did not review that. That was part of the original review and approval of the TMI design.

Q These circuit breakers were not used originally?

A That's right. These are two spare breakers, one in each switch gear.

Q Are you saying that the staff reviewed spare breakers during the original licensing of the plant?

A No, the staff doesn't have to review spare breakers. You take a look at the switch gear, and all of that is encompassed in that, and I assume, picking up the review now, that that was all part of the normal review. If you would approve one breaker in there -- you really don't approve breakers, you approve the switch gear which includes the breakers, and a spare would be included in the original review.

Q You are relying on the assumption that the staff determined that these breakers were safety grade at the time Three Mile Island Unit 1 was licensed, and you have made no attempt to verify whether that is correct?

A That is indeed the case.

Q Do you agree that the three undervoltage relays which have been added to Bus 1D and 1E are new equipment that weren't there originally?

A Yes.

Q Are those undervoltage relays safety grade?

A To the best of my knowledge, they are.

Q Are they seismic category one?

A As far as I know.

Q How do you know that?

A From the give and take with the Licensee over reviewing the design. They said they were putting in safety grade equipment. Now, I did not require them to submit test results and all of the rest of that to verify that.

Q In other words, the Applicant said they were safety grade and you made no attempt to verify whether or not they were?

A I made no independent attempt to verify that, that's correct.

Q Is there any portion of the modification which was required at Three Mile Island Unit 1 in order to power the pressurizer heaters from the on-site power supply wherein you made any attempt to verify whether or not the design is in fact in compliance with safety grade requirements?

A There is no portion of this design where I required the Licensee to submit all the background material that would cover seismic environmental qualifications of any of these devices. The only new device we are actually adding to power that comes into the circuit itself is the disconnect device. Everything else is existing equipment.

Q Also the undervoltage relays are new, correct?

A They are not in the circuit, but that is new equipment, that's correct.

Q Do you know whether any of the new equipment added as a result of this modification is included among the equipment of the Licensee's response to IE Bulleting 79-01B?

A No.

Q No, you don't know?

A That's correct.

Q How about the existing equipment? Do you know of the equipment that was before the modification that is now utilized to power the pressurizer heaters, do you know whether or not that is included among the listing of equipment in response to 79-01B?

A No.

Q On page C8-7 of the Safety Evaluation Report, the last paragraph on that page references Emergency Procedure 1202-19, Pressurizer Systems Failure.

Did you review that procedure in preparing this portion of the Safety Evaluation Report, or in preparing your direct testimony?

A I had one look at, to the best of my recollection, one look at EP 1202-29, Rev 0, Rev 1, something way back and made some preliminary comments on it to the people charged with reviewing the procedures. The fellow I worked with then is the one, as I said earlier, there were two other people that gave me some inputs to this SER. The part on the procedure was his input, and that is Mr. Boger is the name of the fellow.

Q Was it your responsibility or Mr. Boger's responsibility to determine whether or not the addition of the pressurizer heaters and the methods of connecting the pressurizer heaters to the on-site power supply would not result in overloading the diesel generator.

A That is basically a split responsibility.

Q For your portion of that responsibility, did you review the design of Three Mile Island Unit 1 to examine the non-safety equipment which can be powered from the emergency bus?

A No. What I did with this procedure was the main part of -- what I did with the procedure was to ensure that the Kirk Key interlock system was reflected in it, and the loads documented in the procedure were loads on the bus. There are many more loads on the bus -- on the list -- excuse me, the list that might have to be tripped to get the pressurizer heaters on, dependent on the loading of the diesel.

Mr. Roger would then take over and verify that those loads may or may not be able to be tripped in any given circumstance. That's why there are a number of loads there. The procedure leaves it up to the discretion of the shift supervisor, exactly what loads. The procedure says these are loads that can be tripped, and it is the discretion of the shift supervisor which loads he would take off in order to accommodate the 100 -- to make sure his 126 kilowatts of capacity are available left on the diesel.

The other thing that should be made clear is the pressurizer heater load, as the staff discussed in response to UCS 3, it is not an absolute requirement for safety. It may well be the shift supervisor's decision that the loads he has on there are more important, and he wouldn't shed any of them, and just forego using the pressurizer heaters. But that his shift supervisor discretion.

Q Did you review those loads listed in Emergency Procedure 1202-29 to verify that they were in fact non-safety loads?

A No. All I did was check that they were loads that would be available to be tripped. It then transfers over to the shift supervisor to determine these are the loads that are available to be tripped, can I afford to trip any of these? If he can't, he won't.

Q Do you know whether Mr. Boger made any attempt to determine whether the loads listed in Emergency Procedure 1202-29 are non-safety loads?

A No. As far as I know, neither I nor Mr. Boger care whether they are safety or non-safety. The fact is they are loads that are available to be tripped if you need to get some spare capacity because of diesel generator loading. It is still the shift supervisor discretion on whether he trips or doesn't trip any of these loads, depending on how he perceived the need of the plant, and he may well decide the loads he is running are more important than pressurizer heaters, and he just doesn't use the pressurizer heaters. But that is totally -- the procedure leaves that totally up to the discretion of the shift supervisor.

Q In the course of your review, did you determine that there are some non-safety loads capable of being powered from Bus 1P or 1S in addition to the pressurizer heaters?

A No. The concern of safety and non-safety of the given already approved design was of no concern to me in terms of reviewing and approving this modification, and so I did not go into that.

Q Let me see if we can then make an assumption. Let's assume for the purposes of the next question that all of the loads listed in Emergency Procedure 1202-29 are in fact non-safety loads. They are in no way needed to protect the health and safety of the public, and recognizing the staff's goal of the short term Lessons Learned Report to improve the reliability of the pressurizer heaters by making available the capability to power the pressurizer heaters from the on-site power supply, do you think it would be valuable to require that some of these non-safety loads be taken off the diesel generator bus so that they could not be powered from that bus in order to preclude the need for the operator to worry about load shedding to prevent exceeding the capacity of the diesel generator?

MR. CUTCHIN: I object to this question on the ground that this witness has on several occasions disclaimed competence to judge what the purpose of these loads is and what they are used for. He only looks at the electrical engineering design to see if that load may be safely added to the diesel power supply.

CHAIRMAN SMITH: Mr. Cutchin, it hasn't been our practice to sustain objections based upon exceeding competence. Instead of that, we establish that by the witness and the particular question, and then rather successfully we have had an understanding that they won't pursue the area generally beyond the competence of the witness.

MR. CUTCHIN: I raised this, Mr. Chairman, because at least my ears tell me that he has made this statement several times, that he doesn't care about these sorts of things.

CHAIRMAN SMITH: I understand that. I understand that is what he said, but let's give him a chance to answer the question.

DR. JORDAN: We are interested in the question, Mr. Cutchin, of whether in tripping loads and making available the 126 KW, that there are no loads tripped that are important to safety, and someone must have made that determination, and if the staff hasn't reviewed that, we would be interested in knowing that.

MR. CUTCHIN: I thought I heard the witness say as well, Dr. Jordan, that it doesn't really necessarily make any difference that it is a safety load if that particular safety load is no longer needed at the time in question.

DR. JORDAN: That is exactly the point I am making. Is it no longer needed? Has there been any valuation of the proposed loads for tripping, that those loads are not needed under the circumstances being prescribed?

MR. CUTCHIN: That is a Board question that goes slightly outside the scope of this question. I think it is a perfectly proper question for the Board to ask. I am not sure that Mr. Fitzpatrick is the one. Maybe we will just let that question go forward and see if he can answer it.

DR. JORDAN: I don't want it to be outside the scope at the moment. If you believe it is outside the scope, I would like to know why. It seems to me that an important part of the Contention is that the adding of the 126 KW will not overload the diesel generator or interfere with the general safety. Surely that is an obvious follow-on.

The reason we have been following this with the Licensee is to make sure that in choosing loads to be tripped, that he is not choosing loads that are important to safety. And nobody has yet told us that these loads are not important to safety.

MR. CUTCHIN: The witness has said, I believe, Dr. Jordan, that he looked at those listed in the procedure without concern for whether they were safety or nonsafety.

DR. JORDAN: That's exactly my problem: He looked at them without the concern of whether they were important to safety. And I am concerned -- and I believe that this is an important part of the Contention -- that they must not be important to safety, otherwise you don't dare trip them. And, therefore, you cannot -- you will overload the generators.

MR. CUTCHIN: If you are asking can we answer that question, let's see if Mister -- I doubt that he can answer that question, since he said he can't. And if the Board believes that it needs that answer, we will get you an answer.

DR. JORDAN: That's the question we have been trying to get an answer to now for over a week.

MR. CUTCHIN: I hadn't heard that question directly posed to the staff in general.

DR. JORDAN: Not to the staff. Not to the staff.

MR. CUTCHIN: I will volunteer to get you an answer to that question, Dr. Jordan.

DR. JORDAN: Fine. I do want to know, then, the answer to the question.

MR. POLLARD: I do, too. I would like to add a comment to this discussion. Let's say we had a hypothetical plant where all the loads necessary for safety took up the full rated capacity of the diesel generator. I don't know exactly what the meaning of the requirement in the Short-Term Lessons Learned Report would be. Would that mean in that particular plant they don't have to bother connecting the heaters to the on-site power supply?

DR. JORDAN: The question I was posing then has been some time ago. And I guess I will ask it, then, again; namely: Have you looked at the loads that are being proposed for tripping in order to make the capacity of 126 kilowatts available; have you looked at those loads or has anyone in your organization looked at those loads to make sure that those are loads that can indeed be available?

You used the word "available" for tripping. Is there a list? In other words, is there a list of loads that are available for tripping that are not important to safety? As well, of course, including on the list those that are important to safety and may not be tripped?

Does Mr. Boger or anyone in your organization know what those loads are?

THE WITNESS: The answer to the last part of your question first is: I believe it is page 13 of the emergency procedure 1202-29. It lists -- it doesn't make a distinction, it doesn't set one group as these are safety loads and these are nonsafety loads. It gives the operator a list of all of the loads that are available to him. I can't say --

DR. JORDAN: By "available," what do you mean?

THE WITNESS: I want to get to that. When I said "all of the loads," I can't say it is all, every single load that is available. It is a group of loads that is available to the operator. He must get shift supervisor approval for any load he would take off. These may or may not be what we would call safety or nonsafety loads.

The thrust of the procedure is that it is up to the shift supervisor's discretion on what loads come off, because it is up to the shift supervisor to determine at that point in time what safety loads the plant needs. The plant most likely does not need every safety load available to that operator at any given time in the plant.

So the shift supervisor has, by this procedure, has a number of loads to choose from. If he then determines -- and they may be safety or nonsafety as the designation -- but if that load is not needed for the plant safety at that particular point in time and the shift supervisor so determines that, he is able to give approval to the reactor operator to trip that load in order to make room for the pressurizer heaters.

It is also his discretion that if all of these loads are needed, he can at that point say, "We do not use the heaters; we stay with the loads we have."

DR. JORDAN: Are you comfortable with a procedure that allows the shift supervisor or the operator to discard loads which may be important to safety during an accident situation without having an established procedure for deciding which loads should be discarded?

THE WITNESS: The procedure, as I understand it -- and I want to go back again -- that I have only seen one of the very, very earliest revisions. I have heard Revision 12 passed back and forth during the hearing here. But as far as my understanding of the procedure is, or any procedure for -- any emergency procedure -- you cannot foretell ahead of time exactly what might go any which way.

These procedures, in a case like this, have to leave some discretion to a knowledgeable on-site person -- in this case, the shift supervisor -- to determine at any given point in time what is and is not necessary for the safety of that plant.

DR. JORDAN: I guess then, whether you are comfortable or not, I guess, really wouldn't affect me. But I must say to you that I am uncomfortable with a lack of procedure for deciding whether or not a load at the time is safety-related or not. This is left to the discretion of the operator. I can't help but be uncomfortable about that. We will leave it at that.

THE WITNESS: The only suggestion I might make is Mr. Boger is the staff expert in this particular area. I am not sure I should be volunteering him for this, but he would be the optimum person to address a question in that area, Dr. Jordan.

MR. CUTCHIN: If I may, I may comment here. This, I think, is the same sort of a problem that we got into when we were talking about automating everything. If you can't -- you will never be able to have that completely developed.

DR. JORDAN: There is a similarity, and I have the same misgivings that I had then.

BY MR. POLLARD:

Q I would like to try again the question we had before we digressed. Let's see if I can restate it for you. I am not asking you to determine whether a particular load is safety-grade or nonsafety-grade or when it has to be shed. I am trying to ask you from your own professional opinion, in designing Three Mile Island Unit 1, with the goal in mind of not degrading the capacity, capability, or reliability of the on-site power supplies by the connection of the pressurizer heaters, would you please assume as an assumption as a given that the loads listed in emergency procedure 1202-29 have absolutely no relationship to protecting the health and safety of the public, they are nonsafety loads. Do you think it would be a safety advantage to remove those loads from the diesel generator bus in order to relieve the operator of the need to shed them in order to connect the pressurizer heaters to the on-site power supply?

A Yes. I would think there would be some advantage to that. I am not sure how big that might be, and I certainly wouldn't be in a position to try to quantify it for you. But in the thrust of your assumptions, my answer would be "Yes, I would see that there would be an incremental advantage to reassigning those loads."

Q In the course of your review of Three Mile Island Unit 1, did you give any consideration to requiring the removal of any nonsafety loads from bus 1P or 1S?

A No.

MS. WEISS: Mr. Chairman, we are going to begin a line of questioning on Regulatory Guide 1.63, which was mentioned by the witness in his rebuttal yesterday and provided to the parties by the Licensee. It is Revision 2, July 1978, Regulatory Guide 1.63, Electric Penetration Assemblies in Containment Structures for Light Water-Cooled Nuclear Power Plants.

We would ask that that be marked for identification as UCS Exhibit 31.

MR. CUTCHIN: Mr. Chairman, I am going to object to this line of questions as clearly surrebuttal-type information, in that this was mentioned in passing. It was referred to only for the proposition that here was an example of a regulatory guide involving a situation where use of fault current devices was acceptable. If the line is that narrow, then I will sit back and wait. But if it is going much broader than that, I am going to be objecting.

MS. WEISS: I take it you are not objecting now, Mr. Cutchin, so we will begin the line of questioning. And if you think it goes beyond that, well, then, I am sure you will object.

(The document referred to was marked UCS Exhibit No. 31 for identification.)

MR. TROWBRIDGE: What has been marked for identification?

MS. WEISS: Reg Guide 1.63.

MR. TROWBRIDGE: Just the two pages of 1.63 or all the --

MS. WEISS: All three pages, the three pages that you distributed for us. And I thank you for it. The regulatory guide and the letter of July 18, 1978, from Robert Minogue, office of standards development, transmitting the regulatory guide. It is three pages in total.

MR. TROWBRIDGE: Very well.

BY MR. POLLARD:

Q Mr. Fitzpatrick, can I address your attention to yesterday's transcript page 9705.

A I don't have a copy in front of me.

(Handing document to witness)

MR. TROWBRIDGE: 9705?

MR. POLLARD: Yes.

BY MR. POLLARD:

Q Beginning at line 14 on page 9705, you testified that, "Another item in this regard is the fact that Mr. Pollard has also said -- he has quoted 1.75 and 1.6, the reg guides, in terms of these are cases where we don't use fault protection, overcurrent protection. There is another Reg Guide 1.63 where the staff explicitly relies on overcurrent protection, and that is for protecting the containment penetrations from a fault. So the staff does use overcurrent devices and gives full credit for them."

Do you have any changes to make to that

testimony?

A No.

Q Focusing on line 20, you particularly used the word "fault" rather than "fault current." Did you mean to make that distinction here as well?

A You are correct. That should read "fault current."

Q If I could now direct your attention to --

CHAIRMAN SMITH: We will actually correct the transcript at that page to conform with -- or don't you want that?

MS. WEISS: No. I think I would like it to reflect what he said, and s is a change.

CHAIRMAN SMITH: All right. That is your prerogative.

BY MR. POLLARD:

Q If I could direct your attention to Regulatory Guide 1.63, particularly regulatory position C.1. This is on page 1 of the guide. First, some preliminary things. You would agree that this Guide 1.63 describes a method acceptable to the staff for complying with the provisions of General Design Criterion 50, which is containment design basis, and for complying with Appendix B, quality assurance criteria for nuclear power plants and fuel reprocessin plants? Is that correct?

A Yes.

Q In general, what the regulatory guides does is say that, "IEEE Standard 317-1976, entitled 'IEEE Standard for Electric Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations,' provides an acceptable method of complying with General Design Criterion 50 of Appendix A and with Appendix B to 10 CFR Part 50, with respect to the mechanical, electrical, and test requirements for the design qualifications, construction, installation, and testing of el- -ic penetration assemblies in containment structu s for light water-cooled nuclear power plants subject to the following"?

A That is indeed what it says.

Q Now, regulatory position C.1 states: "Section 4.2.4 should be supplemented by the following: The electric penetration assembly should be designed to withstand without loss of mechanical integrity the maximum short-circuit current versus time conditions that could occur, given single random failures of circuit overload protection devices."

Is it not correct that what that position statement means is that you should design the containment penetration to withstand the fault current which would persist if the overcurrent protection failed?

A The thrust of the requirement here is that you must design the penetration to withstand a failure, to be able to maintain its integrity long enough for the second overcurrent protection device to work, assuming they are coordinated and the first one, the one that would go first, is the one that fails.

Q So in the case where we have an arrangement like we do with the pressurizer heaters, if the main feeder breaker trip did not trip and the fault current was not sufficient to trip the incoming main bus breaker, if this was the arrangement used on a particular containment penetration, the containment penetration would have to withstand for an indefinite period of time the fault current? Is that not correct?

A No -- well, that would be one way of satisfying the regulatory guide. The other way would be to put in another device, which is usually what happens, because you wind up with a penetration as a given, and you do your protective relaying around it.

I would like to make a comment on your analogy. If we look at Figure 1 of the Shipper-Torcivia testimony for a second, the distribution breaker, way down downstream of the main feeder breaker, that would, for the purposes of this Regulatory 1.63, would also be countable.

Q Even though it is not fully safety-grade from the standpoint of its location?

A That's correct.

Q Another thrust I think you confirmed was that an acceptable way of meeting Regulatory Guide 1.63 is to design the containment penetration assembly to withstand the fault current without loss of containment integrity.

A Yes. You can make the design withstand it indefinitely. Or if that is not the case, then you work your protective relay around it to protect it.

Q Would you agree with me that there are some containment penetration assemblies which carry safety-grade circuits?

A Yes, there are.

Q So you don't have the option, at least for those, of deenergizing or interrupting that circuit during an accident; is that correct? In other words, we could not trip open all circuit breakers which are supplying power to all the circuits which go through containment penetrations with an accident signal?

A That's correct.

Q You would agree that Regulatory Guide 1.63 sets forth acceptable ways of meeting different Commission regulations than Regulatory Guide 1.75? In other words, Reg Guide 1.63 has nothing to do with assuring the integrity or isolating nonsafety loads from safety-grade power supplies?

A That is not the direct purpose of the regulatory guide.

CHAIRMAN SMITH: What was your answer?

THE WITNESS: That is not the direct purpose of the regulatory guide.

BY MR. POLLARD:

Q Is it an indirect purpose?

A No. The reason I mentioned it is the overcurrent protection is a main portion of this document.

Q At least for safety-grade circuit for pass-through containment penetrations, you don't have any other option, do you, other than relying upon the overcurrent protection, since the circuits must be energized in order to cope with the accident?

A That is correct.

MS. WEISS: I have a couple more questions.

BY MS. WEISS:

Q When did you join the NRC, Mr. Fitzpatrick?

A June of 1974.

Q Did you come immediately to the electrical instrumentation and control systems branch?

A That is correct.

Q Can you tell me who your instructor was on the meaning and interpretation of Regulatory Guide 1.75?

A I don't think I can point to anyone specifically.

Q Do you know if it was Mr. Pollard?

A I doubt it. Mr. Pollard and I were in the branch simultaneously for, as I remember, a pretty short period of time before he moved on to be a project manager.

Q You don't recall that he was your instructor on Regulatory Guide 1.75?

A No, I don't remember really working with Mr. Pollard that much all during that short time period.

Q Do you recall that you took a series of training lectures?

A No.

Q You don't recall the training lectures?

A I don't recall him giving a training lecture on this, no.

CHAIRMAN SMITH: Ms. Weiss?

MS. WEISS: No further questions.

(Board conferring)

CHAIRMAN SMITH: Mr. Adler.

CROSS EXAMINATION

BY MR. ROBERT ADLER:

Q I would like to make sure that I understand your testimony in response to Mr. Pollard's questions regarding the use of the methods of connecting pressurizer heaters to emergency power supplies in other plants.

You did testify that there are other operating plants where the pressurizer heaters are connected to ES buses?

A That is correct.

Q Did you testify that in those plants the isolation devices that are used are circuit breakers and not undervoltage relays?

A The operating plants I specifically addressed were the other B&W plants. What I said was they had similar designs to TMI-1 without the additional protection afforded by the undervoltage protection. They use the circuit breaker with overcurrent protection.

Q And without the use of undervoltage relays, do those designs meet Reg Guide 1.75?

A Yes. I should also add that they have the safety injection signal also. I want to make that clear.

Q Taking the circuit breakers alone, don't the circuit breakers rely on fault current?

A I am not sure I heard -- there is a word I didn't catch in that question, if you could repeat it, please.

Q After the ES signal --

CHAIRMAN SMITH: You withdrew the question?

MR. ROBERT ADLER: I am trying to clarify the question. I will withdraw it and reask it, if necessary.

BY MR. ROBERT ADLER:

Q The other plants use a circuit breaker in an ES signal; is that correct?

A Yes.

Q And following the ES signal, it is possible, as in TMI-1, to reconnect the pressurizer heater to the ES bus?

A That is correct.

Q And at that point the only means of protecting against degradation of the ES bus from a fault on the pressurizer heater is the circuit breaker; is that correct?

A It would be some number of circuit breakers in a row, just as we have at Three Mile Island. The detection would be in overcurrent detection.

Q Is it your testimony that under those circumstances Reg Guide 1.75 no longer applies?

A Yes, it is my testimony that following -- as I point once again back to the Standard Review Plans, following any stabilization period, you were then allowed to add any loads you so desire back onto the buses.

Q Can you show me where in Reg Guide 1.75 it is indicated that is permissible?

A No, sir. The reg guide does not address that at all.

Q It is on the Standard Review Plan?

A That is correct. The Standard Review Plans attempt to, at least in some way, supplement guidance to the staff in this area, because it is lacking in the reg guide as it is now written.

DR. JORDAN: If you are about to leave it, I want you or someone to ask how the Standard Review Plan includes that.

MR. ROBERT ADLER: We have a quote from the Standard Review Plan on page 4 of Mr. Fitzpatrick's testimony. Perhaps he could expand upon how that language permits this circumstance.

THE WITNESS: The paragraph that I quote from Standard Review Plan section 8.3.1, Revision 1, on page 4 of my testimony, is a paragraph designed to give staff reviewers guidance in how to review the connection and disconnection of non-Class 1E loads to and from the Class 1E distribution buses.

DR. JORDAN: Are you quoting now?

THE WITNESS: Well, I was reading -- I was reading along.

DR. JORDAN: Where are you reading?

THE WITNESS: I was reading from the middle of the first sentence, just taking the thrust of the first sentence. That is why it is there, to give guidance to the technical reviewers on the staff on the subject of connection and disconnection. It is part of that first sentence. I am trying to paraphrase from it as to why -- what the paragraph is about.

MR. ROBERT ADLER: Perhaps it would help if you go through each sentence.

CHAIRMAN SMITH: Let's back up. There was some confusion. You said "Mr. Pollard's testimony," and you didn't mean that. The Standard Review Plan is quoted on page 4 of this witness' --

MR. ROBERT ADLER: I thought I said "Mr. Fitzpatrick's testimony."

DR. JORDAN: We are talking about Mr. Fitzpatrick's testimony?

MR. ROBERT ADLER: Yes, sir.

(Board conferring)

DR. JORDAN: Where are you reading? You say you are not reading but you are paraphrasing?

THE WITNESS: I was paraphrasing from the first sentence, just stating what the purpose of this paragraph is is to give the technical reviewers of the staff guidance in the subject of connection and disconnection of non-Class 1E loads to and from the Class 1E distribution buses.

DR. JORDAN: Is it the first sentence or the second sentence?

THE WITNESS: I am reading from the first sentence of the quote from the Standard Review Plan. I am taking words out of that.

DR. JORDAN: You are paraphrasing faster than I can follow. That's all there is to it. What's wrong with the sentence as it stands?

THE WITNESS: Nothing. I was just trying to shorten it to get across a point, that's all. I am really trying to get to the last sentence of the paragraph.

DR. JORDAN: That's what I am trying to get to, is the last sentence of the paragraph. I can't see how that sentence says that it doesn't apply after the period of stabilization. I just don't read it that way. Presumably, you do, and that's why I want you to go fairly slowly, because I don't understand how you arrive at the conclusion.

THE WITNESS: Yes, sir, I will go through that now. The sentence we are talking about, the last sentence of the quote, says: "Further, the design must also prevent the automatic or manual connection of these loads during the transient stabilization period subsequent to this event."

DR. JORDAN: That doesn't say at all that you can disregard 1.75 after stabilization. I just don't see it, anything that even makes me infer that.

THE WITNESS: As we come down through the paragraph itself, it starts addressing Regulatory Guide 1.75.

DR. JORDAN: Yes, it does.

THE WITNESS: By the time you get to the bottom sentence, you have a design that you have stripped all the nonsafety loads from the buses, given that this event has happened, some event has happened. And so the loads are off the bus.

DR. JORDAN: Now they are going to go back on?

THE WITNESS: It is reasonable to assume that this could have been an SI signal that started your event. It is basically one of two things that starts an event that involves a diesel generator: It is either a safety injection -- an emergency --

DR. JORDAN: Also, a diesel generator.

THE WITNESS: That affects the diesel generator. Two things bring the diesel generator into play: One is a loss of power on the bus, which is usually assumed to be a loss of off-site power; and the other is an accident signal. That may or may not load the diesel, but it certainly starts it up and puts it into a standby mode, at least.

DR. JORDAN: I was going to get into this in considerably greater detail, and I don't like to interrupt the Commonwealth's questioning unnecessarily at this time, but I do want to get into the scenarios that you are talking about. And, of course, loss of off-site power is a major one. Assuming loss of off-site power, the diesels have been started, the loads have been shed.

THE WITNESS: Right.

DR. JORDAN: We are now connecting the pressurizer heaters to the diesels, as required. I don't see where this has anything about you don't have to pay any attention to Reg Guide 1.75.

THE WITNESS: Taking that scenario first, Dr. Jordan, at that point in time you have not had an accident signal. You had a -- your scenario was a loss of off-site power, and now we have loaded -- subsequent to that -- we have loaded the diesel with its loss of off-site power loads and manually put on the pressurizer heaters some time later, which would be after the stabilization of certainly the diesel generator.

Now, if an accident comes along, we still have -- an accident signal comes along --

DR. JORDAN: You are assuming a simultaneous loss of off-site power, an accident?

THE WITNESS: No, sir. I would like to get to that one next. You were breaking up the scenario, so I wanted to take you through both of them.

DR. JORDAN: Have you completed with the loss of off-site power?

THE WITNESS: No, sir, no.

DR. JORDAN: You had a loss of off-site power.

THE WITNESS: Yes.

DR. JORDAN: We are now reconnected to the diesels, as required.

THE WITNESS: We have autoloaded whatever sequenced loads went immediately onto the diesels. The diesel now is in a steady-state operation, and the operators had determined that now they want power. They want to power a bank of heaters from the on-site system, and they add those heaters to the system.

At that point in time, we have available to us, in accordance with Regulatory Guide 1.75, the accident signal available to us because we have not had an accident in this scenario. Should one come along, e accident signal would tr this load off.

DR. JORDAN: But I am assuming for the moment there is no accident signal. You connected a pressurizer heater. Only one of the diesels has come on, say. You have connected the pressurizer heaters to the remaining diesel or one of the diesels that failed after the pressurizer heaters have been connected.

That pressurizer heater had the fault, and that knocks out the other diesel because of the failure of the isolation device, which is -- which doesn't meet the requirements of 1.75. It is only an overcurrent device. Why doesn't it have to meet the requirements of 1.75, that it relies entirely on current?

THE WITNESS: A fault at that point in time, it would rely on the coordination of the overprotection devices.

DR. JORDAN: But you are saying it does not have to meet 1.75, because it is beyond the stabilization time.

THE WITNESS: That is an acceptable mode; right. If an accident should --

DR. JORDAN: Where in here does it say that under this circumstance it doesn't have to meet the requirements of 1.75? I don't see it in here.

THE WITNESS: No, sir, it doesn't state that explicitly. I was trying to get to the reasoning behind it.

DR. JORDAN: It doesn't say it here, but you reason from this. Tell me the reasoning why you are comfortable with not requiring the -- meeting the requirments of 1.75 after the load has been stabilized and the heaters have been connected?

THE WITNESS: At that point in time, we have traditionally allowed any of the nonsafety loads to be reloaded onto the safety bus. There are a lot of other concerns beyond the scope of power systems as to when and what loads that might be.

DR. JORDAN: My main concern is the second load. You have lost one diesel, and you have to assume that in a loss of off-site power that one diesel will not start because the statistics are all in favor of once out of 100, at least. I am worried very much that we are now approaching the station blackout situation, which is a transient that is not considered a tolerable transient, that connecting the pressurizer heaters will knock out the remaining diesel, and that we now have a station blackout.

Don't you need to protect against that by having isolation devices that meet at least the requirements of Reg Guide 1.75, is what I am questioning. Why you think -- are you not worried about station blackout, or what is the reasoning that says you don't need to meet 1.75 after the diesel is stabilized?

THE WITNESS: You are now adding a load to the system, once things have settled down on the diesel generator. You are adding now a load, the pressurizer heaters to the diesel, once things have stabilized.

In order to jeopardize the diesel generator itself, there are -- in the TMI-1 design, there are five intervening circuit breakers between the load and the diesel generator. The maximum fault current that you can get due to the natural impedances of the circuit with the bolted three-phase fault has been supplied by the Licensee.

This level of fault current should not even be seen by, say, the top two breakers in this chain of five. So this fault --

CHAIRMAN SMITH: The top two breakers what?

THE WITNESS: The top two breakers in this chain of five breakers that separate the diesel generator itself from the pressurizer heater load, they should not even be detecting a fault of this magnitude down at the 40-volt level.

So you are really not attacking the diesel generator itself. There are just too many intervening circuit breakers with protection involved that you really are talking about major failures in this system.

Now you are into the Class 1E system, as soon as you leave the distribution breaker. You would have to take an awful lot of single failures along the way here before you could get this second diesel, which is, in my opinion, not a reasonable scenario.

DR. JORDAN: I guess what my real problem is when do you need to pay attention to Reg Guide 1.75?

THE WITNESS: The provision of Reg Guide 1.75, for instance, using the SI signal to strip nonemergency -- nonsafety loads from the bus, that is -- the staff has considered that vitally important at the start of a given event, to go as far as we can to protect the sanctity of the system, particularly at the beginning of an event, when you have the diesel generator starting, taking on all these loads.

We have gone out of our way to ensure that nonsafety loads, although we allow them to be present on the bus, will be nowhere around during this period of time, not only power systemwise, but also during the -- the transient is bigger than the power system; it also involves the reactor system itself, for whatever transients the electrical system may be responding to.

It is vitally important during this period of time to protect the sanctity of the system. As things stabilize out, you get into an event, things are going the way an operator understands them to be going. At that point in time, we have allowed them to put nonsafety loads, at least be available on this bus, if he now determines that it is time to start one of those nonsafety loads and he feels that he can do that safely without perturbing anything else. The staff has allowed that practice.

And at that point in time, given you have already had, say, an SI signal which started you into the event, you at that point in time do not have SI as a backup signal. And that has to be recognized. That is where we are here again at TMI-1. There are points in time when the SI signal just is not available, although the staff allows connection of these loads.

What you are counting on then is a multiplicity of circuit breakers in the circuit, and all with relay coordination among them.

DR. JORDAN: Are you really saying, then, that 1.75 requires isolation and -- and I think, from reading your testimony, you do indeed say that -- it requires the isolation of safety-grade circuit breakers and a safety injection signal.

THE WITNESS: An SI signal or something else that someone can come up with and prove is equivalent.

DR. JORDAN: By "SI signal," you mean in the case of TMI-1 it is the signal that starts the engineered safety features; namely, the high-pressure safety injection?

THE WITNESS: That's correct.

DR. JORDAN: All right. I guess you can see that my surprise was that I felt that protection of the Class 1E generators was of such prime importance that anything that was connected at any time would have been required, would have required the protection of Reg Guide 1.75. And that was just a misapprehension.

THE WITNESS: If we were to follow through on that, we would have to basically preclude any addition of nonsafety loads on the safety buses, which has not been the staff's practice to do that.

DR. JORDAN: It requires more than just simple overcurrent relays, is what I would have thought would be required. But you are saying that is not the case.

Overcurrent relays are adequate.

THE WITNESS: At somme point in time, followinng one more time, those words, "transient stabilizatin period," in my testimony, it is recognized that most likely the SI signal is no longer available as a signal.

DR. JORDAN: But, you see, the transient I am considering most likely is the loss of off-site power. There is no safety injection signal. There is an extreme need to keep those diesels running. That is what the whole plant safety is now dependent upon: those diesels. We have got to have them. The emergency feedwater systems, everything, now is depending on that. In part, the emergency feedwater system, but other systems certainly are.

So it just does bother me. That's all I can say at the moment is that it does bother me that the requirements for isolation of nonsafety loads does not have to meet Reg Guide 1.75.

What requirements must be met? Where does it say that -- for these loads the only requirement is, I think you have said, is that there be overcurrent protection devices; namely, circuit breakers. I believe you said those have to be safety-grade Class 1E. Is that true? Since 1.75 is now no longer applying --

THE WITNESS: Yes. Whatever loads you put on a nonsafety load, you put on a Class 1E bus. Except for the special case, like the heaters we have in front of us where we have an intervening distribution breaker --

DR. JORDAN: I didn't hear that.

THE WITNESS: Except for the case in front of us with TMI-1 --

DR. JORDAN: "Except in the case"?

THE WITNESS: The case in front of us, TMI-1, and the pressurizer heaters.

DR. JORDAN: I am sorry. My hearing or phonetics is so bad. "Except in the case of"?

THE WITNESS: In the case of TMI-1, where we have an intervening distribution breaker.

DR. JORDAN: What?

THE WITNESS: An intervening distribution breaker. In most cases, the first breaker will be the Class 1E breaker tying that nonsafety load to a Class 1E bus.

DR. JORDAN: I see. What is a Class 1E breaker, or what are the requirements besides the usual ones of testing. There are no requirements for redundancy, for example?

THE WITNESS: Not within the switch gear, but each switch gear itself would have to have its redundant counterpart. Using the TMI-1 nomenclature, you would have a red system and a green system.

DR. JORDAN: I don't really know what a Class 1E circuit breaker is. What makes it Class 1E?

THE WITNESS: It is environmentally and seismically qualified. It has a large paper trail associated with its QA, et cetera.

DR. JORDAN: Is the staff's experience with circuit breakers, has it been so good, are they so reliable, that that is all that is necessary? You really believe you can trust the circuit breakers to work every time? I don't see that it compares, for example, with the reliability of the reactor protection system, the trip systems, or other redundant systems.

In your opinion, is a circuit breaker a very, very reliable device? I don't think a diesel is, for example. I am familiar with the experience on diesels, and the reliability is very poor. But circuit breakers, I am not familiar with. And I am now asking you for your professional opinion, because I do not know the answer. I have not had the experience. Are circuit breakers exceedingly reliable devices, so reliable that we can indeed use them for isolation devices for Class 1E -- for Class 1E systems?

THE WITNESS: I am not sure that I know the exact reliability of circuit breakers. I believe them to be reliable devices. And the staff has traditionally put faith in them to do just that.

DR. JORDAN: This is a staff position, that they are sufficiently reliable that that is all that is necessary in isolating nonsafety loads from the Class 1E systems after stabilization?

THE WITNESS: At some point downstream of an event, all you will have left when you put non-Class 1E loads back on the Class 1E buses is a coordinated set of circuit breakers to provide the protection you are talking about.

DR. JORDAN: All right. This, as you can see, I am a little startled by this. I am here to learn about the TMI-1 system. Thank you.

I am sorry, Mr. Adler.

MR. ROBERT ADLER: That's fine.

DR. JORDAN: I didn't mean to go into it, but once I got started, I just needed to clear up that matter. Thank you.

CHAIRMAN SMITH: While we're on that subject, when you are referring to circuit breakers and coordinated circuit breakers, does that include fuses?

THE WITNESS: It can very well include fuses, yes.

CHAIRMAN SMITH: It is about time for the midmorning break. Would that be convenient for you?

MR. ROBERT ADLER: Let me just ask one question, and then I can come back.

(Counsel for the Commonwealth conferring)

BY MR. ADLER:

Q Just to follow up on some of Dr. Jordan's questions, there is a transformer between the 4160-volt bus and the 480-volt bus. Would that transformer also act as an isolation device to protect the diesel generator?

A The only credit I would give that transformer itself is that it throws some extra impedance into the circuit which limits the fault current. In terms of an isolation device in the TMI-1 design, no.

MR. ROBERT ADLER: All right, we can take a break now.

CHAIRMAN SMITH: Before we do, let's see what the day holds for us. Last night, we had considered the possibility of informing Mr. Lewis and Ms. Bradford that, contrary to our earlier report to them, that it would not be possible to begin hearing the filtering case beginning at 1:00 o'clock. And then, when it became apparent that we believed there was only going to be ten more minutes of UCS examination and there would be only limited cross examination of Contention 9, it was reasonable to expect we could arrive at the filtering Contention.

Now it is all up in the air again. Do you have --

is Mr. Toole -- they are ready. How about the four people you have on the filtering?

MR. BAXTER: I told them to be here at 11:00 o'clock.

CHAIRMAN SMITH: And how about Mr. Boger and Mr. Sullivan?

MR. CUTCHIN: They are both here, and our filtering men will arrive early this afternoon.

CHAIRMAN SMITH: Is it fair to say it would be equally convenient or inconvenient to take [illegible]ver another? Or how does that affect your people?

MR. BAXTER: My people have been here for a couple of days. The filters people will be arriving. They are in transit. I can't stop them. I would still prefer to go in order.

MR. CUTCHIN: So would I. My other people have been here a little over a day now, too, and I would like to get them back to the office.

CHAIRMAN SMITH: Yes, I can see that it would be preferable to go in order. We may be faced with a decision of -- well --

MR. CUTCHIN: It is a guess as to whether we push it back to tomorrow morning. But I guess these people have known all along that we were giving them our best guess. They may have to spend a few hours longer than they anticipated in order to get their issue up.

CHAIRMAN SMITH: I am not concerned about that, particularly. Everybody has to wait. I am concerned about Mr. Lewis' statement, that if it has to be scheduled after today, if it has to be scheduled for tomorrow, he simply can't make it. I am not saying that that is controlling, but we are going to have to have the decision to make. If it can be avoided, I would like to avoid it.

MR. CUTCHIN: Can we guess how much longer we are going to be here?

CHAIRMAN SMITH: It doesn't seem possible that, the way this examination is going, that we can conclude this panel and get the next panel on and off and then get the filtering completed today. It just doesn't seem possible.

MR. BAXTER: As I understood, you don't know for sure that Mr. Lewis is coming this afternoon; isn't that true?

CHAIRMAN SMITH: That's right. There is nothing for us to rule upon now. I just thought if we could look down the road a bit and avoid a problem. That's right. Mr. Lewis could not even assure us that he would be here.

MR. ROBERT ADLER: Do we know if ANGRY is going to be here?

CHAIRMAN SMITH: Yes. Ms. Bradford will definitely be here. So we will proceed. I don't want to borrow trouble. I just try to avoid it if we can. We will proceed and see what happens.

(Brief recess.)

CHAIRMAN SMITH: During the break I received a message that Mr. Basdekas would like to talk to me. We arranged a telephone conference in which all three members of the Board participated with Mr. Basdekas. Mr. Basdekas stated that he had had conversations with Mr. Tourtellotte and Mr. Pollard, although he has full confidence in Mr. Tourtellotte expressing is position, he wanted to be assured that there is no mistake on what his position is and he wanted to communicate it directly to the Board.

In essence he told us precisely what Mr. Tourtellotte told us. He understands that the form in which he has presented the information is not evidence; it would only become evidence if he came to the hearing and was submitted to cross examination on it. I confirmed that that is the case.

He stated that his position is that he is not requesting to come but he is quite willing to come if the Board believes that his views should be reduced to evidence. He obviously understands the difference between limited appearance statements and evidence. We told him that indeed Mr. Tourtellotte made that point clear. He stated also that he is willing to be interviewed by Mr. Pollard; that he wishes to be interviewed as a staff member, not as a private citizen, and it would be appropriate for a member of OELD to be present and that he does not feel that the presence of counsel from OELD would have any intimidating effect upon him expressing his views.

We told him indeed Mr. Tourtellotte had made that clear, too, so in essence the conversation was just a feeling on his part that expressing his views through third parties is not always satisfactory and that he felt a direct communication to the Board would be prudent on his part. As it turned out, it was precisely as Mr. Tourtellotte represented it to be.

There was one other aspect. He believes his views have a direct application to TMI-1. I stated that we noted that statement in his report and we were considering that and we are now in the process of considering whether the Board on its own is going to ask him to appear to present all or a portion of his views as expressed in those documents.

(Board conferring)

CHAIRMAN SMITH: Dr. Little said I should emphaize the emphasis that Mr. Basdekas made that he just doesn't feel that the presence of OELD would have the slightest intimidating or restrictive effect upon him at all. That is the impression I received from him, too. He seems to be pretty strong in his views that he will express his views regardless of what the circumstances of the interview are.

MR. ROBERT ADLER: I have just a few more questions.

BY MR. ROBERT ADLER: (Resuming)

Q Mr. Fitzgerald, do you happen to know when Section 8.3.1, Revision 1 of the Standard Review Plan was written?

A Yes. I would like to think a moment. I would like to give you a ballpark answer. I can't give you a date on it. The reason I can't give you an exact date is NRR policy as to Revision 1 determined that no dates would be placed on the pages. My best guess would say maybe a couple of years ago the original Revision 0 was placed out, I believe in 1974. I don't believe you will find a difference in this paragraph between Rev. 1 and Rev. 0.

Q This paragraph has been in effect since 1974.

A That would be my understanding without having the documents in front of me to absolutely verify that.

Q I'm curious. Reg. Guide 1.75, Revision 2, is dated September 1978. If it is your testimony that Standard Review Plan is a modification of the Reg. Guide, I wonder why that is not reflected in C.1 of Reg. Guide 1.75.

A I am not sure I can give you a specific answer to that. It is an entirely different office at the NRC that creates and publishes reg. guides, an entirely different office that creates the Standard Review Plan. There are interactions between the two entities that can come into play.

Q You said there are interactions?

A Yes. There are necessary interactions that may or may not on a timely basis pick up details here or there.

MR. CUTCHIN: Mr. Adler, maybe I could help here. It is my understanding that Standard Review Plans would refer to reg. guides but it is not normal practice -- in fact, I am unaware of any instance where a reg. guide would refer back to a Standard Review Plan.

MR. ROBERT ADLER: However, if the officers who were dealing with the Standard Review Plans found an inadequacy in the reg. guide, wouldn't it make sense to inform the Standards Development Office and hav them revise accordingly?

MR. CUTCHIN: I'm not sure I can agree with the characterization of an inadequacy. It may have been a lack of completeness, but the normal practice is to refer these matters, as I understand it, to the Standards Development people who are invol ed in putting out at least the draft of the reg. guide for review. I guess I can't shed any more light on it than that.

BY MR. ROBERT ADLER: (Resuming)

Q Would the proposed TMI-1 design be acceptable for a new operating license?

A Y.s.

Q With the undervoltage relay?

A With or without.

Q Either with or without it would be acceptable?

A That is correct, yes.

Q I am not sure I understand how you derive the fact that the undervoltage trip was an acceptable means of meeting Reg. Guide 1.75. Is it simply your testimony that it is not prohibited by either the IEEE standards or the reg. guide?

A Could you repeat that question for me?

Q Let me rephrase the question. I will withdraw it.

The undervoltage trip, according to your testimony, is not prohibited by Reg. Guide 1.75; is that correct?

A That's correct.

Q It is not explicitly allowed for?

A It comes under the heading of something other than a signal derived from fault current. It fits into that category. The only explicit exception is safety injection signal, but it fits in the category of other than derived from fault current, which, other than the SI signal is not addressed by the guides.

Q And it is acceptable to take credit for an undervoltage trip as an isolation device.

A It can be. The concept of the undervoltage trip is a acceptable concept, but then you must review the design specifically to make sure the undervoltage trip will indeed cover you, and in all cases that is not true with the TMI-1 design, as Mr. Torcivia indicated earlier. There may be something less than a bolted three-phase fault that would give a higher impedance and, therefore, a higher voltage on the bus. You would not trip the undervoltage relays.

Q In the last paragraph of your professional qualifications you refer to the fact that you are a member of IEEE. Did you have anything to do with the development of IEE 384-1977?

A No, I did not.

Q As part of your responsibilities in the NRC, do you have any responsibility for reviewing proposed IEEE standards?

A The usual means of reviewing an IEEE standard is when it is put out in draft form. The Office of Standards Development has the lead in this area. A standard would be under the responsibility of, say, the Power Systems Branch, as well as some other branches in the agency would also given copies and a request by Standards Development to review and make comments on the document.

So, my branch probably [illegible] receive a request to review the document. I was not involved in that review.

Q Reg. Guide 1.75 expressly accepts the guidance in IEEE 384, 1974, and my question is whether the NRC has considered the 1977 version in terms of acceptability as part of Reg. Guide 1.75.

A Yes. It is my understanding from talking with the man in Standards Development who was responsible for coordinating the review of the 1977 version that the staff explicitly rejected the 1977 version.

Q Do you have a copy of the 1977 version in front of you?

A No.

Q This is Met Ed Exhibit 22.

MR. ROBERT ADLER: Perhaps the witness could be supplied with a copy.

(Handing document to witness.)

BY MR. ROBERT ADLER: (Resuming)

Q Before you look at the document itself, do you know specifically why this proposed revision to IEEE 384 has been rejected by the NRC?

A No. I understand there were 26 negative comments sent back to IEEE, but what the 26 comments were, I do not know.

Q If you look at page 15 of that document, and I believe you were here during Licensee's rebuttal testimony when they referred to Section 6.1.2.1 as permitting the use of circuit breaker automatically tripped by fault current given the two conditions set forth in the document as an acceptable isolation device, do you know if that was one of the reasons why this proposed revision was rejected by the NRC?

A I don't know specifically any of the 26. I would assume that was one of them, yes.

Q Do you have any explanation for the fact that an undervoltage trip was not also included in this proposed revision as an acceptable isolation device?

A No, I cannot address that.

MR. ROBERT ADLER: Thank you.

I have no more questions.

CHAIRMAN SMITH: Mr. Trowbridge.

MR. TROWBRIDGE: Let me confer very briefly with Mr. Torcivia. I will have at most one question.

(Counsel for Licensee conferring.)

CROSS EXAMINATION

BY MR. TROWBRIDGE:

Q I will ask one question, not knowing whether Mr. Fitzpatrick can answer it or not.

If, as you thought likely, one of the reasons for NRC rejection of the 1977 version of IEEE 384 was the section on circuit breaker trip by fault currents, you also suggest that the reason for the rejection would be the failure to have included an accident trip as well.

A I don't believe in answer to that question I mentioned that that accident signal was part of the provision acceptability or not. I'm not sure what your question is.

Q The question I attempted to ask was whether -- let me start over.

You indicated that you thought it likely that one of the reasons that the staff rejected IEEE 384, 1977, that version, was the section on circuit breaker trip by fault current.

A That is correct.

Q I ask you whether you also think it likely that the reason for rejecting that section is because it failed to provide in addition for an accident signal for an ES signal trip.

A If you look at the next section of the standard, Section 6.1.2.2, that is an independent provision of the standard, to trip circuit breaker trip by accident signals. That would not have been, I presume, in the list of 26. That is an acceptable method.

MR. TROWBRIDGE: Thank you, Mr. Fitzpatrick.

(Board conferring)

CHAIRMAN SMITH: Have you concluded your examination, Mr. Trowbridge?

MR. TROWBRIDGE: Yes. Mr. Fitzpatrick has provided all the information, I think, that he is able to provide.

(Board conferring)

BOARD EXAMINATION

BY DR. JORDAN:

Q I started to explore with you the transients that you felt were being specifically addressed by the need or the additional requirement for connecting the pressurizer heaters to the Class IE supplies.

Were you part of or involved in any way with the task force that made the recommendation that appears in 0578?

A Dr. Jordan, during that time period I was detailed to the TMI-2 task force and spent most of my time right at the site.

Q I see.

What, in your mind, are the transients that were the chief concerns that would be met by adding the pressurizer heaters? Were they considering primarily loss of load, loss of off-site power?

A That would not be my understanding. My understanding is that the thrust of wanting the provision for being able to add the pressurizer heaters gets involved with small break LOCA scenarios such as we had at TMI-2. Beyond that, that is the extent of my knowledge.

Q You think, therefore, it was primarily to protect against small break LOCAs?

A Not to protect against them, but here is something you can do to help you get through, or something to that effect.

Q Why would the connection of the pressurizer heaters to the Class IE loads be valuable during a small break LOCA?

A All I can tell you is what I remember reading out of 0578, and that says if you are able to add the pressurizer heaters, get a source of power for the pressurizer heaters, and the only source of power available given a loss of off-site power is the emergency power system, that given you can put those heaters onto an alternate source of power and the only one available is the emergency power supply, you are then able to maintain, I believe, it at hot standby conditions.

As others have testified on UCS 3, if you don't have them, then you start dropping in pressure and you know longer maintain hot standby conditions, but you still maintain natural circulation. But beyond that, I have exhausted my expertise in the area -- excuse me -- knowledge in the area.

Q Normally if there were a small break LOCA sticking PORV, is there a requirement for the on-site supply? I know the on-site supply will be activated during a small break LOCA or a safety injection signal, but that doesn't mean you are automatically switched to it, does it?

A That is correct. If the engineered safety features actuation system detects a small break LOCA, it will react accordingly, and one of those reactions will be to start the diesel generators. They would not come into the picture unless you had a loss of off-site power.

Q I guess my feeling is that the transient that would be helped most by this requirement is the loss of off-site power. Am I correct in that feeling? Do you see where I am perhaps possibly wrong?

A I don't think I am the one to address that. All I know is personally prior to TMI-2, if we were given a loss of off-site power event at a nuclear power plant that didn't have pressurizer heater availability to the safety buses, that was a survivable event without pressurizer heaters. That I can state. Beyond that I just don't know.

I personally don't see what compels the operators of a plant now to run out and immediately place the pressurizer heaters on the emergency bus when they never were able to do that before, to cope with a loss of off-site power. If there are reasons for that, I am not the one to address them.

Q I guess I am a little puzzled. If you have a loss of off-site power, then the best condition to put the plant in is hot standby. Is that perhaps correct?

A I don't know the best position to put the plant in.

Q But if you are to put it into hot standby, then you do need pressurizer heaters.

A It is my understanding to maintain hot standby you would need pressurizer heaters.

Q I guess I am really wondering in part what motivated the task force to put this requirement on new plants in view of the fact that there is also some danger in connecting a load as large as that to the 1E bus. Has there really been a balancing of the advantages and disadvantages of making this connection? I know the connection is not required, but the availability for putting it on must be there.

This is one of the fixes that I guess in my mind comes under the category of is it necessary rather than addressing the question of is it sufficient. I really see relatively few cases in which it is necessary, excepting for the case of loss of off-site power. In the case of off-site power, I can see that there really is -- well, there is a need for it because certainly then going to hot standby and from there to cold shutdown is certainly a desirable procedure.

Now, are there any other -- you talk in the position statement on page 4 that you quoted from the Standard Review Plan, you talk about possible other nonsafety loads. It says, "If the power supply has not been sized to accommodate the added non-Class 1E loads during emergency conditions, the design must provide for the automatic disconnection of those non-Class 1E loads upon the detection of the emergency condition."

But if the power supply is designed and can handle these loads, if they are, say, relatively small, then there is no need to disconnect them. Is that what this sentence says?

A This is supposed to be supplemental to a few sentences back where it talks about the provisions of Regulatory Guide 1.75. We have to consider this in the overall big picture of what is going on. This paragraph here is hoping to tie in a number of thoughts together for the reviewer.

Q Let's take the case of the loss of off-site power. Does that disconnect all nonsafety-grade loads? Does that event itself disconnect the loads? I don't see any requirement in either 1.75 or here. I don't see the requirement.

A It is not clear that it would trip all the non-safety loads. All of the major heavy loads would be tripped. There may be some at the low voltage buses that would just hang on.

Q Those loads that stay on, do they have to meet the requirements of 1.75 so that if there was a fault they wouldn't degrade the power supply?

A By the requirements of 1.75, you mean the automatic disconnection?

Q Yes, the isolation requirements.

A They may not come under that provision depending on whether or not they are trippable. If you have some very small loads on, say, the instrument bus that are nonsafety, those really are not trippable by an SI signal. The switch gear involved in that just is not amenable to taking an outside signal and tripping it like a molded case circuit breaker.

Q I didn't hear either.

A For instance, a molded case circuit breaker. A molded case circuit breaker may protect a large number of very small loads, some of which may be nonsafety. Those really would not be trippable under an accident condition, nor would they be of a magnitude that you worry about it as a real direct threat to the emergency power system.

Q If they are small loads, are you saying that even if there was a fault, it would not draw a large current?

A That's right.

Q That is because the wiring for a small load would be small also.

A That's correct.

Q You did start to reply to me that in the case of a fault in the pressurizer heaters, that that current would not be so large as to endanger the diesel generator itself? You started to say something in the event -- and that led me to that conclusion.

A That's right. That level of fault when it is reflected way back up to the diesel itself should not be a threat to the diesel or to the breakers, the diesel generator breaker.

Q Didn't we have testimony from Mr. Torcivia that that fault load could be as large as 1000 amps?

A He predicted the initial current to be 4000.

Q Initial current through the fault in the pressurizer heater?

A Through the fault itself, yes.

Q Is 4000 amperes not a threat to the diesel?

A Well, 4000 amperes would, first of all, be reflected through the transformer.

Q Of course, 4000 amperes at 680 volts. Is that not a pretty fair-sized power load?

A That is a good load, but one of the concerns we have is that you allow circuit breaker coordination. That type of a load should not threaten the circuit breaker for the diesel generator itself. That should not trip --

Q I don't know what you mean by threaten. You say

4000 ampere load is not sufficient to trip the main circuit breaker on the diesel.

A Right.

Q Even though that represents 2 megawatts of power; or am I wrong in my mental calculation?

A That seems terribly high.

Q 4000 amperes at 680 volts. I guess I have made a mistake.

A It looks like it would come out in that ballpark.

Q How's that?

A It looks like it would.

Q I seems to me it would be a threat to the diesel, and also a very significant load on the main circuit breaker.

A You also see by the curve supplied by Mr. Torcivia that that drops down significantly in a very few seconds or cycles. The instantaneous setting of that circuit breaker would not be challenged, and the time overcurrent would probably not even start picking up either because you have to size that breaker large enough to handle all the loads on the bus and then use that as a backup for the 4160 volt breakers if they fail to interrupt the major faults somewhere on that bus. The setting of the diesel generator circuit breaker, both instantaneous and time overcurrent settings, should be much higher than the threat posed by this fault down at the 480 volt level.

Q Yes, 480 volt. But if the main circuit breaker doesn't trip, this is indeed a load of some megawatts, like 1 or 2, that is a serious load on the diesel and could lead to tripping of the diesel or faulting of the diesel somehow. I have been having trouble with this statement that the load due to a fault is not significant, is not a threat to the diesel. It seems to me it is a threat to the diesel.

A Before you threaten the diesel in the diesel generator breaker you would also have to fail the four intervening circuit breakers with coordinated protection.

Q So you are saying that what you are depending on is not the main or the big circuit breaker at the diesel itself; what you are depending upon are the two circuit breakers below? Are those the ones you are talking about mainly depending upon?

A The first two or three ought to get us through the event without even worrying about the final two.

Q Without what?

A There are five altogether, five breakers between the heaters and the diesel generators.

Q You are counting the three that are in parallel? I guess each one is connected in parallel, but each one to a different heater load? Is that the first three you are talking about looking at --

A If we could look at Figure 1 of the Shipper-Torcivia testimony, if you start at the distribution breaker panels, the first breaker, these breakers would be in series. There are five series circuit breakers.

Q Five?

A Five in series.

Q I don't see five.

A The first one is within the distribution breaker panels.

Q All right.

A Then we move up to the main feeder breaker.

Q Two.

A Then the main breaker.

Q But the main breaker would not be open, you said, by a fault in the heater.

A The main breaker would be open by a fault in the heater at a approximately -- I believe the Licensee testified 12 to 15 seconds.

Q I see.

A Then going up through the transformer, the breaker at the 4160 volt bus, and then going --

Q There is another breaker up there?

A Yes, that square above the transformer.

Q The square above the transformer is a breaker.

A 4160 volt breaker, and following along the bus --

Q I didn't realize that was a breaker.

A And the fifth would be the diesel generator circuit breaker itself.

Q Yes, of course, that is the breaker, as you said. Mr. Torcivia said 4000 amps would trip in about 15 seconds.

BY CHAIRMAN SMITH:

Q Didn't you testify earlier that there were five breakers to the bus?

A Between the diesel generator and the pressurizer heaters.

Q I misunderstood you. I thought you said there were five --

A There were four between the 4160 volt bus and the heaters, and five between the diesel generators and the heaters.

Q I understand you are saying that now. I thought you said differently before in your testimony.

A I don't believe so.

BY DR. JORDAN: (Resumig)

Q So far as you now, the only nonsafety load that could be a threat to the diesel in case of a fault, assuming a failure of all of the overload protection, is the pressurizer heaters.

A That's the only one I know in TMI-1 design that would do that. However, I would like to add to that. A fault of that magnitude would do one of two things. It would either then trip out the undervoltage -- we really must make a distinction here at the main feeder breaker. If you are failing the main feeder breaker because it fails to respond to overcurrent, that is one thing, and then the undervoltage is then available. If you are failing the main feeder breaker itself, then you are failing a piece of safety grade equipment and using up a single failure. I think that distinction should be made.

Q I see. I see. So you are saying that that main feeder breaker should not fail but overcurrent.

A The overcurrent should not destroy that breaker.

Q I see. Okay. Is that part of being safety grade? Is that in one respect why perhaps that breaker is different from an ordinary breaker?

A No. The only real advantage is that if you fail that breaker itself in terms of the single failure analysis, the advantage is you have used up your single failure. In most cases Licensees will buy the exact same switch gear for their safety and nonsafety loads. What they save in is not getting a paper trail that I described before with all of the QA involved, but they buy the same equipment and it is just easier that way. It is done in a lot of cases. I can't testify that TMI-1 has done that, but that is a very common practice with applicants, that all of the switch gear is the same. They just don't try to take credit for it as being Class 1E.

Q So far as the regulations are concerned, the single-failure criteria being Class IE, is part of the argument in that if you have a failure there, then that is the single failure?

A That is right.

Q Would the fact that it is now a Class 1E, say, main feeder breaker, does that mean that it has been tested, qualified for large currents?

A It should have been put through a testing program to demonstrate its capability.

(Pause.)

Q So far as you know, has there been any analysis of the interaction of the main -- the pressurizer heaters, possible failure of pressurizer heaters with the remainder of the system? It has been suggested that there should be interaction studies in some cases. Do you know of any study that has been made of the possible effects, or is it assumed that there will never be a failure which will lead to loss of power?

A You are talking about -- I am not sure what you are talking about.

Q A safety study in which one assumes that there are possible failures beyond the single-failure criteria. In other words, system interaction studies, safety studies. Do you know whether there have been any that have assumed failures of the pressurizer heater and the breakers, the possible consequences and what might happen, what mitigations might be considered and so on.

A I have personally gone through some of that in my review of the design itself. I am not sure how deep you are asking the question.

Q What were you referring to? You mean what you said in the restart report?

A No, what I went through in determining the acceptability of this design during my review of it, not necessarily what I documented.

Q Would you say a little more about that, what you went through then in determining the acceptability?

A In terms of interaction?

Q Yes.

A The TMI-1 on-site power system is what we call a split bus design. It has two separate divisions. With my review and my requirement which I placed in the SER, that the green and the red not be energized simultaeously, I found no other way to threaten both power sources with any interaction.

Q You said not be loaded simultaneously? Is that the word you used?

A It may have been, but I guess the better word would be not to energize banks 8 and 9..

Q In other words, you would not allow them to start both diesels at the same time.

A No, I am talking about energizing group 8, pressurizer heater group 8 from the red system, and pressurizer heater group 9 from the green system simultaneously.

Q I misunderstood what you meant by energize. So you are saying the two pressurizer heater loads should not be connected at the same time.

A That was a requirement I put in the SER, yes. and that has since been reflected in the procedures.

Q And that you have talked about in your testimony, I believe. As a matter of fact you did, yes. Either they are in the restart report --

A It is definitely in the restart report. The TMI-1 SER.

Q That is where I read it, then.

A Yes.

Q All right. And you feel that the interaction study you have done did lead you to that conclusion that they should not be loaded simultaneously.

A And I felt putting in that requirement precluded the interactions.

Q I d i read it, and I will say that I didn't perhaps even understand it possibly at that time. Would you review briefly for me why loading them at separate times is an additional safety advantage?

A The concern I was thinking of at the time of the review as if the red bus was energizing pressurizer heater group 8 and the green bus was energizing pressurizer heater group 9 simultaneously, if you look at the physical design of TMI-1, once you get into, I believe it is, the secondary shield, there is a terminal box there where the pressurizer heater power cables come in, and then from there you have a different set of cables that run off to the pressurizer itself.

There is essentially no physical separation at all in there. There was never a requirement of the original design.

Q It doesn't meet IEEE 279 or anything else?

A Or much else, because it was all nonsafety loads clumped together. Now, given a read and a green energized simultaneously, you would have them running side by side through that common area. That was the basis of that requirement.

Q That I didn't pick up. All right, fine.

DR. JORDAN: That completes my questions.

MR. TROWBRIDGE: Mr. Chairman, I would like to try my little question one more time having read further in the standard.

CROSS ON BOARD EXAMINATION

BY MR. TROWBRIDGE:

Q What I am disturbed about is that as the record now stands, it indicates your view that it was likely that the Office of Standards rejected IEEE 384-1977, among other reasons because of the section on circuit breakers tripped by fault current. Now, let me look at the whole right-hand column on page 15.

CHAIRMAN SMITH: You are referring to Licensee's Exhibit 22.

MS. WEISS: I don't believe that is what the witness said. I thought the witness said that there were 26 negative comments and he believe that one of them, at least, had to do with that section to which you referred but not that it was the sole, primary --

MR. TROWBRUDGE: If I indicated sole in any way, I did not mean to. I agree with your statement. I am looking at the whole section. I guess it is still a subsection 6.1.2, isolation devices.

BY MR. TROWBRIDGE: (Resuming)

Q Do you have that in front of you?

A Yes, sir.

Q Under the next subsection, called circuit breaker tripped by fault currents, it indicates that a trip, that a circuit breaker automatically tripped by a fault current is acceptable provided it meets the conditions that are specified in that subsection. We have been over those before. I am not sure whether you have seen the transcript on this subject or not.

What I want to get to is the next subsection to which you referred before, which has not been discussed before, which is "circuit breaker tripped by accident signal," and I want to read that subsection. "A circuit breaker not meeting the requirements of 6.1.2.1" -- which is the circuit breaker tripped by fault current subsection -- "qualifies as an isolation device if it is automatically tripped by an accident signal generated within the same division as that to which the device is applied, provided that the time delay involved in generating the accident sequence tripping the breaker does not cause unacceptable degradation of the Class 1E system."

Now, I read that and I think the reasonable reading of that section is that the converse of that section is that if an isolation device does meet the requirements of 6.1.2.1, that it doesn't need to have an accident signal trip. I am suggesting to you that that may be the most likely reason for the rejection of that -- for one of the objections of the Office of Standards, rejection of the standard.

MS. WEISS: The witness stated he knows it was rejected and there were 27 negative comments. He does not know the substance of the comments.

MR. TROWBRIDGE: The witness testified as to what he thought was likely. I don't like the record standing on the what he thought was likely without exploring further. I realize what he thinks is likely is not the soundest or the most persuasive evidence, but if he has said it, I would like to explore it further.

CHAIRMAN SMITH: We can find out quite quickly. Mr. Trowbridge on this particular issue is in the same posture of cross examination as the Union of Concerned Scientists.

MS. WEISS: I don't understand that comment, Mr. Chairman.

CHAIRMAN SMITH: This is cross examination. We would not think for a moment to interrupt Mr. Pollard's or your cross examination of this witness along this line, and on this particular issue, this particular point made by Mr. Trowbridge, his cross examination, his relationship to this witness on this point is the same as yours.

Objection overruled.

BY MR. TROWBRIDGE: (Resuming)

Q Mr. Fitzpatrick, have you now lost my question as a result of this, or do you still have it in mind?

A I would be willing to try to answer it without your going through it again.

Q All right.

A The first section of Section 6.1.2.2, which you have pointed out does disagree with the provisions of Regulatory Guide 1.75 because it essentially endorses the position above, 6.1.2.1, which the staff has traditionally had trouble with. Whether or not one of the 26 items would have been specifically addressing that, I don't know.

In my view, when the staff comes out and says 6.1.2.1 is not acceptable, then whatever 6.1.2.2 has to say about it really doesn't matter. We are telling licensees and applicants to forget about 6.1.2.1, and whether it is talked about later or not, the staff position is 6.1.2.1 is unacceptable following an accident or some major perturbation of the system.

As I have said before, later on you wind up using 6.1.2.1 and you wind up with just that protection, or you certainly may wind up with only that protection of coordinated circuit breakers. But for the immediacy of an event to protect the sanctity of the on-site power system, the staff says in Reg Guide 1.75 that just using those circuit breakers sitting there waiting for a fault and not taking these challenges completely away from the on-site power system is unacceptable.

Whether or not 6.1.2.2 says anything about that or not, the concept in 6.1.2.2 of using an accident signal is especially addressed in the reg guide as being acceptable. Any reference that it may make to an unacceptable thing may or may not have been picked up by the reg guide comments.

I don't know, but to me it doesn't matter as a reviewer on the staff. It does not matter.

MR. TROWBRIDGE: I think you have answered my question.

Thank you.

CHAIRMAN SMITH: Now, we have to decide whether you have your final -- or do you have questions, Ms. Weiss? Do you have further examination?

MS. WEISS: I believe go after the staff's redirect.

CHAIRMAN SMITH: Is that all right.

MR. CUTCHIN: That is all right because I would get another turn if it was something that was really important. I have only one question, if you would like me to ask it now.

REDIRECT EXAMINATION

BY MR. CUTCHIN:

Q Mr. Fitzpatrick, during his early questioning Mr. Pollard was trying to make a point that even though the pressurizer heaters might be automatically shed, the operator might decide to quickly reconnect them to the on-site power source. Do you have a feeling -- and I know at the time that it took on the order of seconds for the diesel to come up to speed and stabilize -- do you have a feeling for about how quickly the operator could reconnect those pressurizer heaters and what procedures he would have to go through in terms of distance, time, and the like?

A I can only reiterate what I have heard sitting here the past five or six days. Someone would have to be dispatched to another level to throw a switch. How long it might take to get there using the -- I'm not sure if there are or not locked doors on the way or things like that. I know they have a card key system over there. It may or may not be beween the control room and the switch gear room. It takes a finite time to do that, certainly well beyond the diesel loading sequ nce of approximately 25 seconds.

Q It would clearly take loncer for him to perform that procedure than it would take for the diesels to stabilize out.

A I would certainly expect that to be the case.

Q Thank you.

MR. CUTCHIN: No further questions.

CHAIRMAN SMITH: Ms. Weiss, how long is your cross examination?

MR. POLLARD: I have four short technical questions and then Ms. Weiss has one or two.

CHAIRMAN SMITH: Would you prefer to try to conclude it before lunch?

MS. WEISS: Yes.

MR. POLLARD: Yes, sir.

RECROSS EXAMINATION

BY MR. POLLARD:

Q During the discussion you had with Dr. Jordan, the discussion centered upon whether or not the heater fault could result in loss of the diesel generator. I think we all can agree that opening of the diesel generator circuit breakers is clearly unacceptable in terms of an effect; that is something that wants to be avoided.

My question is: Is it not also the goal to prevent tripping of the main bus breaker and thereby deenergizing bus 1P or 1S?

A Yes, that would certainly be a goal. The goal in any power system configuration where you have multiple circuit breakers at multiple voltage levels is to coordinate all your protection such that you lose the least amount of load, and certainly that goal that you mentioned is included in that overall goal that exists.

Q In other words, loss of bus 1P and 1S simultaneously is unacceptable; is that correct?

A I'm not sure I can speak to that. There may or may not be instances where it could be acceptable.

Q Those are the redundant ES buses, are they not, 1P and 1S?

A They are redundant to one another but they are not the full spectrum of the emergency power system, so that there may be some point in time where, because of the loads involved and the situation at the plant, you wouldn't need either one. I don't know.

Q Would you agree that there must be at least some other points in time where loss of both 1P and 1S would be unacceptable?

A I would definitely agree that that would be true.

Q You also mentioned to me your testimony and discussion with Dr. Jordan that the maximum fault current had been supplied by the Licensee. Did you do any independent verification of what the maximum fault current would be from a fault in the pressurizer heaters?

A No.

Q Prior to your attendance at this hearing, did you do any independent review of what the setpoints ought to be in order to have proper breaker coordination?

A No. Prior to my appearance at the hearing, as far as I know, the design is not finalized yet. My tour through TMI-1 in the late fall, all I was able to do was look at

empty spaces on the walls. The equipment wasn't even around
yet.

Q My next question is: When you were discussing with Dr. Jordan a scenario of loss of off-site power, you responded to one of his questions by saying that since the main feeder breaker was safety grade, if it failed to open you would have to count that the single failure of a safety grade piece of equipment. Did I understand that correctly?

A That is correct.

Q Do you agree with me that in order to call that breaker safety grade, it must, among other things, meet the requirements of General Design Criterion 3, 17, and 21, and Section 4.6 of IEEE Standard 279-1971?

A Coud you go through that list again?

Q The list are the regulations referenced in the introduction to Regulatory Guide 1.75. I can repeat it. General Design Criterion 3, 17, 21, and Section 4.6 of IEEE Standard 279-1971.

(Pause.)

A I would say from my reading of this introduction that the circuit breaker we are talking about would have to meet the considerations specified for General Design Criterion 3 and Criterion 17 and not the others.

Q But in order to be called safety grade, it would have to meet the requirements of General Design Criteria 3 and 17; is that what I understood your answer to be?

A If that was the question I was answering, no, that doesn't make it safety grade.

Q I know that doesn't in and of itself. Let me back up and try and restate the question and cut my list down.

You had said, in answer to a question by Dr. Jordan, that if the main feeder breaker failed to trip, that that would have to be counted as a single failure of a safety-grade piece of equipment. Now, my question is: In order to classify the main feeder breaker as safety grade, in addition to some other requirements doesn't it also have to meet the requirements of GDC 3 and 17?

A GDC would place no design requirement on the breaker. It would place a location requirement.

Q What about 17A?

A It would appear again from reading the introduction that the single failure criteria would be applied out of GDC 17.

Q And you would agree that Regulatory Guide 1.75 sets forth a method acceptable to the staff for complying with, among other regulations, GDC 17?

A Some aspect thereof. If you follow 1.75 and that's all you do, you would come nowhere near 17.

Q Were you finished?

A Yes. It just doesn't fully satisfy 17. This just addresses a piece.

Q I understand.

Would you agree, then, that if the Three Mile Island Unit 1 design did not comply with the requirements of Reg Guide 1.75 or did not provide a degree of protection equivalent to meeting Reg Guide 1.75, you would therefore be unable to conclude that at least that portion addressed by the reg guide of General Design Criterion 17 was not met and therefore the breaker could not be called safety grade?

A I'm sorry. If you could try that one more time.

MR. POLLARD: Would you please read the question back?

(The record was read by the reporter as requested.)

THE WITNESS: My understanding of the question is that I believe that is true. The safety grade breaker is a qualified breaker. The single-failure criterion comes in where you have, in TMI nomenclature, a red and green system.

BY MR. POLLARD:

Q When you were discussing with Dr. Jordan the subject of systems interaction, you stated that in your review you had concluded that both groups of heaters should not be energized from the on-site power supply simultaneously because at some point in their circuits there was no physical separation between the two groups of heaters. Was that correct?

A That is correct.

Q Do I understand you, then, that one potential thing that concerned you was if there were a fire in the heater cables, that fire could simultaneously affect both groups of heaters? Would that be an example of the kind of concern you might have?

A That's true.

Q Under such circumstances where you had a fault in both groups of heaters at the same time, why couldn't you rely upon the breaker coordination just as you rely upon the breaker coordination if only one group of heaters is connected at a time?

A That gets back to the same concept that you find in the basis of Reg Guide 1.75 when it talks about isolation device, when it comes down and it says all of this coordinated protection is fine, but there is a concept in here that the next sentence starts, but it is still prudent not to do this.

That concept comes forth here also. You may well be protected by all of the various layers of five circuit breakers on each side, all with relay coordination, but the fact is it is still not a prudent thing to do because when these things are energized, there are other requirements of IEEE 384 which Reg Guide 1.75 also endorses with comments, and that is about the separation of circuits like this. This is the red and the green power with absolutely no separation at all for a good length.

It was my concern that this should be allowed to be run simultaneously, and I made it a requirement in the safety evaluation report, notwithstanding all the protection afforded by the system design.

Q Correct me if I am wrong. It is my understanding of IEEE Standard 384-177, in combination with the provisions of Reg Guide 1.75, that physical separation is definitely not required between nonsafety circuits if those nonsafety circuits are separated from the Class IE power supply by acceptable isolation devices.

That is, if we could rely upon breaker coordination as an acceptable isolation device, then there would be no requirement to separate the two heater bundles. Do you disagree with that interpretation of the requirements of IEEE Standard 384-1974 in combination with the provisions of Reg Guide 1.75?

A No, and I was well aware of that when I made my review, and in spite of that I made the requirement on the Three Mile 1 that they would not be energized simultaneously, and it is for consideration such as Dr. Jordan brought up of any possible interactions.

Q What type of interaction was causing you concern?

A I didn't identify any. It was just one more step in a conservative direction to protect this design.

Q In other words, you were somewhat concerned, though, that if there were a fault generated on both groups of heaters at the same time, that that could possibly result in loss of both bus 1P and 1S.

A There is always a possibility of that, and going right back to what it says in Reg Guide 1.75, it is prudent to avoid that if possible. I may have gone beyond what was required, but I did what I did and I required it.

Q Now let me give you a little different arrangement and see if you would also agree that it would be prudent not to connect the heaters to the on-site power supply in this arrangement. Let's assume we have had a loss of off-site power. One diesel generator fails to start. So that means we have already lost either bus 1P or 1S. Would you agree that under those circumstances, then, it would be prudent to preclude the connection of the pressurizer heaters to the one remaining bus, 1P or 1S?

A I don't think I am the one to make that decision. I would leave that up to, again, say, the shift supervisor. If he feels he needs that load for any reason, he ought to be able to apply it. The Lessons Learned requirement was we provide the capability for adding this load. Now, to me, you leave it up to the person who knows exactly or should know exactly what is going on in the plant, and if he doesn't, he shouldn't be trying to be adding on safety loads if he knows it is under control. I don't have a problem with him taking the initiative to add the load if he thinks he needs it.

I don't think the design is of such a detriment to the capability and reliability of off-site power system that he should be totally shy of adding this load if he feels that at any specific point in time he needs the pressurizer heaters. That is not within my scope to worry about it.

Q Can you explain to me why you are not willing to leave up to the discretion of the shift supervisor the option of connecting both groups of heaters simultaneously?

A I have been told by my reactor systems counterpart tha only one bank is needed, and I believe it states that is a factor of 2.5 in excess of what is needed to maintain, the kilowatts are in excess of a factor of 2.5 of what is required. So there is no system requirement as far as has been identified to me that two would need to be on simultaneously.

Therefore, coming back to this worrying about any possible interactions, just trying to preclused it as much as possible. We had the direct, the disconnect link concept, which isolates us from the BOP part of the system, and with the prohibition of energizing red and green simultaneously, I thought that was sufficient that we didn't have to worry about the interaction of red and green, and that covered the bases sufficiently. Maybe it was an overkill; those are my requirements. That is what I did.

Q If you had been aware that there was never a need in terms of need in the sense of protecting the health and safety of the public, that there was never a need to ever connect pressurizer heaters to the on-site power supply, would you then agree it would be prudent to preclude it given the design arrangement at Three Mile Island Unit 1?

CHAIRMAN SMITH: That is a question I want to make sure is understood, all of the premises --

MR. POLLARD: I want him to assume that there is never a need in the sense of need to protect the health and safety of the public

CHAIRMAN SMITH: The way it was phrased, if he was aware, which is somewhat different.

MR. POLLARD: I am sorry. I want him to assume that that is the case.

BY MR. POLLARD:

Q Suppose you were told, and you shall assume for this question that you were told correctly, that there is never a need to connect the pressurizer heaters to the on-site power supply in order to protect the health and safety of the public. Under those circumstances, would you then adopt the position that it is prudent to preclude the heaters from ever being connected to the on-site power supply utilizing the design proposed for Three Mile Island Unit 1?

A Yes. I would have to go beyond just that. If I was told that the pressurizer heaters were never required for the public health and safety, my interpretation of what you said would mean that the staff would take away its lessons learned on the subject. That may be something you did not mean, but my interpretation of what you were saying was that the staff came to me, other members of the staff came to me and said we have decided we were wrong in Section 2.1.1 of Lessons Learned, we don't need this capability. Then it goes away.

Q You are aware that the staff has not required the pressurizer heaters to be safety grade.

A That is correct.

BY MS. WEISS:

Q I want to briefly follow up Dr. Jordan's questions on the purpose for the Lessons Learned requirement.

Do you have a copy of NUREG-0578, the TMI-2 Lessons Learned Task Force Short-term Report?

A No, I don't.

Q I will see if I can make a copy available to you.

A If you are going to talk about the requirements on the pressurizer heaters that is in the SER.

Q No, I am interest in the language on page A-2 of NUREG-0578.

(Handing document to witness.)

MS. WEISS: Thank you, Dr. Jordan.

BY MS. WEISS: (Resuming)

Q Page A-2 of the document, the second full paragraph, third sentence states: "Experience at TMI-2 has indicated that the maintenance of natural circulation capability is important to safety, including the need to maintain satisfactory natural circulation during an extended loss of off-site power."

My question to you simply is is not -- strike that. I will try to avoid double negatives.

Isn't it true for the loss of off-site power event that the only signals available to protect the ES power supplies by tripping the heaters in the event of a fault in the pressurizer heater circuits are signals derived from the fault current?

A I'm sorry; I was half listening and half trying to read the context of this. Would you repeat?

Q I'm not sure I will be able to say that all again. I will give it a try.

Isn't it the case that for the loss of off-site power event, the only signals available to protect the ES power supplies by tripping the heaters in the event of a fault in the pressurizer heater circuits are signals derived from the fault current?

A No.

Q What other signals are there?

A Undervoltage.

Q And in your opinion, undervoltage is not a signal derived from the fault current?

A Yes. Hopefully. I went through that extensively this morning.

Q Is undervoltage adequate for all size faults?

A Not in the TMI-2 design.

Q TMI-1?

A Excuse me, yes.

Q For TMI-1 there are certain faults in the pressurizer heater circuits that would not activate the undervoltage relays, correct?

A That's correct. These would be very small faults. That would be that much less challenge to anything upstream also.

Q What do you mean by very small? Do you know what the size would be?

A No.

Q One other line of questions. I want to make sure I understand the concept of stabilization as you use it with reference to the applicability of Reg Guide 1.75. Is it true that in your opinion, Reg Guide 1.75 does not apply after the plant has been stabilized, and that you define stabilization as being reached at the point at which all of the automatic loads have been sequenced on to the default generators?

A No, that's not correct.

Q Please tell me where I went wrong.

A I have said that the provisions of Regulatory Guide 1.75 in terms of using something other than fault current are really not applicable sometime downstream of an event, some period of time called the stabilization period. I also said as many factors involved in determining the stabilization period, all of the major factors involved in establishing the stabilization period are not within the purview of the Power Systems Branch.

From the Power Systems Branch point of view, the emergency power system has reached stabilization following the diesel sequencing. The reactor systems and the reactor itself, it may be some time before that --

Q Isn't it true that it is your branch that reviews the design of the electrical system and determines whether it meets Reg Guide 1.75?

A That is correct.

Q And you do not ask the systems people to define stabilization? You define it for your purposes as stabilization of the electrical system. That is when the sequenced loads have been automatically added to the diesel generators.

A That is the electrical stabilization. That is not the overall stabilization, that is correct.

Q And that has no relationship to the status, no particular logical relationship or no particular -- strike that.

It has no particular necessary relationship to the status of the plant in general, particularly the condition of the core? That may not be the clearest way to ask the question, but isn't it true that you could reach stabilization as you define it and in terms of the Power Systems Branch without respect to whether the core is being cooled or is in a cooled condition?

A Yes. The power system stabilization occurs quite early in an event and is nowhere near the limiting factors in determining stabilization.

Q And the conditions or the limitations on connecting nonsafety loads to the emergency power supplies are related to the definition of stabilization on the electrical system and not to the definition of stabilization with respeact to the condition of the core or the other condition, any other condition of the plant.

A I believe there is only one stabilization period.

I have lost the sense of your question.

Q I understand that you look at only one part of the plant and you don't obviously want to suggest that there aren't other things going on that other safety systems and other people haven't reviewed. There are many things which interact. It is your responsibility to determine in what manner or when the conditions are present for the addition of nonsafety loads on the emergency power bus. That is within your purview, correct?

A Yes.

Q So the question simply is with respect to the connection of the pressurizer heaters to the emergency power supplies, that may be done at any time after what we have defined as the stabilization of electrical system, which may not have any relationship to the condition of the core or other conditions in the plant.

A I'm sorry; could I have that read back?

(The record was read by the reporter as requested.)

THE WITNESS: I disagree with that. The operators at Three Mile Island have the procedures in force to tell them when and how to do this. It is up to them to decide if it is proper to add these loads. In terms of power system threat, the power system threat goes by very early, but it is then left up to the operators at Three Mile Island to determine if and when they need these loads.

BY MS. WEISS: (Resuming)

Q I want to know insofar as the prohibitions placed by your interpretation of the NRC regulations, Regulation 1.75 -- excuse me -- Regulatory Guide 1.75. As you apply that regulatory guide in the course of your work, you place no prohibition on the reconnection of the pressurizer heaters to the emergency power supplies except that it may not be done until the electrical system has reached stabilization?

A That is not correct. The requirement then is that there must be sufficient capacity on the diesel, and that is for any nonsafety load, not just the pressurizer heaters. That is the Branch's scope of responsibility.

Q Thank you. Those are the only two limitations which you place?

A Right. The remainder of the concerns are someone else's.

MS. WEISS: No further questions.

Before we leave the subject matter entirely, I want to make sure we move UCS exhibits into evidence. I don't know whether this is an appropriate time to do that or not.

CHAIRMAN SMITH: It is up to you.

MS. WEISS: There have been four exhibits marked for identification that have yet to be moved into evidence.

They are marked as UCS 27, which is Safety Guide 1.6; UCS 29, which is Regulatory Guide 1.75, Revision 2, September 1978, Physical Independence of Electric Systems; UCS 30, which was the nine-page compilation of corresponding pages and Amendment 18 and Amendment 22 from the Restart Report; and UCS 31, Regulatory Guide 1.63, Revision 2, July 1978, Electric Penetration Assemblies and Containment Structures for Light Water Cooled Nuclear Power Plants.

We would move at this time that all of those be accepted into evidence.

MR. TROWBRIDGE: No objections.

CHAIRMAN SMITH: They are received.

(The documents referred to, previously marked for identification as UCS Exhibits No. 27, 29, 30 and 31, were received in evidence.)

MR. CUTCHIN: I have one final comment. Dr. Jordan had expressed his concern about getting an answer to a question that I agreed to attempt to get the answer to, and it was whether the staff has determined that loads listed on page 13 of Emergency Procedure 1202-29 are indeed available for tripping off in order to add the pressurizer heaters.

My information is that when the procedure was originally written, it only stated that the heaters could be added if there were loads available for tripping. The reviewer insisted that there be specific loads listed that were the only ones that could be tripped.

Again, the staff has made no determination as to whether those loads are safety loads or nonsafety loads, and that determination will be made by the operator depending on conditions at the time that he determines to trip them as to whether they are available for tripping or not. So they haven't been looked at to see if they are safety or nonsafety, and the staff really hasn't any real concern in that area.

DR. JORDAN: I think that is fine. The Licensee is going to come in with people whow know about that, and we will reserve questions until they come in.

CHAIRMAN SMITH: Anything further with this witness?

MR. ROBERT ADLER: Yes. Mr. Dornsife has a few clarifying questions.

CHAIRMAN SMITH: I think it would be better to defer it until after lunch, then.

MR. ROBERT ADLER: It is very short. We could finish with the witness.

CHAIRMAN SMITH: All right.

RECROSS EXAMINATION

BY MR. DORNSIFE:

Q First of all, I would like to ask you: Concerning the loss of off-site power transient alone, assuming one of the diesel generators are not available, and further assuming that either by failure of some one of the breakers on the other IE bus to open or whatever, the other diesel generator is not available either, isn't it true there would still be available the emergency feedwater pump using only DC power supplies which would be able to remove decay heat for at least a period of a couple of hours?

A That is my understanding, yes.

Q I would also like to ask you a clarifying question concerning Mr. Cutchin's question, follow-up question. I didn't understand necessarily the scenario you were talking about. Was the scenario he was discussing with you considering an accident signal occurring with off-site power being available and then all of the ES loads starting on off-site power, and subsequent to the stabilization period when the ES signal is bypassed, then you lose off-site power? Was that the scenario he was talking about of reclosing the pressurizer heaters?

A I'm sorry, I just don't recall that, any of that conversation.

Q Isn't it true, though, that if the ES signal is initially -- that initially if the signal that sheds the loads off the bus, the pressurizer heaters off the bus, that until the ES signal is bypassed, and that assumes you have to follow the small break LOCA procedures as far as plant stabilization, that if you try to reclose that breaker it will trip until that signal is bypassed?

A That is my understanding, yes.

Q So the scenario he was talking about was a subsequent loss of off-site power following stabilization, which would then allow possibly the reconnection of the pressurizer heaters right away if you could physically do it.

A Yes, I believe that is true, yes.

Q I also have one follow-up question concerning Dr. Jordan's line of questioning on the diesel generator and its response to an overcurrent assuming the breakers, you know, would not open as designed. You recall Mr. Torcivia's follow-up oral testimony concerning the maximum ratings of the diesel, that the half-hour rating was 3300 kilowatts and the 2000 hour was 3000? Is it conceivable?

Do you know, first of all, what that rating is based on, how the manufacturer arrives at a diesel generator rating?

A No, I don't know all of the things they go through to derive a rating, but the basis of providing various ratings is if you run a machine for, let's say, this particular machine at 3000 KW for 2000 hours, you would then want to shut it down and do an overhaul on the machine. That is to ensure it's long life.

Q It is not necessarily if you exceed the rating you won't necessarily fault the diesel or destroy the diesel.

A Not necessarily. It would depend on the magnitude of the fault.

Q Is it partially based on maybe temperature restrictions?

A Yes, temperature is an important effect.

Q It is conceivable that the diesel could very readily for 10 minutes handle a load even larger than 3300 kilowatts.

A Yes, that is correct.

Q And isn't it also true that, using Mr. Torcivia's example of a fault current which instantaneous four cycles gives you 4000 amperes, which as Dr. Jordan pointed out was about 2000 KW, and let's assume the diesel is fully loaded at 2800 KW to begin with, which is about the loading of the accident, let's say that instantaneous loading is put on the diesel of an additional 2000 KW for four cycles and nothing trips, would the diesel necessarily fault -- could the diesel handle that sort of an instaneous load without faulting?

A It should be able to do that.

Q In addition, according to Mr. Torcivia's example, the load then settles out, assuming nothing happens, to about 1800 amperes, which is about 900 KW. Isn't it conceivable that the diesel could for a period of ten minutes, let's say, handle that load?

A Yes, sir.

Q And the operator would then have sufficient time to trip the pressurizer heaters off the bus, noting he eas exceeding the 3000 KW rating of the diesel.

A That is correct.

MR. DORNSIFF: Thank you.

CHAIRMAN SMITH: Anything further?

(No response.)

CHAIRMAN SMITH: Thank you. You are excused.

(The witness was excused.)

CHAIRMAN SMITH: Would it be possible to take a somewhat shorter lunch break today? We will return at 1:35.

MS. WEISS: We will not be back, Mr. Chairman. Mr. Chairman and the Board, thank you all for pushing through, and I hope we all meet in a better place sometime.

CHAIRMAN SMITH: Ms. Weiss, before you leave, there is a matter, a housekeeping matter that we have to attend to, and that is at what time in the proceedings should cross examination plans be available for examination? I suggest at the end of the entire proceeding we will go through our various papers and make them available for whoever wants to examine them.

MS. WEISS: I thought that is what we had agreed to.

CHAIRMAN SMITH: I don't think so. I think as far as yours were concerned, it was at the end of your presentation. I think the better approach is at the end of the entire proceeding.

MR. POLLARD: Yes.

CHAIRMAN SMITH: Just a moment, please.

(Discussion off the record.)

CHAIRMAN SMITH: We have a message that Marvin Lewis is en route.

(Discussion off the record.)

CHAIRMAN SMITH: We will recess for lunch, to return at 1:35.

(Whereupon, at 12:52 p.m., the hearing recessed, to reconvene at 1:35 p.m. the same day.)

AFTERNOON SESSION

(1:40 p.m.)

CHAIRMAN SMITH: Before we proceed, let's have a discussion with Mr. Lewis about what has transpired.

MR. LEWIS: I am Marvin I. Lewis, pro se.

CHAIRMAN SMITH: Mr. Lewis, why don't you and Ms. Bradford move up to the front table. These microphones we know work. Bring your signs, if you wish.

MR. LEWIS: I am Marvin I. Lewis, pro se. I just wanted to ask, hopefully, that my Contention goes on today. I can't get back tomorrow nor until Friday. That's all I want to put on the record. I want to thank everybody for informing me about my Contention today.

CHAIRMAN SMITH: We have an estimated hour, hour and a half. I see by your cross examination plan that it will be a very efficient cross examination. So if that fits into your schedule, let's proceed on the ordinary schedule.

And, Ms. Bradford, may I suggest that you take advantage of the intervening hour and a half to prepare the cross-examination plan, which is required by the several Board orders now. Are you aware of that, Ms. Bradford? Do you know about cross-examination plans?

MS. BRADFORD: Yes, sir.

CHAIRMAN SMITH: May I suggest that you take advantage of that time and prepare a cross-examination plan.

MS. BRADFORD: Yes.

CHAIRMAN SMITH: Well, "Yes," "No"? Do you have any feeling about that?

MS. BRADFORD: Yes. I don't know that I have any questions to ask, sir.

CHAIRMAN SMITH: I see. All right.

MS. BRADFORD: Thank you.

CHAIRMAN SMITH: Sure. Now, do you understand the procedure -- maybe it is a good idea for you to observe an episode of receiving evidence. The ordinary procedure is that the testimony is presented in writing, and you have received that in writing. And if you don't have any questions and the Board doesn't have any questions and nobody else has any questions, then that's it, everybody goes home. Okay?

MS. BRADFORD: Yes. Thank you. I understand that. Thank you.

CHAIRMAN SMITH: Now, so that we will --

MR. BAXTER: Licensee is attempting to call Mr. Walsh and Mr. Toole.

CHAIRMAN SMITH: All right.

(Board conferring)

CHAIRMAN SMITH: I would point out what has happened so that Mr. Lewis and Ms. Bradford will understand. We are now taking Union of Concerned Scientists Contention Number 9 and ECNP Contention Number 1C. UCS has withdrawn this Contention 9. ECNP has other commitments, and they have not attended.

So, the Board, having the panel not appear, the Board presented them for questioning by the Board itself, the Commonwealth, and whoever may want to ask questions of them. That was a matter of our discretion.

Mr. Baxter.

Whereupon,

PATRICK S. WALSH and

RONALD J. TOOLE,

called as a witnesses by counsel for the Licensee, Metropolitan Edison, having first been duly sworn by the Chairman, were examined and testified as follows:

DIRECT EXAMINATION

BY MR. BAXTER:

Q Gentlemen, would you each identify yourselves, give your full names for the record, and your position and place of employment? Mr. Toole?

A (WITNESS TOOLE) I am Ronald J. Toole, manager of TMI Unit Number 1. I am employed by General Public Utilities.

A (WITNESS WALSH) I am Patrick Walsh. I am the plant analysis manager for GPU Service Company.

Q I call your attention to a document that bears the caption of th: proceeding, dated September 15, 1980, entitled "Licensee's Testimony of Patrick S. Walsh and Ronald J. Toole in Response to UCS Contention Number 9 and ECNP Contention Number 1C, Safety Systems Status Panel."

I would like to begin by asking you, Mr. Toole, whether you have any changes or corrections to make to this document?

A (WITNESS TOOLE) Yes, I have a correction on page 2. The sentence above where it says "Testimony by Witnesses Walsh and Toole" should be "by Witness Walsh." And on page 4, about the center of the page, above "The thrust of the UCS Contention," the words "by Witnesses Walsh and Toole" should be inserted there.

Q And this document is the material associated with your name, including the statement of professional qualifications attached, testimony which you have prepared or had prepared under your direct supervision for presentation at this hearing, Mr. Toole?

A (WITNESS TOOLE) Yes, it is.

Q Mr. Walsh?

A (WITNESS WALSH) Yes, it is.

Q Is your testimony true and accurate, to the best of your knowledge and belief?

A (WITNESS TOOLE) Yes, it is.

A (WITNESS WALSH) Yes, it is.

MR. BAXTER: I move the receipt into evidence of the testimony and ask that it be physically incorporated into the transcript as if read.

MR. CUTCHIN: No objection.

CHAIRMAN SMITH: There are no objections?

(No response.)

The testimony is received.

(The testimony of Witnesses Toole and Walsh follows.)

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
METROPOLITAN EDISON COMPANY	)	Docket No. 50-289
	)	(Restart)
(Three Mile Island Nuclear Station, Unit No. 1	)	

LICENSEE'S TESTIMONY OF

PATRICK S. WALSH AND RONALD J. TOOLE

IN RESPONSE TO

UCS CONTENTION NO. 9 AND ECNP CONTENTION NO. 1(c)

(SAFETY SYSTEM STATUS PANEL)

OUTLINE

The purpose and objective of this testimony is to respond to UCS Contention No. 9 and ECNP Contention No. 1(c), each of which challenge the adequacy of the methods used for monitoring safety system or component status at TMI-1. Further, the testimony discusses the impact of EFW valve closure on the outcome of the TMI-2 accident. The testimony identifies the instrumentation and administrative controls utilized at TMI-1 to assure that safety systems are not disabled.

INTRODUCTION

This testimony, by Mr. Patrick S. Walsh, GPU Plant Analysis Manager, and Mr. Ronald J. Toole, Manager, TMI-1, GPU, is addressed to the following contentions:

UCS CONTENTION NO. 9

> The accident at TMI-2 was substantially aggravated by the fact that the plant was operated with a safety system inoperable, to wit: two auxiliary feedwater system valves were closed which should have been open. The principal reason why this condition existed was that TMI does not have an adequate system to inform the operator that a safety system has been deliberately disabled. To adequately protect the health and safety of the public, a system meeting the Regulatory Position of Reg. Guide 1.47 or providing equivalent protection is required.

ECNP CONTENTION NO. 1(c)

> The electronic signals sent to the control room in many cases record the wrong parameters and may, thereby, mislead the reactor operator. For instance, in the case of the Electromatic Relief Valve ("ERV", the Metropolitan Edison designation is RC-RV2), the signal sent to the control room to indicate a closure of this valve indicates only the electrical energizing of the solenoid which closes the valve, not the actual physical valve closing itself. This misleading signal aggravated the accident at TMI-2. There is no reasonable assurance that this same problem, or comparable ones, cannot arise many times over at TMI-1. It is the obligation of the Suspended Licensee to provide sufficient information on the performance capability of all pertinent components of the control system to reasonably ensure that electronic signals will record, accurately and in a timely manner, all necessary and correct parameters.

ECNP Contention 1(c) was limited by the Board to "signals sent to the control room" and further limited to core cooling systems and containment isolation systems. (See First Special Prehearing Conference Order, dated December 18, 1979, at 38).

RESPONSE TO CONTENTIONS

BY WITNESS WALSH: ~~AND TOOLE~~

The assumption which underlies these contentions is that the accident at TMI-2 was substantially aggravated in that the plant was operated with a safety system inoperable. Before turning to the merits of the contentions that the indication of safety system status at TMI-1 is inadequate, it is important to note that the underlying assumption to UCS Contention 9 is invalid. First, the Emergency Feedwater (EFW) System is not classified as a safety system. Second, the closure of the EFW valves did not have a substantial effect on the eventual outcome of the TMI-2 accident. Analyses(1) performed by GPU using the RETRAN code(2) indicate that even with the correct operation of EFW, the condition of the plant would have been identical 20 minutes following the start of the accident. It should be noted that core damage did not occur until after reactor coolant pumps were turned off, 100 minutes following the start of the accident.

These analyses compared two alternate scenarios with the actual accident sequence. In the actual event sequence the reactor tripped from high pressure at 8 seconds due to loss of feedwater. The power operated relief valve failed to reclose at 15 seconds. The steam generators boiled dry at approximately 1 minute and 45 seconds. High Pressure Injection (HPI) was actuated at 2 minutes and 2 seconds and was throttled at 4 minutes and 38 seconds. Emergency feedwater flow was initiated at 8 minutes and nominal steam generator conditions were achieved at approximately 20 minutes. The two alternate scenarios that were analyzed are: (1) emergency feedwater available from the beginning of the event with other accident events unchanged; and (2) HPI properly maintained with no emergency feedwater. The results of the analysis of the first scenario indicate that simulated plant conditions were identical to the actual event after about 20 minutes. The results of the second scenario show that the core would have been adequately cooled by HPI even without emergency feedwater. This second result is verified by the actual system response during the accident since Reactor Coolant System temperatures did not increase during the period when HPI started at approximately 2 minutes until it was throttled at about 4 1/2 minutes.

The lack of EFW flow was discovered by the operators using indications of system conditions that were available on the main control board. The EFW system was realigned 8 minutes after the reactor trip and approximately 6 minutes after the first indications of steam generator dryout. The operators reacted to the fact that steam generator level was not increasing despite open control valves, and thus discovered the closed EFW block valves by checking the pump and valve control indications on the main control board. The steam generator conditions were returned to nominal design conditions 20 minutes after the reactor trip. Thereafter, plant conditions were undistinguishable from conditions that would have existed if EFW had operated normally. In addition, other analyses of the event(3,4,5) have concluded that the brief EFW isolation had no significant effect on the outcome of the accident. Consequently, the assumptions underlying UCS Contention No. 9 are invalid.

BY WITNESSES WALSH AND TOOLE:

The thrust of the UCS contention is that the principal reason the improper EFW valve position existed during the accident was that TMI-2 did not have an adequate system to inform the operator that safety systems have been disabled. The contention is not valid for either TMI-1 or TMI-2. At TMI-1, the Engineered Safety Features Actuation System (ESFAS) has indicating lights on the main control console indicating whether the HPI and LPI protective systems are fully enabled and indicating whether actuation bistables are reset or bypassed. Annunciators will indicate a "not reset" condition, a "not bypassed" condition and an "ES actuation trouble" condition which further alerts the operator to an abnormal condition. Annunciators will also indicate abnormal status of core flood tank isolation valves (a portion of the ECCS). In addition to these indicators and annunciators, a dedicated control panel in the control room indicates the status of all individual components that are actuated by the ESFAS. This panel's display lights are color coded so that any exceptions to an automatic actuation are indicated to the operator.

Besides these features, procedures have been instituted in the following areas since the TMI-2 accident to verify the operational readiness of Engineered Safeguards Features (ESF) Systems and EFW Systems.

1. ESF Checklist

This checklist verifies the readiness of ESF and EFW system components each eight-hour shift. It verifies control room valve position and control switch positions for these systems.

The checklist is initiated by the off-going shift, and reviewed and signed by the on-coming Control Room Operators, Shift Foreman and Shift Supervisor.

2. Administrative Valve Controls

Critical valves in the ESF and EFW systems have been either locked or placed under routine surveillance. This includes locking of manual overrides where applicable, and/or routine checking of manual override status as part of the Auxiliary Operator log sheet entries. Locked valves are checked at defined intervals, established on the basis of their importance and frequency of use.

3. <u>Log Sheets</u>

Non-control room indicated main flow path ESF and EFW valves will be checked at defined frequencies (once a shift or daily) to assure correct position. The determination of frequency is based on accessibility not only to the Operations Staff but to other personnel who may be working in the plant.

4. <u>Verification Prior to Surveillance or After Maintenance</u>

Proper ESF and EFW valve positions will be confirmed as an initial procedure step prior to initiating surveillance tests on any ESF or EFW train. Upon completion of the surveillance activity, the valves or switches that were manipulated will be verified by procedure to have been returned to the correct position.

Prior to returning components to service after maintenance or special testing, the affected components and all other components manipulated during the maintenance will be verified to be in the correct post-maintenance position by two independent operators.

These individual administrative systems by their very nature provide various levels of backup to the primary control method. This is illustrated on Figure 1 for valves. Depending on the importance of the particular valve, one or more of the backup methods are applied to each valve.

These administrative controls inform the operator of system status not only periodically, but also each time a safety system would be unavailable during testing or maintenance. These methods are considered effective since an operator will be required to acknowledge that a safety system is disabled when he begins his shift and at any time during the shift the equipment is disabled. Because of the required deliberate administrative action necessary to manipulate ESF or EFW components, these controls are considered to be as effective as automatic annunciation of disabled systems.

It is implied from UCS Contention 9 that if a system meeting the requirements of Regulatory Guide 1.47 had been installed at TMI-2, then the EFW system would not have been disabled. If applied, Regulatory Guide 1.47 requires a display system which would provide automatic indication and alarm of safety system availability at the system level. Continuous automatic indication of disabled safety systems, however, provides no guarantee that the operator will recognize and maintain awareness of the abnormal configuration. Because of this, administrative controls still have to be depended upon to require the operator to overtly note status on a status list or record system even if automatic annunciation is available. This is recognized in Regulatory Guide 1.47, which itself states that: "An acceptable way of aiding the operator's knowledge of plant status is to supplement administrative procedures with automatic indication of the bypass or inoperability of each redundant portion of a system that performs a function important to safety" (Emphasis added). The Regulatory Guide also recognizes the limitations of the concept of automatic indicating systems:

> It is recognized that automatic indication of inoperability or a bypassed condition is not feasible for all the possible means by which safety-related systems could be completely or partially rendered inoperative.

It also recognizes that:

> Manual capability would [still] be useful in displaying those inoperable or bypassed conditions, whether deliberately induced or not, which are not automatically indicated.

The feasibility of automatic indication assumes certain conditions. The Regulatory Guide states that:

> Such a design is considered practical because (1) appropriate emphasis on testability [of safety systems] early in the design process can reduce to a minimum the number of bypasses needed for frequent activities such as testing and (2) activities such as modification, repair, and maintenance either are conducted infrequently or can be restricted to times when plant conditions do not require the affected system to be available.

It is implied that this requirement is not practical except early in the design process of a plant under construction and thus would not be practical when applied in a backfit situation such as TMI-1. Further, it presumes that there is an infrequent need to bypass safety systems. Operational requirements for surveillance testing and preventative maintenance activities at TMI-1, however, require a significant number of brief periods of unavailability for safety systems or their supporting systems. Consequently, providing an automatic, consolidated, system level indication of bypass is not practical because the assumptions which form the basis for the practicality of the requirement are not valid for TMI-1.

In summary, Contention 9 of UCS is incorrect in its allegation that the TMI-2 accident was substantially aggravated by the fact that two Emergency Feedwater System valves were closed at the beginning of the event. Additional administrative controls have been instituted since the TMI-2 accident to verify the correct status of critical components after testing, at shift change and at predetermined intervals during operation. The addition of an automatic system that meets the requirements of Regulatory Guide 1.47 would be an unnecessary addition of hardware that would not improve the protection of the health and safety of the public, since this system would also continue to rely on administrative controls to assure its effectiveness.

ECNP Contention 1(c) asserts that electronic signals sent to the control room may mislead the operator. Licensee has performed a review of signals to the TMI-1 control room for the emergency feedwater system, emergency core cooling systems and containment isolation systems, and found no position indication that could mislead the operators by a demand indication rather than direct position indication such as the power operated relief valve in TMI-2. Valve position indications for these systems were verified to originate from limit switches driven by the valve stem, and not from demand signals to the valve.

Other major components also have direct indication of operation. The Emergency Feedwater System motor driven pumps have indications for motor breaker position, and pump discharge pressure, and will have feedwater flow instruments which are being installed, all of which will give a direct indication of pump performance. Similarly, the steam driven emergency feedwater pump has indication of turbine speed and pump discharge pressure. The high pressure injection pumps (makeup pumps) have motor breaker position indication, pump discharge pressure indication and flow indication. Decay heat removal system pumps have motor breaker position indication, pump discharge pressure indication and flow indication.

All valves which are required to respond automatically to an ESFAS signal have special indicators on a dedicated control panel in the control room which are color coded to inform the operator that the valves are in the proper position after an ESFAS actuation. This allows the operator to note any exceptions to an ESFAS actuation sequence within a short period of time. Finally, modifications to the PORV to improve indications of its performance are described in Licensee's Testimony on Valves and Valve Testing in response to UCS Contentions 5 and 6.

REFERENCES

1 The Use of RETRAN to Evaluate Alternate Accident Scenarios at TMI-2, T. G. Broughton, N. G. Trikouros, Proceedings. of the ANS/ENS Topical Meeting on Thermal Reactor Safety, April 6-9, 1980, p. 924.

2 EPRI CCM-5, RETRAN - A Program for One-Dimensional Transient Thermal Hydraulic Analysis of Complex Fluid Flow Systems.

3 Analysis of Three Mile Island - Unit 2 Accident, NSAC-1, July 1979, Nuclear Safety Analysis Center.

4 The Report of the President's Commission on the Accident at Three Mile Island, October 1979.

5 Three Mile Island - A Report to the Commissioners and the Public, January 1980, Nuclear Regulatory Commission Special Inquiry Group.

VALVE ADMINISTRATIVE CONTROL SUMMARY

Figure 1

REASON VALVE POSITION CHANGE IS MADE	METHOD USED FOR NORMAL REALIGNMENT	BACKUP METHODS POTENTIALLY AVAILABLE TO DETECT ERROR			
1. Major Outage	Operating Procedure Complete Valve Alignment	AP 1011 Lock Valve List/Shift	Shift Turnover Check List/Shift	ES Check List/Shift	Operator Daily Tour Check List
2. Preventive Maintenance	Preventive Maintenance Procedure	AP 1011 Lock Valve List/Shift	Shift Turnover Check List/Shift	ES Check List/Shift	Operator Daily Tour Check List
3. Corrective Maintenance	Surveillance Procedure	AP 1011 Lock Valve List/Shift	Shift Turnover Check List/Shift	ES Check List/Shift	Operator Daily Tour Check List
4. Surveillance Procedure	Surveillance Procedure	AP 1011 Lock Valve List/Shift	Shift Turnover Check List/Shift	ES Check List/Shift	Operator Daily Tour Check List
5. Operating Procedure	Surveillance Procedure	AP 1011 Lock Valve List/Shift	Shift Turnover Check List/Shift	ES Check List/Shift	Operator Daily Tour Check List
6. Operator Mistake	Operator Logs Equipment Status each time he makes changes. The Logs are reviewed by the Shift Foreman and Operations Engineer.	AP 1011 Lock Valve List/Shift	Shift Turnover Check List/Shift	ES Check List/Shift	Operator Daily Tour Check List

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Education: B.S., Chemical Engineering, Illinois Institute of Technology, 1969.
M.S.E., Nuclear Engineering, Catholic University of America, 1978.
U.S. Navy Nuclear Training Program, 1969 to 1970.

Experience: Plant Analysis Manager, GPU Service Corporation, 1979 to present. Responsible for conducting evaluations of operating experience and technical performance of all GPU system nuclear generating stations.

Senior Engineer, Nuclear Analysis Section, GPU Service Corporation, 1978 to 1979. Responsible for performing nuclear fuel thermal-hydraulic analyses and fuel performance analyses.

Senior Engineer, Nuclear Fuel Management Unit, Baltimore Gas and Electric Company, 1976 to 1978. Responsibilities included the performance of fuel management analyses; evaluation of safety analyses required for license amendments; and, supervision of, and preparation of procedures for, core refueling, new and irradiated fuel inspection and spent fuel shipment.

Engineer, Startup Test Group, Baltimore Gas and Electric Company, 1974 to 1976. Responsible for procedure preparation and supervision of hot functional, low power physics and power escalation testing of mechanical and instrumentation systems.

Officer, U.S. Navy, 1970 to 1974. Held positions of Nuclear Submarine Engineering Department Division Officer and Nuclear Prototype Instructor and Training Officer.

Professional Affiliations: Registered Professional Engineer, New Jersey.

BY MR. BAXTER: (Resuming)

Q The testimony does not indicate in particular where it is responding to UCS Contention Number 9 and where it is responding to ECNP's Contention 1C. Mr. Walsh, could you identify for the record what part of the written testimony response to each Contention?

A (WITNESS WALSH) The first part of the testimony, starting on page 2 and running through to the third paragraph on page 9, is directed toward answering UCS Contention Number 9. Starting on the last paragraph on page 9 to the end of the testimony is directed toward ECNP Contention 1C.

Q I have one clarifying question for you, Mr. Walsh, about a statement that appears in the staff testimony that is going to be presented yet on these issues. Mr. Boger, in his testimony at page 7, states that, "Regulatory Guide 1.47 requires that an automatic system be provided to indicate on a system level the bypassing or deliberately induced inoperability of a safety-related system, whereas the measures being implemented at TMI are administrative in nature."

I don't know that Mr. Boger intended that statement to be exhaustive, but could you tell me whether at TMI we rely exclusively upon administrative controls?

A (WITNESS WALSH) No, we do not rely exclusively on administrative controls. On page 4 and 5 we do make some reference to some of the annunciators that indicate whether the engineered safeguard systems are actuated or are lined up in a ready mode. In addition to those, as further examples, there are several other annunciators which specifically indicate the inoperability of bypass of systems.

Most of the -- all of the pumps used in the emergeny safeguard systems have annunciators associated with them, that if the control handle for the pump is in the pull-up position or the breakers react out, there is an annunciator for each size pump motor. The 4-KV motors and the 480-volt motors have separate indicators for those conditions.

There are also four or five annunciators on the diesel generators which indicate troubles, failure to start, overload, fault, blocked conditions, or breaker trip conditions. The actuation systems themselves have indications of whether on the control board whether each channel is bypassed or not reset, and there is also a main annunciator which indicates that condition.

Q You referred to pages 4 and 5. Was that to your own direct testimony?

A (WITNESS WALSH) To my own direct testimony, yes.

MR. BAXTER: The panel is available for

examination.

CHAIRMAN SMITH: Mr. Adler.

CROSS EXAMINATION

BY MR. ROBERT ADLER:

Q Gentlemen, have you analyzed what compliance with Regulatory Guide 1.47 would entail at TMI Unit 1?

A (WITNESS TOOLE) Yes, I would say we have analyzed to some extent, not completely.

Q I wonder if you could briefly give us some analysis of what would be required to comply with Reg Guide 1.47 in terms of plant engineering modifications in terms of time and in terms of cost?

A (WITNESS TOOLE) As far as in terms of time and cost, I don't think I am prepared to answer that for the entire system. As far as examples of what it would take to accomplish the Reg Guide 1.47, I could address that.

Q Fine. Go ahead.

A (WITNESS TOOLE) What it would take as far as to analyze the system on a component basis and to review our surveillance procedures to determine each individual component, which is actuated or its position is changed once a year in a process of testing and look at each one of those components individually as to could we provide a signal from that component that we could, in turn, tie into a logic that would be developed in such a way that it would give a system indication that that system had been disabled when the component's position has been changed.

For instance, if a valve is to be normally opened to support an ES alignment to allow flow in the low-pressure injection system, for instance, if that valve were to be closed to perform a surveillance, what we would have to have is a position switch on that valve that would tie into this logic. And once the valve is closed, we would get an alarm saying low-pressure injection system A is disabled.

Q Can you try to speak directly into the microphone?

A (WITNESS TOOLE) How much did you miss?

Q I could hear you, but with some difficulty.

CHAIRMAN SMITH: Mr. Toole, you are taller than the witnesses who have been using that microphone, and they are very distance-sensitive. I suggest you change the stand that is being used. You have to be within a very few inches.

BY MR. ROBERT ALDER:

Q Is it your testimony that no analysis has yet been performed to determine which individual components in the plant would affect the systems status at the system level?

A (WITNESS TOOLE) To my knowledge, we have not done a complete study to determine exactly every component that would have to be inputted into this.

A (WITNESS WALSH) I have been involved in the analysis. We haven't done a specific analysis to see what would be required to meet Regulatory 1.47, literally, because we looked at the systems that we have in place and we looked at the administrative controls that we have in place. We feel our objection to implementing 1.47 is not an economic or scheduling basis. We feel that we have a more effective system.

My main objection to putting in that type of a system is I think it is another extensive hardware modification to the plant that will lead to increased complexity. The operator will have to deal with that increased complexity and eventually there will have to be administrative controls to ensure that the operator enables that particular system or that system is tested and operated and the operator takes note of a particular annunciator's or system panel that is installing the system. And we would be no better off than the present administrative system that we have right now.

Q That, in fact, was my next question, whether you think -- whether your objection to complying with Reg Guide 1.47 was simply that it was not necessary or that your administrative procedures are superior. Are you saying you disagree with 1.47?

A (WITNESS WALSH) Yes. I disagree with the concept that an automatic system is -- for indicating inoperability and bypass is an absolute necessity. I think the administrative controls are a more effective means of keeping the operator involved on a regular basis of checking his lineup and an effective means of having the operator stay involved in the process, which is a very important concept, I think.

A (WITNESS TOOLE) 1.47 would address one set of specific criteria, where the administrative controls monitors multiple mistake-monitoring type criteria. If you followed the requirements of Reg Guide 1.47 and designed specifically to satisfy that reg guide, you would put yourself into a position where you could identify certain problems. Our system is geared to identify that problem plus many more.

Q My concern is this: You stated that you have not analyz hich individual components affect the plant at the system evel. Your testimony is that you expect the operator to do this.

A (WITNESS TOOLE) When I say I haven't analyzed it, what I haven't done is sat down and written out a list of each and every component and compared that to every test that we have run or that we do perform to assure that it is correct.

A (WITNESS WALSH) Our administrative controls look at every component in the engineered safeguard system and check that its lineup is in its proper standby position, so that the checklist that the operator does in the control room at the turnover each shift checks every component that is indicated in the control room that needs to be lined up to operate, and that the other administrative controls are log sheets on which the operator in the plant has to go out and physically verify the position of valves that are in -- the manual valves -- that are indicated in the control room, the position of those valves that need to be in certain required positions for standby status of the engineered safeguard systems.

BY MR. DORNSIFE:

Q I have one follow-up question, if I may, on that identical subject. It seems -- let me try to understand your administrative procedures a little better. You are saying the operator identifies which components are unavailable; and then he, in his own expertise and knowledge of the systems, will then decide whether that makes that train of ESF unavailable? Is that correct?

A (WITNESS TOOLE) That is not correct. What we have done is analyzed the system, low-pressure injection. And low-pressure injection has a flow path and an alignment from the borated water storage tank to the vessel. We have looked at that system, and we have developed a checklist that says that these valves must be in this alignment and this pump must be in this alignment.

The operator, on a shift basis, will confirm that they are in that alignment. If the A side were to be disabled for maintenance or for surveillance, he would then know that that side was disabled. Or just prior to disabling it, he would look to make sure that the other side on paper was aligned properly.

For valves that are not -- do not have a component level indication inside the control room, the auxiliary operator looks at it on a shift basis or on a daily basis, depending on location, to ensure that it is in a proper position.

Q So therefore, from a functional standpoint, at least, the administrative procedure is identical to Reg Guide 1.47. The bottom line of the procedure is that the system is not available, and that is known to the operator by looking at the checklist.

A (WITNESS TOOLE) I would say that is correct. I would say if you were to try to meet Reg Guide 1.47, the first step would be to identify the components involved, which we have done, and we have established a checklist in that manner. We have now looked at each individual component to determine what signal we would get to tie into the logic.

BY MR. ROBERT ADLER:

Q Have you read the testimony filed by Mr. Robert Pollard that was originally intended to be introduced into evidence?

A (WITNESS TOOLE) Yes, I have.

A (WITNESS WALSH) Yes, I have.

Q At page 9-2 of that testimony --

CHAIRMAN SMITH: Off the record just a moment.

(Discussion off the record)

CHAIRMAN SMITH: Proceed.

BY MR. ROBERT ADLER:

Q In the first full paragraph, in the paragraph beginning, "Another example," Mr. Pollard discusses the tripping of the diesel fuel racks. And then he says," In violation of operating procedures, the fuel racks were left in the trip position. Failure to reset the fuel racks resulted in a condition that prevented either diesel generator from being started either automatically or manually from the control room."

I don't believe that you addressed this scenario in your testimony. First of all, did this failure to reset the racks in fact render both diesels inoperative?

A (WITNESS TOOLE) That is correct. This failure or by placing the diesel in this position, as identified on page 9-2 of Mr. Pollard's testimony, Reg Guide 1.47 would not have required us to indicate that in the control room, to satisfy Reg Guide 1.47.

Reg Guide 1.47 requires us to indicate manipulations that are performed once a year. This is a manipulation that is not normally performed.

DR. JORDAN: It's not what?

WITNESS TOOLE: It is not a manipulation that would be performed once a year on a scheduled basis.

BY MR. ADLER:

Q Would your new administrative procedures have detected this error?

A (WITNESS TOOLE) Yes, it would. We have an alarm in the control room which identifies in this condition that the diesel generator is blocked.

A (WITNESS WALSH) In fact, there was an alarm in the Unit 2 control room that indicated the diesels were tripped.

Q But the operators didn't see it?

A (WITNESS TOOLE) That's not true.

Q It's not true? The operators knew that it was not reset?

A (WITNESS WALSH) The operators deliberately tripped the fuel rack to prevent the unnecessary starting of the diesel from several conditions. They went through the ES trip set points several times during the day. They deliberately tripped the diesel fuel racks to prevent the diesel from starting automatically, having to be manually shut down, to attempt to prevent damage to the diesels. It would start up and run under an unloaded condition, and the manufacturer doesn't recommend running the diesels in the unloaded condition.

This was a violation of the tech spec, but the operators did deliberately do this, with the reason. And there is no reason for me to believe that they didn't realize that the diesels were tripped during this whole time.

Q How long would it have taken to reset the racks?

A (WITNESS TOOLE) Within five minutes.

Q Five minutes. So you don't really see any adverse effect from the violation of the tech specs?

A (WITNESS TOOLE) It was a tech spec violation.

DR. JORDAN: Mr. Adler asked a question which I would like you to clarify a little. You said that tripping of the racks is not something that would have been included in Reg Guide 1.47 because it doesn't happen as often as once a year?

A WITNESS TOOLE: That's correct. We do not trip the fuel racks in any surveillance procedure or inservice inspection testing that is done on a scheduled basis. We could go for a number of years wihout tripping the fuel racks.

DR. JORDAN: Therefore, it doesn't come in under 1.47 for that reason?

WITNESS TOOLE: For that reason, yes.

DR. JORDAN: Okay.

BY MR. ROBERT ADLER:

Q Without wanting to get too heavily into regulatory philosophy, your substitute for Reg Guide 1.47 relies heavily, if not exclusively, on administrative procedures. And yet, in this example you are saying that the operators deliberately violated both the tech specs and the plant operating procedures, and that decision was correct.

Doesn't that indicate either that the procedures were incorrect or that the operators made an incorrect decision?

A (WITNESS TOOLE) Would you repeat that as you said that? I don't think we said that the operators were correct in what they did.

Q You implied that there was a good reason for it. Do you agree that there was a good reason to leave the diesel racks unset?

A (WITNESS TOOLE) I believe it was a valuable reason to block the diesels. The diesels had started and stopped a number of times, and the probability of failures in cycling the diesels increases with starting and stopping.

Q If you were an operator, you would have done the same thing?

A (WITNESS TOOLE) I really can't answer that question. I was not involved in that.

Q At pages 3 and 4 of your testimony -- before we go on to the next subject, let me go back and ask one more question about the diesels. To your knowledge, and in your opinion, were the operators at all times during the TMI-2 accident aware that they had left the diesel fuel racks in the trip position?

A (WITNESS TOOLE) From the time that the diesels were tripped until the time that the diesels were reset, the operators who made the decision to trip the diesel were still there.

Q The same operators were there?

A (WITNESS TOOLE) Yes. Other than that, I have never asked that question, so I don't know the answer.

Q Let's say there was a change of shift. Your current procedures would require the outgoing shift to inform the new shift that the racks were tripped?

A (WITNESS TOOLE) Yes, that's right. And it would be documented on the ES checklist.

Q Turning to page 3 of your testimony, you explain the process whereby the operators discovered that ESW flow had been impaired, and you state that it was discovered as a result of an analysis of the shifting parameters and that they in fact determined that the valves had been shut eight minutes into the accident. Then you state that the steam generator conditions were returned to "nominal design conditions 20 minutes after reactor trip."

First of all, can you explain what you meant by "nominal design condition"?

A (WITNESS WALSH) Yes. The steam generators are designed to go to a condition after reactor trip is determined by the turbine bypass valve settings at approximately 1010 p.s.i.g. and 550 degrees. That is what I mean by "nominal conditions after the trip."

Q The steam generators were completely functional at 20 minutes?

A (WITNESS WALSH) That's correct. The steam generator level set point was above the 30-inch level required for this condition, and the temperature and pressure were in that band.

Q Have you done an analysis to determine whether this 20-minute interval would have been acceptable under all accident scenarios?

A (WITNESS WALSH) I am not sure what you mean by "acceptable."

Q Would having the steam generators not up to what you term "nominal design conditions" be adequate to protect the safety of the plant for all accident scenarios for 20 minutes?

A (WITNESS WALSH) You are saying with auxiliary feedwater, emergency feedwater unavailable for 20 minutes; is that right?

Q That's correct.

A (WITNESS WALSH) Making some other assumptions, the emergency safeguards high-pressure injection system was functional and operating during that time, yes. The plant would have been safe from -- or at least to the best of my knowledge -- safe from all postulated accidents during that period.

(Counsel for the Commonwealth conferring)

BY MR. ADLER:

Q At page 5 of your testimony, you introduce your testimony on the procedures which have been added since the TMI-2 accident. You say, "Procedures have been instituted in the following areas since the TMI-2 accident to verify the operational readiness of the engineered safeguards features systems and ESW systems." Are all of these procedures new?

A (WITNESS TOOLE) The procedures are not new. These are additions and changes to existing procedures. The engineered safeguard features checklist is in addition to the operator turnover procedure.

Q Before you go too far, what I am getting at is I would like a more clear definition for each of these four areas of procedures, of how these procedures supplement the procedures that existed at the time of the TMI-2 accident.

MR. BAXTER: Let me make sure we don't have a semantics problem. Mr. Adler, when he uses the word "procedure," I think, is not meaning it in the strict sense of a new operating procedure number and title, but a new function or exercise. Is that correct?

MR. ROBERT ADLER: That's correct.

WITNESS TOOLE: What we identify here is new.

BY MR. ROBERT ADLER:

Q Everything here is new? In that case, can you briefly describe the administrative procedures that existed at the time of the TMI-2 accident and why you thought they were deficient?

DR. JORDAN: I didn't get the question.

MR. ADLER: I will withdraw that question. Let me ask it this way.

BY MR. ROBERT ADLER:

Q Can you describe the major differences between the administrative procedures that existed at the time of the accident and these procedures, and have they have improved as a result of the change?

A (WITNESS TOOLE) Prior to the accident, administrative procedures required an operator turnover. What it did not have was a checklist that would require an operator to go completely through the status and establish what the conditions are to the plant and sign off that this is the status and use that checklist to turn over to the oncoming shift that this is what your status is.

Prior to the accident, that would have been a verbal discussion. It would not have been as complete or as systematic.

On valve controls, prior to the accident, when we did a test, surveillance tests or ISI tests, we would run the test, and when the test was completed we would have been finished. We have now made additional requirements in a procedure that, prior to running the A system for tests or removing the A system from service, we would verify by monitoring these individual components for position to ensure that the redundant side is prepared to go into operation if we did have a problem.

When the tests or the surveillance is complete, we have added to the procedure a second redundant verification to ensure that everything has been restored properly per procedure.

Q How many people are responsible for each of these procedures? Is it just one operator who does it? Or is there a double checkoff?

A (WITNESS TOOLE) That is what I mean by a double checkoff. The procedure could be run by one individual operator that started and finished on the same shift. That operator would run the completed procedure. When he was finished, he has a page in the procedure that he would take out, hand to another operator, who would then go through the various components that were operated, and verify that they were restored to the proper position.

So the operator who ran the test would have signed off and verified that he restored the components to the proper position, and someone else would also sign off a checklist that verified the components were restored to their proper position.

Q Let's go to the change-of-shift procedures. Is that performed by one operator on each side of the shift, or two operators on each side of the shift?

A (WITNESS TOOLE) It is the responsibility of the operator who was on shift and his shift foreman to prepare that properly. They both signed that. The people who come in when it is reviewed with them, they sign it.

Q For the incoming shift, do all of the operators on the incoming shift have to read the verification list, the status list?

A (WITNESS TOOLE) The licensed control room operators would all verify that they understood the condition of the plant.

MR. ROBERT ADLER: Mr. Dornsife will continue the questioning.

BY MR. DORNSIFE:

Q I have one additional question concerning ECNP 1C Contention. On page 10 of your testimony, the last paragraph, the first sentence, you say that, "All valves which are required to respond automatically to an ESFAS signal have special indications on a dedicated control panel." My question is: Do those valves include all of the valves that are manually -- in the safeguard systems -- that are manually controlled from the control room?

A (WITNESS WALSH) No. I am not sure what you mean, "manually controlled."

Q That the operator has an ability to change their position from the control room. Is that included on that list?

A (WITNESS WALSH) That is not a list, that is actually --

Q The status panel.

A (WITNESS WALSH) Most of those valves, I think, in almost all those valves, are just the valves that receive a signal to operate during the actuation.

Q So there may be some valves controlled from the control room that may not be on the status panel?

A (WITNESS WALSH) That's correct.

Q Their position indication would be the positive position indication, as indicated in the testimony above, a stem position readable in the control room in some other status panel?

A (WITNESS WALSH) Yes. One of the main control boards from where they were controlled.

Q It would be a mimic bus?

A (WITNESS WALSH) It would depend on the controls. Some of them are mimic buses; some are just labeled as the type of control.

Q For those valves that are automatically actuated or change position automatically, does the operator have the ability in the control room to operate those valves if they don't function, if the status panel says they haven't gone to the proper position?

A (WITNESS WALSH) Yes.

MR. DORNSIFE: I have no further questions.

CHAIRMAN SMITH: Mr. Cutchin.

MR. CUTCHIN: I have one or two questions.

BY MR. CUTCHIN:

Q Gentlemen, in your opening discussions, you were discussing the fact that the diesel generators were blocked out early during the TMI-2 accident. And you, I believe, stated that the operators could have been aware of that by some sort of annunciation in the control room. What is that signal based on? What is it developed from? Rack position or something else?

A (WITNESS TOOLE) In Unit Number 2?

Q In Unit Number 2.

A (WITNESS TOOLE) I am not sure.

A (WITNESS WALSH) The particular alarm that was annunciated was a diesel overspeed trip alarm. I don't know if that is directly derived from tripping the fuel racks or if it was from some other alarm. At least, that was the alarm listed in NUREG-0600.

A (WITNESS TOOLE) I thought the question was physically is it a valve that we closed at the diesel or a lever that eliminates the fuel to the diesel? The diesel overspeed alarm in Unit 2 comes in from a number of alarms that are actuated by various things at the diesels, one being an overspeed trip.

Q I had understood you to say that the diesels had been blocked from starting by virtue of having had the fuel racked out, if you would.

A (WITNESS TOOLE) The fuel was shut off to the diesel.

Q And that would have -- something would have been generated, a signal that would have been annunciated somehow in the control room, but you are not certain of what the exact source of that signal was?

A (WITNESS TOOLE) That's correct.

MR. CUTCHIN: Thank you.

CHAIRMAN SMITH: Is that your only question?

MR. CUTCHIN: That's my only question.

(Board conferring)

BOARD EXAMINATION

BY DR. JORDAN:

Q I notice on page 2 of your testimony you state, "The emergency feedwater system is not classified as a safety system." Are there any plans to make it -- change its classification, upgrade it to be a safety system?

A (WITNESS WALSH) I believe there are some plans for upgrading the feedwater system. I am not sure whether it will be fully safety-grade. I have to refer to what the Restart Report says.

DR. LITTLE: You would have to refer -- I didn't understand.

WITNESS WALSH: I have to check the Restart Report to see what was listed in there as far as what upgrades were planned. I am not sure whether those upgrades would make it fully safety-grade or not.

MR. BAXTER: We introduced a lengthy exhibit in association with the Board question 6, Licensee's Exhibit

15, which describes both the pre-restart and the long-term modifications that are being planned for the emergency feedwater system, which supplemented the Restart Report, essentially pulled it all together in one place.

DR. JORDAN: You did. And the answer, you say -- one of the things that you have submitted already?

MR. BAXTER: Yes, sir. I don't know if you recall the witnesses Capodanno, Lanese, and Torcivia. They presented that exhibit.

DR. JORDAN: In view of the fact that I believe there is a commitment to upgrade, I am kind of wondering why it is that you make a point that the feedwater system is not a safety system.

WITNESS WALSH: I guess the point was that in the Contention it said that had there been a 1.47 system installed at the time of the accident, it would have prevented the closure of the block valve.

The only point made here was that the feedwater system at the time it was installed was not considered safety-grade and probably would not have met the full requirements of 1.47. I guess that is not really an important point at this stage of the game.

CHAIRMAN SMITH: Could you change that sentence to better reflect the circumstances prevailing today? Do you think that's an accurate statement?

MR. BAXTER: The witnesses were responding to the first sentence in Contention 9, which says a safety system was rendered inoperable at the accident. They are saying that the accident, at that time that was not classified as a safety system, we are going to upgrade it in the long term.

DR. JORDAN: It wasn't classified as a safety system at that time.

MR. BAXTER: That's right.

WITNESS WALSH: It does not mean that we don't intend to upgrade it.

CHAIRMAN SMITH: My only concern is I have, in other proceedings, seen sentences like this arise in proposed findings in places out of context. This sentence is one that is amenable to be taken out of context and cited incorrectly or for the wrong purpose. However, I think there is enough surrounding it that there is no long-term concern on it.

MR. BAXTER: We could make it past tense.

CHAIRMAN SMITH: That comports with the purpose of the testimony.

MR. BAXTER: Yes, it does.

Would you like to amend it?

WITNESS WALSH: I would like to amend my testimony to say that on page 2, the third sentence, to read: "First, emergency feedwater system was not classified as a safety system" rather than "not is classified as a safety system."

DR. JORDAN: That helps.

BY DR. JORDAN:

Q I gather your position is that TMI-1 does not have a status panel and, in your view, should not have a safety status panel, that the emergency -- the procedure is a better way of doing business?

A (WITNESS TOOLE) TMI-1 has a status panel. It does not have a status panel on a system level as required by Reg Guide 1.47.

Q Would you review for me now what the status panel now has, what it is like and what it does now have? And then I will perhaps ask a few questions about what it would take to make it a fully compliant status panel.

A (WITNESS TOOLE) The status panel has lights to indicate the logic system as to whether it is in an ES status or a non-ES status.

Q Of all emergency systems?

A (WITNESS TOOLE) When I speak of the logic system, I mean the electrical logic system which would initiate the components that would -- such as the pumps and valves that would align and start to perform the ES function -- electrical logic system, the bystables, the relays. For each relay there is a light on a local panel. The computer knows whether there is power to each relay on the level of

ES channel A there is an alarm that would say --

A (WITNESS WALSH) There is a not-bypass alarm and a not-reset alarm.

A (WITNESS TOOLE) And a trouble alarm. And if a component were to lose power, you would have an ES trouble alarm. So the status panel has lights to indicate that you have power applied properly. And it has lights to indicate the position of the components that are involved.

Q I need a little help in the way of an example, I guess.

A (WITNESS TOOLE) Let me provide an example. The low-pressure injection system draws water from a tank through a valve to a pump, through another valve that would go to the vessel. What we have is we have indication of the position of the suction valve, which is a motor-operated valve. We have an indication that the pump is powered and prepared to start.

Q By powered, if it is powered, why doesn't it run?

A (WITNESS TOOLE) We have an indication in the control room that indicates that the breaker is racked in and we have control power applied to the pump, to the motor, indicating that upon an ES signal the logic would complete and the pump would start.

Q You mean the breaker would close?

A (WITNESS TOOLE) The breaker would close.

Q And then the breaker closes, and then there are some further valves?

A (WITNESS TOOLE) There is a discharge valve that has a light in the control room that would be green. And when the valve received the ES signal to start, the valve would open and the light would go to red.

What we don't have is what Reg Guide 1.47 is asking for, is that we would have those three contacts tied together through a logic that has another annunciator, that if one of those is not in a correct position it would say that the decay heat system is not properly aligned.

Q Wouldn't it also, the logical system of 1.47, wouldn't it also require, say, that that assures that there is an oil supply for the pump, that there is power available to generate the oil supply or whatever is required? Isn't it a lot more extensive, in other words?

A (WITNESS TOOLE) On an oil supply, if you were to look at something like the diesel generator, it has an oil reservoir that supplies oil and it has a level switch on it that indicates whether you have the proper amount of oil in there. Since we -- let me retract that.

If that level switch were a switch that we took out of service once a year to callibrate or to check, that would have a contact in the logic string. If that switch were not taken out once a year, out of service once a year, it would not be in the logic string.

Q Isn't that an inadequacy of 1.47 you are pointing out, rather than because you probably don't have -- or do you read the level of the supply? Is that indicated on your status panel?

A (WITNESS TOOLE) We have an operator monitoring the level, making a daily tour on which he would monitor the level.

A (WITNESS WALSH) There is also an alarm on the tank.

A (WITNESS TOOLE) There is also an alarm on the tank.

Q A low-level alarm?

A (WITNESS TOOLE) Yes.

A (WITNESS WALSH) The point you are trying to make is that the subsystems are available. Like for the example that Mr. Toole gave, that if the low pressure injection pumps are operable, they require -- in some modes of operation, they require coolant water supplied by a closed cooling water system, which is cooled by another river water system.

Those pumps are indicated on this panel. If they are required to start for an ES to support the system -- and some systems, they are not required. In some cases they aren't required. But if they were required to run, then the fact that that pump had reached its ES position, this particular panel would, the light would turn from yellow to blue when the actuation occurred.

Q On the panel you are talking about?

A (WITNESS WALSH) The ES status panel, yes, sir.

A (WITNESS TOOLE) On cooling water to a component, there would be an alarm that would define whether we had insufficient cooling on a bearing. There would be an alarm to indicate the bearing reached a high temperature had you not had cooling.

Q The would be an alarm?

A (WITNESS TOOLE) That's correct, on an individual component level.

Q Yes. Are you saying you do have a status panel, that it presents essentially as much information as would be required by 1.47, but it does not integrate the information in the manner required by 1.47 to sum it all together? Is that the chief difference?

A (WITNESS TOOLE) We have a panel and it does not satisfy Reg Guide 1.47.

Q You have a panel that what?

A (WITNESS TOOLE) We have a status panel and we have individual components indicated in the control room, which do not satisfy Reg Guide 1.47. What Reg Guide 1.47 is saying is that to have component level indication alone is not satisfactory.

Q All right. You do have the component level information, which is what would be required in order to tell you whether the system itself was ready to start, as required by 1.47. But you don't have it all put together into a logic system?

A (WITNESS TOOLE) That's correct.

Q Is that the chief thing that is lacking or is Reg Guide 1.47 requiring additional information that you do not have in your component system?

A (WITNESS TOOLE) There would be some additional information that we would have to provide to the control room.

Q I see. And that additional information is now being provided by the operator going from point to point and making a status check, is that it?

A (WITNESS TOOLE) That's correct. We have valves that are operated more than once a year, that are manual valves, that do not have a position switch on them. What we are doing presently is we put that valve in the position required to support an ES alignment, and we put a chain lock on it and we lock it, and we administratively maintain it locked. And we periodically visually look at it and make sure that it is still there and still locked in the correct position.

BY CHAIRMAN SMITH:

Q Do you have any physical indicator? For example, you lock a valve and take from the valve a device that you hang in the control room that can be seen in the control room, a physical tag, or anything of that nature?

A (WITNESS TOOLE) We don't have a status board. We have a locked valve listing which indicates which valves are locked closed or locked open. That is maintained in the control room .

BY DR. JORDAN:

Q Getting back to the emergency feedwater system, in the contentions what did you have and what will you now have with respect to those valves that were closed?

A (WITNESS TOOLE) The valves that were closed in Unit No. 2 do not exist in Unit No. 1.

Q That is the ideal way to take care of it.

(Laughter.)

Q I'm not being facetious.

Of course, there are still some valves that have to be closed in order to take a system out for maintenance or for testing.

A (WITNESS TOOLE) That's correct. A valve that had to be closed for testing -- and we have those valves -- our test procedure would be such that when that valve was closed there would be a step in the procedure that would designate the closed set valve. When the procedure was completed or prior to the completion of the procedure, at the end there would be a point at which there would be a step that said to open that valve.

In addition to that, there is a separate sheet at the back of the procedure that lists every component that will be manipulated during performance of that procedure. That is given to another operator who independently goes out and verifies that that valve has returned to the correct position.

A (WITNESS WALSH) There is one more difference in the two test procedures. In the specific example of the Unit 2, they closed both those valves for testing either of the three pumps. This particular test procedure only closes a valve on the discharger pump.

So even if they did not reopen that valve, both the steam-driven pump and the other motor-driven pump would still be available.

Q Would 1.47 require any indication of the position of those valves -- rather, not an indication of the valves, but would the position of those valves show up on the status panel?

A (WITNESS TOOLE) What would show up on the status panel would be one window that says emergency feedwater system A is in a correct alignment or is not in a correct alignment, one or the other.

Q That does not show up at present on your status panel?

A (WITNESS TOOLE) That's correct.

Q As a matter of fact, do those valves show up during this maintenance procedure?

A (WITNESS TOOLE) The valve we would close to perform the emergency feedwater motor-driven pump testing, there is a valve for each one of those pumps that would not show up.

(Pause.)

Those valves in themselves would only disable one electric-driven pump.

Q I guess then, in view of that, I have a little trouble reconciling your statement that your administrative procedure is better.

A (WITNESS TOOLE) I think that the administrative procedure is more complete, in that the Reg Guide 1.47 is written to cover the incident where that valve is the specific valve that you left in the incorrect position. We have looked at many more combinations of events that could have occurred, and what we are looking at is more of the system. We are looking at components of the system that are not operated only once a year.

Q Doesn't that mean, however, again that what you are pointing out is a deficiency of 1.47? Or is it just impossible, with a system such as being envisioned by 1.47, to have put in that detail?

A (WITNESS TOOLE) It is not impossible. It is a matter, as you said about the emergency feedwater valves, the best way to not have the problem with them is to just not have them. We are looking at how is the best way to prevent having the problem that we are trying to prevent and countering.

What we feel is the best way is by operator involvement in ensuring that we are cognizant of where the components are in the plant, what position are they in, and are they prepared to run.

BY CHAIRMAN SMITH:

Q Mr. Toole, the impression I get from that analysis is that you are giving it an either or an or evaluation, that compliance with 1.47 would preclude operator involvement with individual components.

A (WITNESS TOOLE) I don't think that is true. What Reg Guide 1.47 would do is, the operator would then be required to look at each individual component, and then he would be required to look at that one more annunciator. If we had that annunciator, we do not believe that that would be the answer to not having the operator make the complete review of the system's status.

BY DR. JORDAN:

Q Even if you had 1.47, you would say that some of the things you are now doing would be required in addition?

A (WITNESS TOOLE) We would do it the same way and add one more item on the bottom of the line that said, look at that annunciator and make sure that that is lighted or unlighted.

A (WITNESS WALSH) Another objection is, I have a strong feeling about increasing the circuit complexity of that power plant. It is another thing that the operator will have to be cognizant of. It is another circuit in there that has to be installed and tested. It has to be periodically tested by the operator. It will require more knowledge on his part. It will require more general complexity of the plant.

I think that is the wrong way to go in design of nuclear power plants.

Q I don't understand the circuit complexity. If the information is available on the present status panel, say, to put that information together now with a logic diagram and sum it in a single warning light or whatever, it seems to me a pretty simple circuit.

A (WITNESS TOOLE) The information is not all available at this time.

Q But isn't that the deficiency, the point of the deficiency at the present, the fact that the information isn't all available? You do have to go and get it piece by piece with the operator.

A (WITNESS WALSH) It requires less indication in the control room. One of the facets of control room design is, in trying to keep it simple enough, you don't put information in the control room that the operator doesn't need to make a decision on a regular basis.

Q I agree. But in a certain sense, I guess I thought that was an advantage of 1.47. You could leave out an awful lot of lights that you have on your present status panel, and you have one light, and if that light is lit he is not troubled, he knows it. And he doesn't have to look at 50 alarms across to see.

A (WITNESS WALSH) He still needs the indication. He operates those controls from the control room. When he operates the valve, he has to have an indication of whether it is open or closed. So the indicators would still be there.

Right now I guess we are serving a dual purpose. On some of those indicators, there are already two indicators in the control room, one on the ES status and one under local control. We can never move the local control lights on a pump or a valve. You would still have to have that.

We are adding to that switch in the circuit. If that goes to a pull lock and it is not now presently indicated on an annunciator, we have to run another set of wires into that switch and put them into a logic circuit of some sort. You are talking hundreds of components here. That is a considerable amount of electrical complexity.

A (WITNESS TOOLE) Each alarm we put in the control room we expect the operator to know what it is and to know what the response is if that alarm came in. And if we put that alarm in, we would expect the operator to remember what all the inputs are that would cause that alarm to come in, which would be quite a complicated alarm.

Q You really do feel professionally that the system you are proposing for TMI-1 is better than that proposed by Reg Guide 1.47? Both of you feel this way?

A (WITNESS TOOLE) Yes, I do.

A (WITNESS WALSH) I believe so.

Q However, be that as it may, is there not an action plan requirement for essentially a status panel which would essentially meet 1.47? Is that not one of the action plans that would be required for operating reactors?

A (WITNESS WALSH) I don't believe it is.

A (WITNESS TOOLE) In new reactors.

Q All right. Well, I am thinking now of --

A (WITNESS WALSH) Are you referring to the reference to 0696, which talks about a safety system display, safety parameter display panel?

Q In part I am. I was first going to refer you to the 0660, task 1-D on control room design. I guess that is true.

Part 2 under that is the plant safety parameter display console. Now, does that do the job required by 1.47 or are those distinctly separate things?

A (WITNESS WALSH) I view those as distinctly separate things. The concept so far in that type of a system -- and I really hesitate to call it a panel as such. Some people propose a panel, some people propose a system. Right now it is a concept whereby I think the idea is that the operator will have in one place or have functions available in the control room where he can evaluate the critical safety functions, however people define them.

Most of the vendors have come up with concepts, and we have done work in that area, but we have not defined specifically one single system or panel that performs this function. I think it is a separate thing from this contention.

Q You believe that the status panel -- that even if you had your system, you would still want your status panel and your controls that you have at present?

A (WITNESS WALSH) Even if we had which system?

Q The parameter display system?

A (WITNESS WALSH) We would still need, I think, the engineered safeguards panel or, if Reg Guide 1.47 was required to be implemented, it would be a separate system.

MR. CUTCHIN: Dr. Jordan, you may or may not have been thinking about task 1D. I believe it is 3 on page

1.D-4 which addresses the safety systems status monitoring directly and refers to Reg Guide 1.47 and discusses the then-planned schedule for initiating a study as to whether to require backfitting of Reg Guide 1.47, on page 1.D-4.

That is in NUREG-0660. The one page I have before me is dated May 1980 and has a task 1.D in the upper righthand corner.

DR. JORDAN: Are you looking now at 0660?

MR. CUTCHIN: That is the task action plan. I believe the page I have is labeled 1.D-4.

DR. JORDAN: Safety system status monitoring, item 3.

MR. CUTCHIN: Yes, and it refers to the plans for studying the necessity for requiring implementation of Reg Guide 1.47, which is the matter we are talking about.

DR. JORDAN: Thank you, I had overlooked that.

(Pause.)

(Pause.)

MR. BAXTER: I have been looking at -- you're talking about task 1.D-1. I have been looking at the discussion in NUREG-0737. I don't see the reference to Regulatory Guide repeated in that clarification.

DR. JORDAN: I think you're right. I also noticed. I looked first at 0737 and did not see it. Otherwise, I might have been triggered, yes.

MR. CUTCHIN: The reason you probably didn't see it, as I read the item in 0660, the study to decide whether or not is not to take place until quite some time in the future.

DR. JORDAN: Yes. Under the resources for the first year, it is estimated to be .5 man-years by NRR, which doesn't sound that NRC is putting a high priority on it. And I gather that the Licensee is not going to put a high priority on it, because he already feels that he has a better system.

I will talk to the staff witnesses about their priority later.

(Board conferring.)

BY DR. JORDAN:

Q One question with respect to your testimony on ECMP 1C. Are you familiar with a letter from the Chairman of the ACRS, Mr. Plesset, to NRC Chairman Ahearne, dated December 11th, 1980, in which there is a recommendation -- and I will read it to you. It goes as follows, quote:

"The Committee believes there is a need for instrumentation to monitor the position -- that is, open or closed -- of the pressurizer, PORV, and safety valves in an unambiguous manner. The sensitivity of the currently proposed method to monitor valve position remains an open issue between the staff and the Licensee. This matter should be resolved in a manner acceptable to the staff prior to restart." Quote.

Now, two or three questions on that. First of all, is it true that the staff has not approved of your proposed indication of position of PORV?

A (WITNESS WALSH) I don't know.

A (WITNESS TOOLE) I thought that the position indication -- that our method of providing position indication of that valve was acceptable.

Q I was rather of that opinion too, so I will reserve that question for the staff, who is hereby forewarned.

Will you now address the substance of this, namely that the sensitivity of the currently proposed method to monitor valve position is inadequate?

A (WITNESS WALSH) The valve -- I'm not an expert on the PORV, but the modification that is being installed is mainly based on indicating the flow rate of the downstream -- downstream of the valve. And its sensitivity I believe is rated at 10 percent of rated flow of the valve.

In addition, the PORV has an accelerometer attached to it, which will indicate the vibration of an open or closed flow through the valve. I am not sure about the sensitivity of that. That is a backup method.

I guess in my opinion, if the 10 percent number is correct, and I think it is in that ballpark, I would think it would be adequate. It is certainly not going to indicate small leakage and that is not what it was designed for. But it will indicate whether the valve is open or closed.

10 percent flow is certainly --

Q It will indicate whether the valve is closed below 10 percent; is that right?

A (WITNESS WALSH) If indeed the valve is linear, that is correct, yes, sir.

Q Do you know about the accelerometer?

A (WITNESS WALSH) That is backup. That would have to hav some flow. I don't consider that as unambiguous a means of indication. It was only installed as a backup method.

Q You agree that there is not at the moment an unambiguous indication of the valve's position?

A (WITNESS WALSH) I have always considered it a better indication of the valve's position, the fact that whatever the valve control indicates -- in this case it's flow.

Q That's a pretty good answer. Apparently there has been a recent meeting between -- in which GPU and I gather B&W met with the ACRS and discussed this. Were you involved in that?

A (WITNESS WALSH) I wasn't present.

A (WITNESS TOOLE) Neither was I.

BY DR. LITTLE:

Q On page 5 of your testimony, in the first full paragraph, it indicates that, besides these features, procedures have been instituted. I understand you to say that these are not new procedures, but modifications to existing procedures?

A (WITNESS TOOLE) That's correct.

Q How many operating procedures are involved in that? Four or 40? How many have been modified to take care of this?

A (WITNESS TOOLE) I would say there was closer to a number like 100.

A (WITNESS WALSH) That involves only to the case where we are talking about verification of surveillance prior to or after new maintenance. That means each individual surveillance test procedure. The other three controls here are really implementation of an administrative procedure.

Q Are these already in operation? The statement is that they have been instituted, which is past tense. So this means that all of these are presently in use? The thing that confuses me, if you look under number one, it is present tense; number two it is present tense; number three it is future tense; number four is future tense. And the leadoff sentence is past tense. That's my confusion.

A (WITNESS TOOLE) Number one, we have established the checklist. Number two, we have established the valve controls. Number three, we have established a log sheet which we are not totally satisfied with those yet. It is not what I would consider a finalized log sheet. One and two are complete.

Item four, when we are talking about the administrative procedures, we are talking about somewhere in the neighborhood of five or six procedures. When we get to item four and we talk about the surveillance procedures and the maintenance procedures, we are talking in the neighborhood of 100 procedures.

At this point in time, we have not gone back and made a review to ensure that we have done all of the procedures exactly how we wanted them to be done.

Q When do you anticipate this will be completed?

A I would anticipate that we will complete this portion of our procedure review by April 1st.

Q '81? Of '81?

A (WITNESS TOOLE) 1981, yes.

Q On page 10 there is a statement down about four lines into the first full paragraph that there will be feedwater flow instruments which will give a direct indication of whether or not water, in this case, is flowing. What kind of feedwater flow instruments are these?

A (WITNESS WALSH) Those are going to be differential pressure applied to a Venturi meter or an orifice that will -- that are being installed as part of the restart modification.

Q Where is the readout for these?

A (WITNESS WALSH) On the main control room board panels CC and CL.

Q I can't hear you?

A (WITNESS WALSH) CC, CL, the center console, the right console. There is the emergency feedwater valve controls there, and the pump controls, and the instruments will be right next to them.

Q Is this yes-no or how much flow? Are they quantitative?

A (WITNESS WALSH) They are quantitative. They are analog meters.

Q Continuous readout or on demand?

A (WITNESS WALSH) Continuous. They will usually be reading zero, because of the system.

(Pause.)

CHAIRMAN SMITH: Any other questions of this panel from anyone?

(No response.)

CHAIRMAN SMITH: You are excused, gentlemen. Thank you.

(Witnesses excused.)

MR. CUTCHIN: Can we take a short break before we put on the staff's witnesses?

CHAIRMAN SMITH: I have received Mr. Lewis' cross-examination plan. I would expect it to be a short cross-examination.

I am wondering what type of hardship would be imposed if we took the filtering panel from the Licensee and the staff out of order.

MR. CUTCHIN: How much time do we anticipate questions on the staff's panel on ECNP 1C and UCS 9?

DR. JORDAN: It won't be long. But on the other hand, we will finish it this afternoon.

MR. CUTCHIN: I don't see what is to be gained by changing the order. I will tell you quite frankly, Mr. Chairman, I would just as soon proceed in the order with the witnesses as planned, if indeed we are going to finish both sets this afternoon.

CHAIRMAN SMITH: The only consideration I can see that should be weighed is that we can assure all parties that we will stay until everything is done. Mr. Lewis is traveling by bus from Philadelphia. He is going to have a short examination.

I am just counting numbers. There are four compared to two on that panel. However, you seem to have a strong reason for it.

MR. CUTCHIN: If we have assurances that we will finish with these witnesses today, then I will not object. I think it is just a matter, if you are saying you wish to accommodate Mr. Lewis because of his travel plans, then that is up to the Board.

CHAIRMAN SMITH: As it turned out, his car was broken. He had to come here by bus. I wouldn't look forward myself to trying to make my way back to Philadelphia tonight by public transportation either.

MR. CUTCHIN: Then we will need about ten minutes to get ready.

CHAIRMAN SMITH: Does anybody object to that procedure and the commitment that we will finish tonight?

MR. BAXTER: No.

CHAIRMAN SMITH: All right.

CHAIRMAN SMITH: Mr. Adler?

MR. ROBERT ADLER: I was going to say no.

CHAIRMAN SMITH: All right.

(Recess.)

MR. CUTCHIN: Mr. Chairman, both of these witnesses have previously been sworn.

CHAIRMAN SMITH: Proceed.

Whereupon,

DONALD F. SULLIVAN

BRUCE A. BOGER,

called as a witness by counsel for the NRC staff, having previoously been duly sworn by the Chairman, were examined and testified further as follows:

DIRECT EXAMINATION -- RESUMED

BY MR. CUTCHIN:

Q Mr. Sullivan, do you have with you a copy of a document consisting of four pages and entitled "NRC Staff Testimony of Donald F. Sullivan Regarding Bypass and Inoperable Status Indications (UCS Contention 9)"?

A (WITNESS SULLIVAN) I do.

Q Is that four-page document accompanied by a two-page statement of your professional qualifications?

A (WITNESS SULLIVAN) Not the particular copy I have, but I do have a copy of my professional qualifications.

Q That has been provided to the reporter?

A (WITNESS SULLIVAN) Yes.

Q Did you prepare both of these sets of documents?

A (WITNESS SULLIVAN) Yes.

Q Are there any corrections which you wish to make to this particular document?

A (WITNESS SULLIVAN) No.

Q Are they true and correct to the best of your knowledge and belief?

A (WITNESS SULLIVAN) Yes.

Q Do you adopt them as your testimony on UCS Contention in this proceeding?

A (WITNESS SULLIVAN) Yes.

Q Do you also have before you a document labeled "NRC Staff Testimony of Donald F. Sullivan Regarding Derivation of Instrument Input Signals (ECMP Contention 1C)" consisting of six pages?

A (WITNESS SULLIVAN) Yes.

Q Was that document prepared by you?

A (WITNESS SULLIVAN) Yes.

Q Are there any corrections you wish to make to that document?

A (WITNESS SULLIVAN) Yes, there is one correction. On page 5 of the document, the second line from the top presently reads, in quotes, "primary system pressurizer pressure." I wish to change that entry. I wish to delete the second entry and eplace it with, quote, "reactor coolant system pressure."

MR. CUTCHIN: That correction appears in the reporter's copy, Mr. Sullivan's testimony on ECMP Contention

1C, and the correction appeared on page 5.

CHAIRMAN SMITH: Would you give me the correction again?

WITNESS SULLIVAN: On page 5, the second line reads "primary system pressurizer pressure." I wish to delete that second entry that I just quoted and replace it with, quote, "reactor coolant system pressure."

BY MR. CUTCHIN: (Resuming)

Q As corrected, as that correct to the best of your knowledge and belief?

A (WITNESS SULLIVAN) Yes, it is.

Q Do you adopt it as your testimony on ECNP Conten ion 1C in this proceeding?

A (WITNESS SULLIVAN) Yes.

Q Mr. Bolger, do you have before you a copy of a document entitled "NRC Staff Testimony of Bruce A. Boger Regarding Bypass and Inoperable Status Indications (UCS Contention 9)"?

A (WITNESS BOGER) I do.

Q And is that accompanied by a two-page statement of your professional qualifications?

A (WITNESS BOGER) Yes, it is.

Q Were these documents prepared by you?

A (WITNESS BOGER) Yes.

Q Are there any corrections which you wish to make?

A (WITNESS BOGER) Yes, I would like to make two corrections. The first is on page 5, line 5. The word "shift supervisors" should be changed to indicate "shift foremen."

MR. CUTCHIN: These corrections have also been made in the reporter's copy, Mr. Chairman.

CHAIRMAN SMITH: One moment.

(Pause.)

MR. CUTCHIN: In the package which you have, Mr. Chairman, Mr. Boger's testimony is bound together with Mr. Sullivan's testimony on UCS Contention 9 and would appear at the back of that package.

(Pause.)

WITNESS BOGER: I have a second correction to make. On page 10, on the fifth line from the top, after the word "operational" should appear the word "readiness."

BY MR. CUTCHIN: (Resuming)

Q As corrected, is this testimony correct to the best of your knowledge and belief?

A (WITNESS BOGER) Yes, it is.

Q And do you adopt these documents as your testimony in UCS Contention 9 in this proceeding?

A (WITNESS BOGER) Yes, I do.

MR. CUTCHIN: I ask that the documents just identified be received into evidence and bound into the transcript, along with the outlines accompanying them.

CHAIRMAN SMITH: No objections; the testimony is received and bound into the transcript.

(The testimony of Donald F. Sullivan and Bruce A. Boger, with the attachments referred to, follows.)

Lay #2

OUTLINE

This testimony of Donald F. Sullivan and Bruce A. Boger contains the NRC Staff's response to UCS Contention 9.

The purpose of this testimony is to demonstrate that, contrary to the assertions made in the contention, a bypass and inoperable status indication system meeting the guidelines of Regulatory Guide 1.47 or equivalent is not required to adequately protect the health and safety of the public.

Conclusions to be drawn from this testimony:

-- The design provisions of Regulatory Guide 1.47 are intended to aid operators in maintaining an awareness of the bypass, or other deliberately induced inoperability of safety system(s).

-- TMI-1 is not required to conform to the provisions of Regulatory Guide 1.47.

-- The Licensee has not volunteered to install a "bypass and inoperable status" system that conforms to Regulatory Guide 1.47.

-- The Staff is presently conducting a study to determine whether to require plants such as TMI-1 to conform to Regulatory Guide 1.47, but a decision will not be made until 1982 or later.

-- Pending completion of the study and a backfit decision, the Staff has required licensees to improve their administrative controls for removing safety systems from service for maintenance and returning them to service.

-- Met Ed has complied with those requirements at TMI-1.

-- The strengthened administrative controls do not provide information to the operator equivalent to that which would be provided by conformance to Regulatory Guide 1.47.

-- The upgraded administrative controls provide reasonable assurance of no undue risk to public health and safety.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
METROPOLITAN EDISON COMPANY, et. al	)	Docket No. 50-289
	)	
(Three Mile Island Nuclear Generating Station Unit 1)	)	

NRC STAFF TESTIMONY OF DONALD F. SULLIVAN
REGARDING BYPASS AND INOPERABLE STATUS INDICATION

(UCS Contention 9)

Q 1. Please state your name and position with the NRC.

A. My name is Donald F. Sullivan. I am a Senior Nuclear Engineer assigned to the Reactor Systems Standards Branch, Office of Standards Development. From July 1979 to September 1, 1980, I was temporarily assigned to the Instrumentation and Control Systems Branch, Office of Nuclear Reactor Regulation.

Q 2. Have you prepared a statement of professional qualifications?

A. Yes. A copy of this statement is attached to this testimony.

Q 3. Please state the nature of the responsibilities you have had with respect to the Three Mile Island, Unit 1 restart program.

A. I prepared the responses to UCS Interrogatories 67, 83, 85, 86, 88, 89, 90, 91, 92, 93, 94, 95, 97, and 98. These Interrogatories and responses include those pertaining to UCS Contention 9.

What is the purpose of your testimony?

The purpose of my testimony is to respond, in part, to UCS Contention 9. Specifically, my testimony supplements that of Mr. Bruce Boger, NRC.

Q 4. UCS Contention 9 states:

A. "The accident at TMI-2 was substantially aggravated by the fact that the plant was operated with a safety system inoperable, to wit: two auxiliary feedwater system valves were closed which should have been open. The principal reason why this condition existed was that TMI does not have an adequate system to inform the operator that a safety system has been deliberately disabled. To adequately protect the health and safety of the public, a system meeting the Regulatory Position of Regulatory Guide 1.47 or providing equivalent protection is required."

This Contention is limited to core cooling, containment isolation, and emergency feedwater systems.

Q 5. What is the purpose of Regulatory Guide 1.47?

A. Regulatory Guide 1.47, "Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems," was issued in May 1973. The design provisions called for in the guide are intended to aid the operators in ensuring that they are aware of the bypass, or other deliberately induced inoperability, of a safety system (or systems). Its development was prompted by experiences at operating plants which had indicated that, when the measures used to indicate inoperable status consisted solely of the then current administrative procedures, the operator was not always fully aware of the ramifications of each bypassed or inoperable component.

Prior to the development of this guide, emphasis on the various "inoperability" or "bypass" conditions was placed only on indication (e.g., by light, alarm, or a "tagging" procedure) that a specific component was inoperable without reference to the system involved or to any other redundant system. For example, assume that maintenance personnel request, and receive from the operator, permission to disable "Direct Current Bus A," an electric circuit which provides d.c. current essential to the performance of several engineered safety feature systems, e.g., "Containment Spray System A". Using an equipment-specific indicating system, there would be no indication that "Containment Spray System A" was simultaneously rendered inoperable. This could only be inferred by the operator from the indication that the "A System" d.c. bus is inoperable. Under a Regulatory Guide 1.47 design, the operator would be presented with an explicit indication that Containment Spray System A (and other ESF dependent on DC Bus A) are inoperable. Thus, if maintenance personnel should subsequently request permission to disable the redundant "Containment Spray Pump B", the operator would be explicitly alerted to the ramifications of this request.

The provisions of the guide are applicable to any portion of a safety system that is expected to be made inoperable more than once per year at times when the affected system is normally required to be operable.

Q 6. Is TMI-1 subject to the provisions of Regulatory Guide 1.47?

A. No. Nuclear power plants are subject to the provisions of only those regulatory guides whose issuance predates the plant's construction permit, unless otherwise stated in Section D, "Implementation," of the guide, or unless the Commission has backfit the guide to the plant. In the case of TMI-1, Regulatory Guide 1.47 was issued five years after the construction permit. Thus, since there is no Section D in this guide, and there has been no backfit action, TMI-1 is not subject to the guide's provisions.

Q 7. Has the licensee proposed to install a "bypass and inoperable status" indication system that conforms to Regulatory Guide 1.47?

A. No.

PROFESSIONAL QUALIFICATIONS

DONALD F. SULLIVAN

U. S. NUCLEAR REGULATORY COMMISSION

I am a senior nuclear engineer assigned to the Reactor Systems Standards Branch of the Office of Standards Development. I am currently on temporary assignment to the Instrumentation and Control Systems Branch, Office of Nuclear Reactor Regulation, performing various design reviews incident to the plant licensing process. This assignment will terminate on September 1, 1980.

I hold a Bachelor of Science degree in Physics from Holy Cross College, Worcester, Massachusetts, and a Master of Science degree in Physics from Trinity College, Hartford, Connecticut. In addition, I have studied electrical engineering, mathematics and physics at the graduate schools of Brown University, Providence, RI, and the University of Tennessee, Knoxville, TN.

I have approximately 26 years of professional experience, commencing in August 1954. During the first 9½ years, I was a member of the Instrument Group, and later the Controls Group, of the Connecticut Advanced Nuclear Engineering Laboratory (CANEL), Middletown, CT. This service included a temporary assignment of 19 months at the Reactor Controls Department, Oak Ridge National Laboratory. My responsibilities at CANEL included the design, specification and installation of various portions of the instrument and control systems for the CANEL critical assembly facilities, the Lithium Cooled Reactor Experiment and its simulator, and miscellaneous test stands.

I joined the AEC (NRC) in March 1964 and for the first (approximately) 8 years performed licensing safety reviews of the protection, control and emergency power systems of numerous commercial nuclear power stations and research and military reactors, and participated in the formulation of related standards and guides.

In April 1972, I was transferred to what is currently the Reactor Systems Standards Branch of the Office of Standards Development. In this capacity I am responsible for the development of various regulatory guides and criteria in the areas of protection, control, and emergency power system design and testing. From August 1978 to April 1979 I served as Acting Branch Chief of the Reactor Systems Standards Branch.

I am the NRC member of the IEEE Nuclear Power Engineering Committee, and participate in the Committee's development of standards for nuclear power plants.

In August 1973 I was the U. S. member of the International Atomic Energy Agency's Panel on the Code of Practice on Safe Reactor Design and Construction, held in Vienna, Austria.

I hold Patent No. 3,050,575 for the development of a special purpose thermocouple.

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
METROPOLITAN EDISON COMPANY, et. al.	)	Docket No. 50-289
	)	
(Three Mile Island Nuclear Generating Station Unit 1)	)	

NRC STAFF TESTIMONY OF BRUCE A. BOGER
REGARDING BYPASS AND INOPERABLE STATUS INDICATION

(UCS Contention 9)

Q. 1. Please state your name and position with the NRC.

A. My name is Bruce A. Boger. I am a Reactor Engineer assigned to the Operator Licensing Branch, Office of Nuclear Reactor Regulation.

Q. 2. Have your prepared a statement of professional qualifications?

A. Yes. A copy of this statement is attached to this testimony.

Q. 3. Please state the nature of the responsibilities that you have had with respect to the Three Mile Island Nuclear Stations.

A. A list of my activities is attached to this testimony.

Q. 4. What is the purpose of your testimony?

A. The purpose of my testimony is to respond, in part, to UCS Contention 9. Specifically, my testimony supplements that of Mr. Donald Sullivan, NRC.

Q. 5. Will the staff backfit Regulatory Guide 1.47 at TMI-1?

A. The backfitting of Regulatory Guide 1.47 is the subject of Sections I.D.3.a and I.D.3.b of the NRC Task Action Plan, NUREG-0660.

In summary, the staff is presently reassessing the matter of backfitting Regulatory Guide 1.47 at operating plants. The Office of Nuclear Reactor Regulation will study the need for all licensees and applicants not presently committed to the requirements of Regulatory Guide 1.47, "Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems," to monitor and verify operations, test and maintenance activities by means of an automatic status monitoring system such as that described in Regulatory Guide 1.47. This study is to be performed following a review of procedures and other nonautomatic actions to verify these activities.

The Staff position with respect to backfitting Regulatory Guide 1.47 at TMI-1 will be developed in 1982, or later, subsequent to completion of the aforementioned study.

Q. 6. What action does the staff consider necessary pending development of the staff position on backfitting Regulatory Guide 1.47?

A. Item I.C.6 of the NRC Task Action Plan, NUREG-0660, requires that the licensee's procedures be reviewed and revised, as necessary, to assure that an effective system of verifying the correct performance of operating activities is provided. In the clarification letter of September 5, 1980 (D. G. Eisenhut to All Licensees of Operating Plants), an acceptable program for this verification is described, except as noted in the September 5, 1980 letter, in Section 5.2.6 of Draft 3 of ANS 3.2 (ANSI Standard N18.7-1972), "Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants." The staff will require the licensee to comply with item I.C.6 pending development of the staff position on backfitting Regulatory Guide 1.47.

Q. 7. What is the implementation schedule on item I.C.6 of the NRC Task Action Plan?

A. The Action Plan provides that the licensee must complete this item by January 1, 1981, or prior to the receipt of a full power license, whichever is later. For TMI, this is required before restart. The Office of Inspection and Enforcement will audit the implementation of this item.

Q. 8. What additional staff requirements were issued to address the administrative controls on safety-related systems?

A. The staff requirements are outlined in IE Bulletin 79-05A, item 10, which states:

"10. Review and modify as necessary your maintenance and test procedures to ensure that they require:

a. verification, by inspection, of the operability of redundant safety-related systems prior to the removal of any safety-related system from service;

b. verification of the operability of all safety-related systems when they are returned to service following maintenance or testing; and

c. means of notifying involved reactor operating personnel whenever a safety-related system is removed from or returned to service."

Q. 9. Has the licensee complied with this IE Bulletin item?

A. Yes. The details are given in NUREG-0680, "TMI-1 Restart," pages C2-7 and C2-8 (item 10). In part, the licensee has modified its administrative controls in the areas of tagging, log entries, and surveillance testing to ensure redundant safety systems are not simultaneously removed from service. Equipment tagging and safety-related systems surveillance testing will be under the direct control of the Shift Foreman. The Shift Foreman maintains an awareness of systems status through a mandatory shift relief and turnover program which requires a review of the station logs. The modified tagging procedure, AP 1002, "Rules for the Protection of Employees Working as Electrical and Mechanical Apparatus," requires that redundant safety-related systems be tested for operability prior to removal of equipment from service. This procedure also requires the Shift ~~Supervisor~~ Foreman to sign tagging applications that remove these systems from service. In addition, log entries must be made when equipment required by Technical Specifications is taken out of service or returned to service. Those systems, permitted in a degraded mode of operation by the Technical Specifications, will be noted on the shift turnover checklists which are reviewed by the Shift Foreman. Additional information on the use of shift turnover checklists is given in NUREG-0680, "TMI-1 Restart", pages C8-54, and C8-55. Based upon the Shift Foreman's awareness of plant status and the procedural and Technical Specification requirements, redundant safety systems should not be removed from service simultaneously.

Q. 10. Have other controls been required by the staff to ensure proper safety system alignment?

A. Yes. Additional controls were required by IE Bulletin 79-05A, item 5, and NUREG-0578, item 2.2.1.c.

IE Bulletin 79-05A, item 5, states, in part:

"Review all safety-related valve positions and positioning requirements to assure that valves are positioned (open or closed) in a manner to ensure the proper operation of engineered safety features. Also review related procedures, such as those for maintenance and testing, to ensure that such valves are returned to their correct positions following necessary manipulations."

The additional controls delineated in NUREG-0578, item 2.2.1.c, require the licensees to review, and revise plant procedures as necessary to assure that a shift turnover checklist is provided and completed by the on-coming and off-going individuals responsible for command of operations in the control room.

Q. 11. Has the licensee complied with these additional controls?

A. Yes. The details are given in NUREG-0680, "TMI-1 Restart," pages C2-5 and C2-6 (item 5) and pages C8-54 and C8-55 (item 2.2.1.c).

The licensee has revised the procedures to ensure that proper valve positions in safety-related systems are consistent with the process flow diagram and are maintained during power operations and after maintenance and testing. The revised procedures also require an independent reverification of valves and switches manipulated during the test and maintenance. In addition, a complete safety-related valve lineup per the system operating procedure lineup checklist will be performed prior to startup.

The licensee has revised the administrative procedures to incorporate Shift Turnover and Engineered Safeguards checklist to be reviewed by incoming and off-going control room operators, shift foremen and shift supervisors.

Q. 12. How will these controls ensure that an operator is informed that a safety system has been disabled?

A. These controls will require that operators review the readiness of safety-related systems on a shift basis via checklists. This checklist review will ensure that the operator is aware of the status of all safety-related systems.

Q. 13. Do these measures described above provide information on safety-related system status equivalent to that which would result from conformance to Regulatory Guide 1.47?

A. No.

Q. 14. In what respect do the measures described above not provide information equivalent to that provided by conformance with Regulatory Guide 1.47?

A. Regulatory Guide 1.47 requires that an automatic system be provided to indicate, on a system level, the bypassing or deliberately induced inoperability of a safety-related system, whereas the measures being implemented at TMI are administrative in nature. In addition, the licensee's controls do not require tagging (indication) at a system level. However, to provide operator awareness of system bypass at the system level, the licensee relies on tagging at a component level supplemented by notations in the station log books and shift turnover checklists.

An operator's mandatory review of these logs and checklists, in conjunction with his knowledge of system design and component interactions, will provide awareness of the bypass or inoperability of equipment at a system level.

Q. 15. Why are these administrative controls sufficient to allow restart without conformance to Regulatory Guide 1.47 or equivalent?

A. Since the issuance of Regulatory Guide 1.47, and primarily since the TMI-2 accident, the administrative controls over safety-related systems have been strengthened considerably. The areas in which controls have been upgraded include:

(1) Verification of safety-related system alignment during normal operations;
(2) Approvals required to remove equipment from service;
(3) Monitoring of equipment while out of service;
(4) Reverification of proper safety-related system alignment after maintenance and testing; and
(5) Periodic audits to review the effectiveness of administrative controls.

The specific changes made to the administrative procedures at TMI-1 in these five (5) areas are outlined below.

(1) Verification of safety-related system alignment during normal operations -- The licensee has modified Administrative Procedure 1012, "Shift Relief and Log Entries," to include an E.S. checklist of valves, breakers and switches from the control room. This check will be performed on every shift. In addition, manual valves in the main flow paths of engineered safeguards and emergency feedwater systems will be checked at least daily by the auxiliary operator and recorded on a logsheet.

AP 1012 also requires the completion of shift turnover checklists for the Shift Supervisor, Shift Foreman and Control Room Operator. These checklists identify the status of E.S. equipment, Technical Specification action items, abnormal lineups and planned operations. Thus, AP 1012 will assure monitoring of E.S. equipment for normal alignment and will assist in the notification of operating personnel when this equipment is out of service.

(2) Approvals required to remove equipment from service -- The licensee has modified the administrative procedures controlling the removal of equipment from service for maintenance and testing. AP 1002, the switching and tagging procedure, requires the Shift Foreman to approve the tagging (removal) of equipment and also states that redundant engineered safeguards equipment must be tested prior to

removal of equipment from service. To ensure proper safety-related system operability during testing, the revised surveillance tests on safety-related systems have been revised to require Shift Foreman approval prior to testing. In addition, these tests require a check of the redundant safety system for operational readiness prior to testing.

(3) Monitoring of equipment while out of service -- As noted in (1) above, the licensee has revised AP 1012 to require the completion of shift turnover checklists. These checklists will identify any E.S. equipment that is out of service and will also specify the time period the equipment may remain out of service according to the Technical Specifications. To account for periods of absence from operating duties (leave, training, etc.), AP 1012 requires that relieving individuals review the station logs, records and special instructions which have been generated since their last shift.

(4) Reverification of proper safety-related system alignment after maintenance and testing -- To assure proper system alignment after maintenance, AP 1002 was revised to require that the restoration switching order (return of equipment to service) be verified by a second person. In addition, a second person will verify proper execution of the switching order. To assure proper system alignment after testing, the surveillance tests have been revised to include an independent position verification. There-

fore, after maintenance or testing safety-related system, emergency standby readiness will be verified independently by two individuals.

(5) Periodic audits to review the effectiveness of administrative controls -- The licensee will evaluate the effectiveness of these programs by requiring: a) the applicable department heads to periodically review/sign their departments' shift turnover logsheets and b) the Operation Quality Assurance Department to periodically audit and review the effectiveness of the shift turnovers.

Therefore, even though conformance with Regulatory Guide 1.47 has not been achieved, the upgraded administrative controls are adequate to provide us with reasonable assurance that operators will know the status of safety-related systems while the study concerning the backfitting of Regulatory Guide 1.47 is completed.

PROFESSIONAL QUALIFICATIONS LIST

BRUCE A. BOGER

Education

June 1971	Received BSNE - University of Virginia
June 1972	Received MENE - University of Virginia

Work Experience

June 1972 to June 1977	Virginia Electric and Power Company Surry Nuclear Power Station Assistant Engineer - Performed startup testing on Unit No. 2. Engineer - Assisted the Supervisor-Engineering Services; trained for and received a Senior Reactor Operator License. Supervisor - Engineering Services - Directed the activities of the onsite engineering staff.
June 1977 to September 1977	Virginia Electric and Power Company Richmond, Virginia Supervisor - Nuclear Engineering Services - Directed the activities of the offsite engineering staff in support of Surry Power Station.
October 1977 to Present	U. S. Nuclear Regulatory Commission Bethesda, Maryland Reactor Engineer in the Operator Licensing Branch - Administer licensing examinations to nuclear power plant and research reactor personnel.

Professional Affiliations

Registered Professional Engineer - State of Virginia

Member - American Nuclear Society

Participation in TMI Activities

Bruce A. Boger

November 1978, April 1980: Administered operator license examinations on Unit One.

November 1978, March 1979, March 1980: Administered operator license examinations on Unit Two.

March - April 1979: Member of the TMI-2 emergency response team, assisted in the preparation of emergency and contingency procedures.

July 1979 - Present: Member of the TMI Technical Support Staff, conducted audit examinations on post-accident installed equipment on TMI-2. Also participated in the review of training and procedures in conjunction with the TMI-1 restart programs. This included preparation of SER inputs and testimony.

OUTLINE

This testimony of Donald F. Sullivan contains the NRC Staff's response to ECNP Contention 1(c).

The purpose of this testimony is to demonstrate that, contrary to the allegations made in the contention, the instrumentation in the TMI-1 control room by which the generator monitors information from the core cooling and containment isolation systems following a feedwater transient or small break LOCA receives signals based on measurements of appropriate parameters

Conclusions to be drawn from this testimony:

-- NRC regulations that require direct measurement of variables that are monitored by the operator apply only to measurements that provide inputs to instruments that are part of the protection system.

-- None of the instrument channels by which the operator monitors information from the core cooling and containment isolation systems following a feedwater transient or small break LOCA, that receive inputs derived from signals that are not direct measures of the desired variables, are part of the protection system.

-- The instrumentation used to monitor steam generator level , pressurizer pressure, core exit and hot leg temperatures and containment isolation valve positions receive inputs derived from signals that are direct measures of the desired variables.

-- PORV and safety valve positions and core coolant subcooling are not directly but are indirectly measured.

-- The instrumentation by which the operator monitors information about the core cooling and containment isolation systems following a feedwater transient and small break LOCA measures or records appropriate parameters.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of METROPOLITAN EDISON COMPANY, et. al. (Three Mile Island Nuclear Generating Station Unit 1)	)))))))	Docket No. 50-289

NRC STAFF TESTIMONY OF DONALD F. SULLIVAN
REGARDING DERIVATION OF INSTRUMENT INPUT SIGNALS

(ECNP Contention 1(c))

Q 1. Please state your name and position with the NRC.

A. My name is Donald F. Sullivan. I am a Senior Nuclear Engineer assigned to the Reactor Systems Standards Branch, Office of Standards Development. From July 1979 to September 1, 1980, I was temporarily assigned to the Instrumentation and Control Systems Branch, Office of Nuclear Reactor Regulation.

Q 2. Have you prepared a statement of professional qualifications?

A. Yes. A copy of this statement is attached to this testimony.

Q 3. Please state the nature of the responsibilities you have had with respect to the Three Mile Island, Unit 1 restart program.

A. I prepared the responses to UCS Interrogatories 67, 83, 85, 86, 88, 89, 90, 91, 92, 93, 94, 95, 97, and 98.

Q 4. What is the purpose of your testimony?

A. The purpose of my testimony is to respond to ECNP Contention 1(c), which states:

"The electronic signals sent to the control room in many cases record the wrong parameters, and may, thereby, mislead the reactor operator. For instance, in the case of the Electromatic Relief Valve ("ERV; the Metropolitan Edison designation is RC-RV2"), the signal sent to the control room to indicate a closure of this valve indicates only the electrical energizing of the solenoid which closes the valve, not the actual physical valve closing itself(4). This misleading signal aggravated the accident at TMI-2. There is no reasonable assurance that this same problem, or comparable ones, cannot arise many times over at TMI-1. It is the obligation of the Suspended Licensee to provide sufficient information on the performance capability of all pertinent components of the control system to reasonably ensure that electronic signals will record, accurately and in a timely manner, all necessary and correct parameters."

ECNP Contention 1(c), as modified by the Board, alleges that the Class 1E instrumentation in the TMI-1 control room by which the operator monitors information derived from signals from the containment isolation and core cooling systems following a feedwater transient and small break LOCA is inadequate in that it measures or records the wrong parameters and may mislead the operator.

ECNP Contention 1(d), as modified by the Board, alleges that the ranges of the Class 1E instruments referred to in ECNP Contention 1(c) are insufficient.

Because not all of the instruments used by the operator to monitor information following a feedwater transient and a small break LOCA are Class 1E, the staff has chosen to:

(1) Identify in its partial response to ECNP Contention 1(d), sponsored by W. Jensen, et. al., the instruments used by the operator to perform necessary functions and monitor information derived from signals from the core cooling system and the containment isolation system following a feedwater transient or small break LOCA without regard to whether the instrumentation is labeled as Class 1E, and then to show that the ranges of the instruments are sufficient.

(2) Discuss in its reference to ECNP Contention 1(c) whether the signals to the instruments identified in the response to ECNP Contention 1(d) are derived from direct measures of the desired variables.

Q 5. Does the NRC have any regulation that requires the direct measurement of variables that are monitored by the operator following a feedwater transient and a small break LOCA?

A. Yes, but 10 CFR 50.55 a(h), IEEE 279-1968 and IEEE 279-1971, applies only to those monitoring instruments that are part of the protection system. Specifically, Section 4.8 of IEEE 279-1968 states, "To the extent feasible and practical, protection system inputs shall be derived from signals which are direct measures of the desired variables." (The 1971 version editorially substituted "that" for "which"). None of the instrument channels discussed in this response whose inputs are derived from signals which are not direct measures of the desired variables are part of the protection system.

Q 6. Are the designs of relief valves such the electromagnetic relief valve described in the contention subject to the provisions of IEEE-279-1968 or 1971?

A. I know of no instance where they are. Relief valves are considered to be control devices, rather than devices that are essential to safety, in terms of performing the pressure relief function. They serve to limit system pressure to values below the setpoints of the safety valves. The safety valves are the ultimate overpressure safety devices.

Since TMI-2, however, it has become apparent that more attention needs to be paid to the reclosure of both safety and relief valves in terms of more reliable position indication information available to the operator. The licensee is proposing to measure flow downstream of the electromagnetic relief valves and safety valves as a means of determining if the valves are open or closed. Although valve position, per se, is not monitored, the presence or absence of discharge flow from the valves bears a direct relationship to the "open" or "closed" state of the valves during reactor operation.

Q 7. Within the context of the contention, as limited by the Board and interpreted by the staff, are all other inputs to indications in the control room derived from signals that are based on direct measurement of variables?

A. My answer is based on the NRC Staff's partial response of Messers. W. Jensen, et. al., to Contention ECNP 1(d).

Inputs to certain of the instruments discussed in that testimony will be derived from signals that are direct measures of the desired variables, as follows:

"Steam Generator Level"

"~~Primary System Pressurizer~~ Reactor Coolant System Pressure"

"Core Exit Temperature"

"Hot Leg Temperature"

In addition, the position indications (open/closed) of the containment isolation valves discussed in the NRC staff testimony of Messrs. Jensen, et. al. are derived from directly actuated position limit switches.

Inputs to the following instruments will be derived from signals that are not, strictly speaking, direct measures of the desired variables. These instruments are not a part of the protection system since their signals do not actuate reactor trip or engineered safety features. Therefore, direct measurement of variables is not required by NRC regulations:

"PORV Position", and "Safety Valve Position": These variables are not measured by devices that directly sense valve position. "Open" or "Closed" is sensed by flow meters which monitor discharge flow when the valves are open and a no-flow condition when they are closed. Since an open valve will always result in a discharge flow, the staff believes that the measurement system constitutes a safe design. (See TMI Restart SER, NUREG-0680, Section 2.1.3.a, Pages C8-11, 12, 13.)

"Subcooling": There is no instrument that can directly measure the amount of subcooling (in the primary system) which is the number of degrees the liquid is below the boiling point for the system pressure at a given time. The system pressure and boiling point are, however, directly related by the laws of physics such that, for a given system pressure, there is a unique boiling point. Thus, a measurement of pressure also yields the boiling point. (See TMI Restart SER, NUREG-0680, Section 2.1.3.(b), Pages C8-16, 17, 18, 19).

Simply subtracting the measured temperature from the known boiling point yields the number of degrees that the liquid is subcooled.

In the TMI-1 system, temperature and pressure are measured directly. The inferred boiling point and subsequent computer calculation (Subtraction) result in an element of indirectness. We believe, however, that this measurement technique results in highly reliable "subcooling" information to the operator.

Q 8. Do you believe that this instrumentation by which the operator monitors information about the core cooling and containment isolation systems following a feedwater transient and a small break LOCA is adequate in that it measures or records appropriate parameters and thus will not mislead the operator?

A. Yes.

PROFESSIONAL QUALIFICATIONS

DONALD F. SULLIVAN

U. S. NUCLEAR REGULATORY COMMISSION

I am a senior nuclear engineer assigned to the Reactor Systems Standards Branch of the Office of Standards Development. I am currently on temporary assignment to the Instrumentation and Control Systems Branch, Office of Nuclear Reactor Regulation, performing various design reviews incident to the plant licensing process. This assignment will terminate on September 1, 1980.

I hold a Bachelor of Science degree in Physics from Holy Cross College, Worcester, Massachusetts, and a Master of Science degree in Physics from Trinity College, Hartford, Connecticut. In addition, I have studied electrical engineering, mathematics and physics at the graduate schools of Brown University, Providence, RI, and the University of Tennessee, Knoxville, TN.

I have approximately 26 years of professional experience, commencing in August 1954. During the first 9½ years, I was a member of the Instrument Group, and later the Controls Group, of the Connecticut Advanced Nuclear Engineering Laboratory (CANEL), Middletown, CT. This service included a temporary assignment of 19 months at the Reactor Controls Department, Oak Ridge National Laboratory. My responsibilities at CANEL included the design, specification and installation of various portions of the instrument and control systems for the CANEL critical assembly facilities, the Lithium Cooled Reactor Experiment and its simulator, and miscellaneous test stands.

I joined the AEC (NRC) in March 1964 and for the first (approximately) 8 years performed licensing safety reviews of the protection, control and emergency power systems of numerous commercial nuclear power stations and research and military reactors, and participated in the formulation of related standards and guides.

In April 1972, I was transferred to what is currently the Reactor Systems Standards Branch of the Office of Standards Development. In this capacity I am responsible for the development of various regulatory guides and criteria in the areas of protection, control, and emergency power system design and testing. From August 1978 to April 1979 I served as Acting Branch Chief of the Reactor Systems Standards Branch.

I am the NRC member of the IEEE Nuclear Power Engineering Committee, and participate in the Committee's development of standards for nuclear power plants.

In August 1973 I was the U. S. member of the International Atomic Energy Agency's Panel on the Code of Practice on Safe Reactor Design and Construction, held in Vienna, Austria.

I hold Patent No. 3,050,575 for the development of a special purpose thermocouple.

MR. CUTCHIN: The witnesses are available for cross-examination.

CROSS-EXAMINATION

BY MR. ROBERT ADLER:

Q I would like to attempt to define what I perceive to be the differences between your testimony and the testimony of the Licensee. I would like to refer you to page 7 of the Licensee's testimony. At the end of the first paragraph, there is a sentence which reads, quote: "Because of the required administrative action necessary to manipulate FSF or ESW components, these controls are considered to be as effective as automatic annunciation of disabled systems."

Now, in today's testimony the witnesses in fact expanded on that statement to say that the administrative actions are more effective than the automatic annunciation. Do you agree with the fact that the administrative procedures are as or more effective than the safety system panel required by Reg Guide 1.47?

A (WITNESS BOGER) I think my testimony indicates that the staff considers the administrative procedures now in effect to be sufficient until such a time as the staff evaluates Reg Guide 1.47 and its applicability to TMI-1.

(Pause.)

Q In your opinion, Mr. Boger, do the administrative procedures proposed by Licensee perform the same functional purpose as the safety system status panel? Do they functionally perform the same task?

A (WITNESS BOGER) The same as the panel that would be required by 1.47?

Q Yes, sir.

A (WITNESS BOGER) Yes.

Q So in your opinion the Licensee's procedure for say a new operating license would be satisfactory to meet the requirements of Reg Guide 1.47?

A (WITNESS BOGER) I don't deal with new operating licenses. I cannot address that question.

(Pause.)

Q On page line of Licensee's testimony, the last sentence of that middle paragraph reads, quote: "The addition of an automatic system that meets the requirements of Reg Guide 1.47 would be an unnecessary addition of hardware that would not improve the protection of the health and safety of the public, since this system would also continue to rely on administrative controls to ensure its effectiveness." Quote.

Again, today Licensee's witnesses amplified on that statement, in fact saying that there would be a safety disadvantage or a disadvantage in terms of the complexity of the plant. Do you agree with those statements?

A (WITNESS BOGER) You have given me several statements. Would you like to go through the particular one that you would like me to address?

Q I gave you two. Let's take the quote from the testimony first. The sentence at the end of the first full paragraph on page 9, beginning with the --

A (WITNESS BOGER) I agree with the second half of the sentence, quote, "this system would also continue to rely on administrative controls to ensure its effectiveness."

Q You do not agree with the portion that says it would be an unnecessary addition of hardware that would not improve the protection of the health and safety of the public?

A (WITNESS BOGER) I am afraid that I don't know what additional hardware would be required and I can't evaluate that sentence.

Q You don't know what hardware would be required in order to meet the requirements of Reg Guide 1.47? Not the specific hardware at TMI-1, but what hardware is normally necessary to construct the system status panel required by the reg guide?

A (WITNESS BOGER) Yes, that. But I can't address the specific valves that would have to be integrated into the system to make a status panel.

Q Hasn't the NRC, in promulgating Reg Guide 1.47, considered whether they think in general it is preferable to add this type of hardware, as opposed to using administrative procedures?

A (WITNESS ROGER) I can't address the NRC's position in that area.

Q Can you, Mr. Sullivan?

A (WITNESS SULLIVAN) I cannot address it specifically with regard to any particular Licensee case. In other words, I have not reviewed any particular submittal from an applicant which would indicate to me how much additional hardware would be involved.

I do understand that Reg Guide 1.47-type systems are being implemented on designs which -- at power plants which are being built, not yet operating. I think the answer to your question is, experience will tell us, presumably within a few years or a year or whatever, how much additional hardware would actually be added to the systems.

There is no operating power plant, to my knowledge, which has this system in it. At the time we prepared the Regulatory Guide there was no value impact analysis performed. I cannot give you a definitive answer as to how much hardware, how much additional hardware, would be involved.

(Pause.)

Q Do you have any idea, when Reg Guide 1.47 was promulgated, whether it was considered to make the requirement retroactive, whether the NRC considered that possibility?

A (WITNESS SULLIVAN) I responded to that in an interrogatory. I have looked into the particular question. As far as I can determine or have determined, there was no specific effort -- that is, nothing in writing or documented or by virtue of an implementation schedule -- that called for the backfitting of the Regulatory Guide.

I would also like to point out that the Regulatory Guide was published prior to the existence of what -- a committee that was formed within the NRC, known as the Regulatory Requirements Review Committee, which came into existence in 1974, which was after the guide was out. Therefore, it did not review the guide. And as a salient point, the Regulatory Requirements Review Committee dealt with backfitting issues.

So to summarize my answer, to the best of my knowledge there was no particular policy, I guess I would use that word, with regard to this particular guide, in terms of backfitting.

BY MR. DORNSIFE:

Q Mr. Boger, your testimony on page 2, question 5, it says -- this is concerning UCS 9. The paragraph is taken right from NUREG-0660?

A (WITNESS BOGER) I believe that's true.

Q And the last sentence: "The study is to be performed following a review of procedures and other non-automatic actions to verify these activities."

Can you explain to me what you mean by that sentence? What does "verify these activities" mean in that context?

A (WITNESS BOGER) I am not familiar with what study will be performed.

Q You think this means the procedures that are currently being adopted by automatic -- by the currently operating reactors will need to be reviewed to see how effective they are? Is that what is meant?

A (WITNESS BOGER) That sounds reasonable.

(Pause.)

Q Your testimony on page 10 of the same Contention -- it starts on page 9, item 2, the very last part on page 9 -- says, quote: "Redundant engineered safeguards equipment must be tested prior to removal of equipment from service." Quote.

My question involves the possibility of an equipment, a piece of equipment in a redundant ESF system being declared out of commission without maintenance being required, just somebody notices that a pump or something is out of commission. Does this paragraph apply in that case? Would the redundant have to be tested?

A (WITNESS BOGER) It infers that if you try to test the inoperable piece of equipment to try to prove its operability and found out in fact it was inoperable, then you couldn't take out the other system, the system that you originally intended to take out, because its redundant system was not available.

Q It seems to me it says you have to test the redundant equipment before you take a piece of equipment out of service, to make sure it is available; is that correct?

A (WITNESS BOGER) That's right.

Q So if something was found to be out of commission, would that infer that you need to test the redundant components, the redundant half, to make sure that it is functional?

A (WITNESS BOGER) That is normally the case.

Q Is there a possibility that during the testing of this redundant piece of equipment it could be also taken out of service?

A (WITNESS BOGER) I can think of cases where that might happen, yes.

Q Is there any special procedure that you know of that covers that specific, or any precautions that are taken?

A (WITNESS BOGER) Just in the surveillance test that would be used to prove the operability of this piece of equipment, it would state that the other train had to be operable. That's the only thing I can --

Q Wouldn't it be covered by tech specs also in some cases?

A (WITNESS BOGER) Yes.

Q Aren't there limitations? If both trains are taken out of service, doesn't that require shutdown in a very short period of time, so maybe you could conceivably violate a tech spec?

A (WITNESS BOGER) The surveillance procedures address the tech specs and tell what the requirements are. In the emergency feedwater surveillance test, I believe it says that both or two trains are required before or above 250 degrees or some such reactor condition.

Q You feel that the procedures adequately cover the place where something is out of condition and you have to test the redundant side to make sure it is available?

A (WITNESS BOGER) The procedures would identify a problem or an area of potential disagreement, and then it would be up to management of the facility to decide how to continue.

(Pause.)

Q Mr. Sullivan, I have some questions for you on your testimony on ECMP Contention 1C. On page 4 your answer to question 6, do you know of an current designs where you can directly determine the position of the PORV? Are there any current power operated relief valves where you can directly determine the position of that valve?

A (WITNESS SULLIVAN) I don't know of any. However, that doesn't mean that there aren't. I haven't done any search on this. I am not familiar.

Q From my understanding, it is a globe valve operated by some power device. So it is conceivable a stem switch could be installed in a particular valve?

A (WITNESS SULLIVAN) I understand your question. I don't know why the applicant has decided not to have a direct indicator valve. They obviously have not.

Q How about other Licensees, B&W Licensees, for example, who have to meet this requirement? How have they satisfied the requirement?

A (WITNESS SULLIVAN) That I don't know.

A (WITNESS ROGER) I might be able to shed some light on that. It is a pilot-actuated valve, where you operate a pilot to actuate the valve. And you cannot actually put a position indication on the piece of equipment that the pilot operates. It is enclosed. You don't have an exposed stem that you could attach a position indication to.

Q Mr. Roger, are the other Licensees satisfying this requirement similar to TMI-1?

A (WITNESS BOGER) I am aware of other B&W units that have similar valves. They have the sonic flow indicators downstream, as the Licensee does.

Q Do they have a delta P elbow tip also?

A (WITNESS BOGER) I can't say whether they do or not.

CHAIRMAN SMITH: If the pilot on the valve has an indication of its actual condition and position, isn't that also a direct indication of the valve that it operates?

WITNESS BOGER: If the pilot sticks in one position or the other, if the valve actually sticks, and the pilot tries to close it and is unable to, then your pilot would indicate closed, but the valve would still be open.

CHAIRMAN SMITH: But the converse would not be true, inasmuch as two masses cannot occupy the same space at the same time.

WITNESS BOGER: I guess that's true, yes.

Let me go back over that. If the pilot -- the pilot could say closed and the valve could be open. If the pilot said open, I think by the same reasoning you couldn't say that the valve was actually open.

MR. DORNSIFE: Mr. Chairman, I don't think that is different than the concept on TMI-2 where just the power available to the valve was indicated. The position of the pilot, that would be an indirect indication, as was the power available.

BY MR. DORNSIFE: (Resuming)

Q Mr. Sullivan, are you aware of any possible configurations which can measure or indicate the position of a safety valve?

A (WITNESS SULLIVAN) No.

Q So the only way to determine the position of a safety valve is by some indirect measurements?

A (WITNESS SULLIVAN) I wouldn't infer that from my answer. I am not an expert on safety valve designs. I simply said I don't know of any, but that is not a very authoritative answer on my part, believe me.

MR. DORNSIFE: I was going to ask some questions concerning your concern, Dr. Jordan, about the sensitivity of the flow device, if you would like me.

DR. JORDAN: Go ahead.

BY MR. DORNSIFE: (Resuming)

Q I had read the same ACRS letter. I am wondering if either of you were aware of the problems with the sensitivities, whether they had been resolved to your satisfaction, whether it is a case of the ACRS letter being written before you had made that determination? What was the problem?

A (WITNESS BOGER) I am aware of the letter. I have seen the letter. But I don't know what the resolution to that concern is.

Q As far as you are concerned now, the sensitivity of the valve is acceptable to the staff the way it is currently designed?

A (WITNESS BOGER) I think the SER indicates that, yes.

Q Except for the possibility that the reduced flow, the SER reads for the safety valve there is a larcern diameter pipe and the flows are reduced, especially when you are just talking about makeup pump capacity flows; is that correct?

A (WITNESS BOGER) I would have to reference the SER to back that up.

MR. DORNSIFE: I have no further questions.

(Pause.)

MR. BAXTER: I have no questions.

BOARD EXAMINATION

BY DR. JORDAN:

Q I noticed in your testimony in the outline, you say, in referring to the lack of compliance with Reg Guide 1.47 and the use of administrative controls in its place, quote: "The strengthened administrative controls do not provide information to the operator equivalent to that which would be provided by conformance to Regulatory Guide 1.47."

Quote.

This is on the outline page of the testimony of Donald Sullivan and Bruce Boger, which is not part of the testimony itself. And the question I was about to ask is, is that supported in the testimony or is this your counsel's idea?

A (WITNESS BOGER) I don't have a copy of those words. I think the testimony, in the final paragraph on page 11 --

Q Just a minute.

(Pause.)

Q All right. Would you read that, then, the section?

A (WITNESS BOGER) The upgraded -- "Therefore, even though conformance with Regulatory Guide 1.47 has not been achieved, the upgraded administrative controls are adequate to provide us with reasonable assurance that operators will know the status of safety-related systems while the study concerning the backfitting of Regulatory Guide 1.47 is completed."

Q That hardly supports the statement in the outline.

A (WITNESS BOGER) If you could reference question 14 and 13 on page 7.

Q Okay. Is it then your position that you haven't decided yet whether compliance with 1.47 would provide additional protection to the point where it should be required for operating licenses?

A (WITNESS BOGER) That is correct. That is a subject of a future study.

Q So then you would not say that you necessarily disagree with the Applicant in this position that the administrative controls and the present status panel is superior, but rather would reserve judgment on that? Do you have reservations about that statement.

A (WITNESS BOGER) '), sir.

Q You don't have reservations?

A (WITNESS BOGER) No, sir. I believe we have determined there is reasonable assurance that the administrative controls are adequate until we perform that study.

Q Adequate for restart?

A (WITNESS BOGER) Yes, sir.

Q That was not really quite what I was getting at. Adequate in the long run, or superior in the long run. The Licensee's position is that it is superior in the long run to Reg Guide -- to the requirements of Reg Guide 1.47. Do you have reservations about that statement?

A (WITNESS BOGER) I think the system could provide some information which would be of benefit, which might make it superior to the administrative controls.

Q Has the Licensee complied completely with the section .1.C.6 of the task action plan? The provision is -- the schedule in the task action plan, according to your testimony -- and I did check that out -- is that the implementation schedule is completion by January 1, 1981. Since we have just passed that date now, did they meet the schedule?

A (WITNESS BOGER) I think my testimony goes on to say January 1, 1981, or prior to the receipt of the full power license, whichever is later. And it says for TMI it is required before restart.

To my knowledge, it hasn't been done. I am not aware that it has been done.

Q All right. You will insist that it be completed before restart?

A (WITNESS ROGER) Yes.

Q You were not party, then, I take it, in any way to the discussions between the staff, the ACRS, and B&W on the recommendations concerning the flow from the PCRV, and you have heard the staff's -- the Licensee's reply today that, in their opinion, measurement of flow itself is a better indication than position of the valve. Do you agree with that?

A (WITNESS ROGER) I personally would like to have direct indication of the valve, where possible.

Q What is wrong with measuring the variable itself -- namely, flow -- rather than valve position?

A (WITNESS ROGER) This flow would be a direct result of the valve being open.

Q Why wouldn't you say you would rather have information as to flow rather than valve position information?

A (WITNESS ROGER) You are asking my opinion.

Q I guess I need to know why you say you believe the valve position information is better than flow information.

A (WITNESS BOGER) It indicates whether the valve is or isn't open. It is directly in the flow path. I think the other information is necessary to back up a particular indication.

Q Does the position of the PORV tell you what the flow is?

A (WITNESS BOGER) No; it tells you a flow path has been established.

Q Is there not another valve ahead of the PORV?

A (WITNESS BOGER) Yes. There is a block valve upstream.

Q So, therefore, isn't flow information yielding more information to you than valve position information?

A (WITNESS BOGER) You can get the same information by verifying that the block valve was closed, which is a direct position indication.

Q You would rather have two pieces of information on valve position -- I understand why you are saying this, in a way -- rather than the single piece of flow information?

A (WITNESS BOGER) I think the flow information is just one of many pieces of information that an operator would use to determine whetther that valve was open when it should not have been.

Q Is it perhaps a matter of reliability is what is bothering you a bit?

A (WITNESS BOGER) I have never used these types of indicators, and I am not familiar with them. I can't evaluate their reliability. Valve position seems better to me, in my opinion.

DR. JORDAN: I have no more questions.

CHAIRMAN SMITH: Anything further by anybody of this panel?

(No response.)

CHAIRMAN SMITH: You are excused, gentlemen.

DR. LITTLE: We weren't quite through.

BY DR. LITTLE:

Q I understand that you feel the modifications to the procedures that the Licensee has described are adequate administratively to be even better than the methods recommended in Reg Guide 1.47.

A (WITNESS BOGER) I said they were adequate until we completed our study on the reg guide.

Q One of Licensee's witnesses testified that these procedures had not actually all been implemented, and they are still working on the procedures. Is someone from NRC going to review these prior to their acceptance?

A (WITNESS BOGER) Those procedures have been under constant review by us, by me. I have reviewed those procedures.

Q And this is an ongoing process?

A (WITNESS BOGER) Apparently so.

Q Did you think you were finished but now you know you are not?

A (WITNESS BOGER) For some of the procedures, I thought I was finished, yes. I am aware of other procedures that the staff has made comments on and requested revisions to. The ongoing change of procedures, we have to complete our review at some point in time. At the point in time I reviewed these, I had the impression that I had a final procedure.

Q Of all four areas mentioned in the testimony, all major categories of procedural modifications that were given in Licensee's testimony?

A (WITNESS BOGER) I didn't get all of the procedures that they referenced, the hundreds of procedures that they referenced. I looked at the procedures that had to do with the alignment of safety systems.

Q There will be another final review?

A (WITNESS BOGER) I don't think an additional review was anticipated on procedures which had been written off on or accepted.

(Board conferring)

Q I understand there are a large number of procedures that will be modified in the process of ensuring the procedural modifications. At what point do you come into review? Summarize again just what you are looking at? Are you looking at each and every procedure that is changed and how it is changed, or are you looking at them in groups and saying that this approach is the way to do it?

A (WITNESS BOGER) The original procedural reviewed the requirements of the Lessons Learned Task Force, the I&E Bulletins and Orders, and the Commission's order itself, and made sure that the Licensee's procedures reflected the requirements of those documents.

To follow that up, a requirement would show up in a master administrative procedure which would require all, say, surveillance procedures to include certain steps. What I did was to look at that administrative procedure and verify that it had a step that was required by Bulletins and Orders Task Force or by the Lessons Learned Task Force. And then I would take, once I verified that that did show up in an administrative procedure, to go to selected surveillance procedures and verify that those procedures had been revised to reflect the guidance provided in the master administrative procedure.

Q And then the Licensee takes care of the fine details to make sure the language is inserted in the proper place in each of the procedures?

A (WITNESS BOGER) That's correct.

DR. LITTLE: Thank you.

CHAIRMAN SMITH: Anything further?

MR. CUTCHIN: I would like to try one follow-up.

REDIRECT EXAMINATION

BY MR. CUTCHIN:

Q Mr. Roger, when Mr. Jordan was asking you why you might prefer a direct indication of valve position rather than just a flow indication in a situation like exists in the line containing both the block valve and the PORV, would not an advantage of having both the direct indication and the flow indication let you be able to determine independently by the direct indicator that both valves were closed, plus have the back-up information as to whether there was a flow in that line?

And then if you opened -- you have to have both valves open in order to have a flow indication, but if you didn't have a flow indication you would not be sure that both valves were closed but only that one was closed?

A (WITNESS ROGER) That's correct.

(Board conferring)

CHAIRMAN SMITH: Isn't there a positive indication of position on the block valve?

WITNESS ROGER: Yes, sir.

CHAIRMAN SMITH: If you have a positive indication that the block valve is closed and you have flow, isn't it an inescapable conclusion that the PORV valve is open, assuming reliability?

WITNESS BOGER: I think if you have the block valve indicating shut and you have flow, then that would lead you to begin to wonder whether or not you had flow or not, and you would continue your investigation and look at the PORV discharge tail pipe temperatures, you would at the quench tank temperature-pressure level. It would lead you to go on and investigate further.

CHAIRMAN SMITH: As Dr. Jordan suggested, it is a question of reliability of all of these signals.

WITNESS BOGER: I hesitate to say "reliability." I would say an operator would use all of the indications he had available to him to reach a final decision or conclusion.

MR. CUTCHIN: I would like to follow up on that.

BY MR. CUTCHIN:

Q If, as the Chairman just hypothesized, you had an indication of block valve closing and an indication of flow, you would not know, would you, whether it was an incorrect indication of block valve closure or an incorrect indication of flow?

A (WITNESS BOGER) Right. That's correct. So you would go on to other things.

CHAIRMAN SMITH: Anything further?

(No response.)

CHAIRMAN SMITH: All right. Thank you, gentlemen.

(Witnesses excused.)

CHAIRMAN SMITH: Mr. Baxter.

MR. BAXTER: Licensee calls William Itschner, Richard Barley, James Moore, and Charles Pelletier.

Whereupon,

WILLIAM ITSCHNER

RICHARD BARLEY

JAMES MOORE

CHARLES PELLETIER

called as a witnesses by counsel for the Licensee, Metropolitan Edison, having first been duly sworn by the Chairman, were examined and testified as follows:

DIRECT EXAMINATION

BY MR. BAXTER:

Q I am going to pose a series of questions to the panel, and I would like you to answer, going from my left to right, and I will not repeat the question for each witness.

Would you state your full name, your title, and your employer, please?

A (WITNESS PELLETIER) My name is Charles A. Pelletier, assistant vice president, with Science Applications, Incorporated.

A (WITNESS BARLEY) My name is Richard Barley, lead mechanical engineer, employed by General Public Utilities at TMI Unit 1.

A (WITNESS ITSCHNER) I am William F. Itschner, senior mechanical engineer for GPU Service Corporation.

A (WITNESS MOORE) I am James P. Moore, Jr., mechanical components manager for GPU Service Corporation.

Q I call your attention to a document which bears the caption of this proceeding, dated September 15, 1980. It is entitled "Licensee's Testimony of William F. Itschner, Richard Barley, James Moore, and Charles Pelletier in Response to the Lewis Contention and ANGRY Contention Number 5D on Filters."

Does the material associated with your name in this document, including the attached statement of professional qualifications, represent testimony prepared by you or under your direct supervision for presentation at this hearing?

A (WITNESS PELLETIER) Yes.

A (WITNESS BARLEY) Yes, it does.

A (WITNESS ITSCHNER) Yes, it does.

A (WITNESS MOORE) Yes, it does.

Q Do you have any changes or corrections to make to your testimony?

A (WITNESS PELLETIER) No.

A (WITNESS BARLEY) No, I do not.

A (WITNESS ITSCHNER) No, I do not.

A (WITNESS MOORE) I have two minor corrections to be made. If you would refer to page 1 -- I'm sorry, page 2. The fourth line from the bottom of the page refers to high efficiency particulate absorbers. It should be changed to high efficiency particulate air. High efficiency particulate air filters is what they are.

On the top of page 3, the second line, there is a misspelling of the word "disposed." It should be d-i-s-p-o-s-e-d.

That is all the corrections I have.

Q As corrected, is the testimony true and accurate to the best of your knowledge and belief

A (WITNESS PELLETIER) Yes.

A (WITNESS BARLEY) Yes.

A (WITNESS ITSCHNER) Yes, it is.

A (WITNESS MOORE) Yes, it is.

MR. BAXTER: I move that the testimony be received into evidence and incorporated into the transcript as if read.

CHAIRMAN SMITH: Are there any objections? The testimony is received.

(The testimony of Messrs. Palitero, Barley, Ishner and Moore follows.)

Lay-in # 3

LIC 9/15/80

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
METROPOLITAN EDISON COMPANY	)	Docket No. 50-289
	)	(Restart)
(Three Mile Island Nuclear Station, Unit No. 1)	)	

LICENSEE'S TESTIMONY OF

WILLIAM F. ITSCHNER, RICHARD BARLEY,

JAMES MOORE AND CHARLES PELLETIER

IN RESPONSE TO THE LEWIS CONTENTION

AND ANGRY CONTENTION NO. V(D)

(FILTERS)

OUTLINE

The purposes and objectives of this testimony are to respond to the Lewis Contention and ANGRY Contention V(D), which assert the need for improvements to the auxiliary building filters and for the installation in effluent pathways of systems for the rapid filtration of large volumes of contaminated gases and fluids. The testimony shows that: the quantity of radioactive gases required to be transported outside the TMI-1 reactor building for processing by the waste gas disposal system will be reduced from that experienced at TMI-2; the leakage of radioactive gases is minimized; and the charcoal in the filters is maintained in a condition which ensures that iodine removal efficiency will be maximized in gaseous effluent pathways. The testimony also concludes that the TMI-2 accident has not demonstrated a need for unspecified additional filtration systems.

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INTRODUCTION

This testimony, by Mr. William F. Itschner, GPU Senior Mechanical Engineer; Mr. Richard Barley, GPU Lead Mechanical Engineer; Mr. James Moore, GPU Mechanical Components Manager, and Dr. Charles Pelletier, Assistant Vice President and Manager, Science Applications, Inc., is addressed to the following contentions:

LEWIS CONTENTION

> Filters: There are new filters on the auxiliary building of TMI#2. There are no similar structures on the auxiliary building of TMI#1. Further, preheaters must be placed on the filters of the auxiliary building because they got wet during the accident on 3/28/79 in TMI#2. To mitigate a similar accident in TMI#1, preheaters on the filters in the auxiliary building of TMI#1 are necessary. There are many design errors in the filter system and design of same. I am presenting the above as examples of a larger problem.

ANGRY CONTENTION NO. V(D)

> The NRC Order fails to require as conditions for restart the following modifications in the design of the TMI-1 reactor without which there can be no reasonable assurance that TMI-1 can be operated without endangering the public health and safety:
>
> (D) Installation in effluent pathways of systems for the rapid filtration of large volumes of contaminated gases and fluids.

RESPONSE TO LEWIS CONTENTION

BY WITNESS MOORE:

This contention addresses gaseous radioactive materials located outside the reactor building. Since these radioactive materials are actually produced in the reactor fuel, they would have escaped from the fuel, penetrated the fuel cladding and have been transported through the containment building via one of the plant auxiliary systems, such as the makeup and purification system. At this point, the material is principally contained by the closed auxiliary systems, and thus the design concern for the filtration systems is the limited release of radioactive materials from these systems.

All of the methods employed to control the release of radioactive material are based on the fact that if radioactive material is stored, natural radioactive decay will reduce the level of radioactivity. In TMI-1, the primary method of controlling gaseous radioactive material is to collect the gas in the waste gas disposal system (WGDS) where it is compressed and stored in tanks. When the radioactivity has decayed to an acceptable level, the gas is released at a controlled rate, as allowed by the plant technical specifications, through High Efficiency Particulate Air ~~Absorbers~~ (HEPA) and charcoal filters to the station vent. The HEPA filters retain radioactive particulate matter, while the charcoal filters retain radioactive iodine. Essentially all of the radioactive particulates and iodine are retained on the HEPA and charcoal filters where they decay and are eventually disposed of when the filters are replaced. Thus, the radioactive gases released will consist of the long-lived radioactive noble gases which did not decay during the storage period.

The TMI-1 auxiliary and fuel handling building ventilation system is designed to control the release of any radioactive gases which may escape from the closed auxiliary systems. These ventilation systems collect air and gases from the various cubicles and areas of the buildings and process them through HEPA and charcoal filters prior to release to the station vent.

In TMI-2, the waste gas disposal system also collected and compressed radioactive gases, and stored them in the waste gas decay tanks. During the first week of the TMI-2 accident, a significant source of gas outside of the reactor building was in the makeup tank which removed gases from the reactor coolant. In the process of transferring this gas from the makeup tank to the waste gas disposal system and compressing it for storage, leaks in pipe flanges and a compressor released some gas to the auxiliary building atmosphere. It was collected by the auxiliary and fuel handling building ventilation systems, processed through HEPA and charcoal filters to remove radioactive particulates and iodine, and then released.

The TMI-2 radioactive gaseous releases and the effectiveness of the charcoal filters following the TMI-2 accident will be discussed below by Dr. Pelletier. The action being taken to assure the effectiveness of the TMI-1 charcoal filters will be described by Mr. Itschner; and the action being taken to minimize the amount of gas which could escape from the auxiliary systems will be described by Mr. Barley.

In addition to these actions, TMI-1 will be modified prior to restart to permit the venting of radioactive gases from the reactor coolant system directly to the reactor building atmosphere for storage and decay in the event of an accident. This reduces the need to transport large quantities of radioactive gases outside the reactor building via the makeup tank for processing by the waste gas disposal system. Thus, the TMI-1 systems outside containment should not provide a significant release path if exposed to the same conditions as experienced at TMI-2.

BY WITNESS PELLETIER:

In responding to both of these contentions, it is important first to put into the perspective the actual offsite radiological consequences of the TMI-2 accident. The liquid releases during the accident were insignificant. In total, about .4 curies of radioactive liquid iodine were released.(8) This amount is less than liquid releases technical specification limits for normal operation.

The gaseous releases amounted to be about 17 curies of iodine and 10 million curies of short lived noble gases (pre purge).(8) These releases, as explained below, would have been significantly reduced had the TMI-2 accident occurred on the as-modified TMI-1. Even so, however, the radiological consequences to the hypothetically most exposed individual from all accident related sources amounted to 76 millirems(8) which is a small fraction of Part 100 guidelines and is less than one-year exposure to background radiation (90 mrem/year).

Early in the TMI-2 accident, it appeared that the charcoal adsorbers in the auxiliary and fuel handling building ventilation exhaust systems were not removing as much I-131 as they should have been. Indeed, laboratory tests showed that the efficiency of auxiliary building charcoal for removing methyl iodide was only 56% to 69.5%.(1) Also, there were uncertainties concerning the source of the I-131 in ventilation air. For these reasons, it was decided to install additional iodine adsorbers.

Subsequent analyses show that the charcoal adsorbers in the auxiliary and fuel handling building exhaust removed approximately 90% of the I-131 to which they were exposed. This estimate is based on the ratio of I-131 measured in the station vent during the first two weeks of the accident and that measured on a sampling of the charcoal after it was replaced starting on April 12, 1980. This higher retention efficiency compared to the previous laboratory tests is due to the following factors. One is that laboratory tests were carried out at 95% relative humidity. The relative humidity to which the charcoal was exposed during the first weeks after the accident was less than 95%. An estimate of 30% has been given.(1) It has been shown that the higher the relative humidity, the lower the efficiency for retaining methyl iodide.(4,5) The other factor is that laboratory tests are carried out using 100% methyl iodide. This form of iodine is the mos penetrating form known. Measurements at TMI-2 showed that from 10% to 30% of the I-131 in air was in the organic form.(2) The rest was in forms which are retained with higher efficiencies.(7)

Nonetheless, the low retention efficiencies for methyl iodide measured for the initial charcoal loading at TMI-2 indicate that the performance of the charcoal had degraded during its first year of operation.(1,3) To insure that the charcoal at TMI-1 retains an efficiency of at least 90% for all forms of I-131, a surveillance program will be carried out. This program is discussed below by Mr. Itschner.

With regard to employing heaters to reduce moisture in the influent air, tests have shown that maintaining the relative humidity at 50% to 70% can extend the effective life of charcoal adsorbers.(4,6) Therefore, heaters to lower the relative humidity may be worthwhile. However, this is a question of economics, not safety. Finally, I know of no evidence which suggests that the charcoal "got wet" during the accident at TMI-2. As noted above, the charcoal appeared to have only been exposed to air with an average humidity of 30%.

BY WITNESS ITSCHNER:

As noted above, during the TMI-2 accident the auxiliary and fuel handling building filter systems removed most of the radioactive iodine that was released to the auxiliary and fuel handling building atmosphere.

One and one half months following the accident Licensee completed construction of supplemental HEPA and charcoal filters on the roof of the TMI-2 auxiliary building that were in series with the auxiliary and fuel handling building ventilation systems and filters. These supplemental filters provided iodine and particulate filtering of the auxiliary and fuel handling building ventilation systems effluent.

The supplemental filters were installed to provide additional capability for radioactive iodine removal during reactor stabilization and plant cleanup because the installed system filters were thought to be degraded as described above by Dr. Pelletier.

In order to prevent degradation of the TMI-1 filter systems, improved testing and maintenance requirements have been adopted for the filters that serve both the auxiliary and fuel handling building ventilation systems and the TMI-1 WGDS. These requirements increase the frequency of routine testing and require non-routine testing following events such as fires or painting which may reduce the filter performance in an accelerated fashion. These requirements were incorporated in the TMI-1 Technical Specifications.

Supplemental filters like those installed on TMI-2 are not needed on TMI-1 because action being taken ensures that the currently installed filters will have sufficient capacity to perform their intended function.

BY WITNESS BARLEY:

As explained above, a significant release pathway of short lived radioactive noble gases was leakage in the Unit 2 WGDS to the auxiliary building atmosphere which bypassed the waste gas decay tanks. To avoid leakage in the Unit 1 WGDS, a leak reduction program for systems outside containment has been implemented as described in Section 2.1.1.8 of the Restart Report. This program will significantly reduce the liquid and airborne radioactive containment levels outside the containment. The TMI-1 waste gas disposal system is included in the leak reduction program (see Item 5 of Table 2.1.-4, Restart Report.)

Further, as discussed in Licensee's testimony on containment isolation in Response to Sholly Contention No. 1, and Section 2.1.1.5 of the Restart Report, containment isolation modifications are being made which will reduce the transfer of radioactive contamination from the reactor building. This will assist in lowering the potential levels of airborne contamination outside containment and also reduce the demand on the gaseous and liquid radwaste systems.

BY WITNESSES ITSCHNER, BARLEY, MOORE AND PELLETIER:

In summary, the modification and design provisions described above ensure that:

(1) The quantity of radioactive gases required to be transported outside the reactor building for processing by the WGDS at TMI-1 will be reduced from that experienced at TMI-2;

(2) The leakage of radioactive gases is minimized, thus ensuring that radioactive gases are decayed prior to release; and

(3) Charcoal is maintained in a condition which ensures that iodine removal efficiency will be maximized in gaseous effluent pathways.

References

(1) "Analysis of the Adsorbers and Adsorbents from Three Mile Island Unit No. 2," NUCON 6 MTG611/04, May 25, 1979.

(2) "I 131 Studies at TMI Unit 2," J.E. Cline, et al., EPRI NP-1389, April 1980.

(3) "Technical Staff Analysis Report on Iodine Filter performance to President's Commission on the Accident at Three Mile Island," Bland, William M., October 1979.

(4) "Effects of Weathering on Impregnated Charcoal Performance," V. R. Deitz, NUREG/CR-0025, March 1978.

(5) "Effects of Weathering on Impregnated Charcoal Performance," V. R. Deitz, NRL Memorandum Reports 4006, NUREG/CR-0771, May 10, 1979.

(6) "Testing Iodized Activated Carbon Filters With Non-Radioactive Methyl Iodide," V. R. Deitz and J. B. Romans, Naval Research Laboratory Memorandum Report 4240, May 30, 1980.

(7) "Long-Term Performance of Charcoal Absorbers Removing Radioiodine in Ventilation Exhaust Air," C. A. Pelletier, et al., EPRI NP-534, July, 1978.

(8) "Assessment of Offsite Radiation Doses from the Three Mile Island Unit 2 Accident," TDR-TMI-116, Revision 0, July 31, 1979.

RESPONSE TO ANGRY CONTENTION NO. V(D)

BY WITNESS MOORE

As discussed in Licensee's testimony above, the TMI-2 accident demonstrated a need to ensure that gaseous systems are appropriately maintained in an operable condition. The Licensee has taken action to assure charcoal and filtration units are properly maintained and that gaseous radwaste systems are intact. Further, the containment structure is designed to hold fission products released from the primary system in the event of accidents.

It is concluded that the TMI-2 accident has not demonstrated a need for unspecified "installation in effluent pathways of systems for the rapid filtration of large volumes of contaminated gases and fluids." Rather, the TMI-2 experience has demonstrated that gases and liquids (fluids) can be maintained in containment and storage facilities until such time as processing can proceed. (See Licensee's testimony of E. Fuhrer and R. McGoey on the Physical Separation of TMI Units 1 and 2.)

WILLIAM F. ITSCHNER

Business Address: GPU Service Corporation
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Education: B.S., Mechanical Engineering, Newark College of Engineering, 1958.

Experience:

Senior Mechanical Engineer, GPU Service Corporation, 1974 to present. Responsible for criteria preparation and evaluation, technical review of engineering design, project assistance, field liaison and consultation for the following generating station systems and components: HVAC, fire protection, waste treatment, heavy material handling and maintenance access.

Project Manager, E.R. Squibb & Company, 1973 to 1974. Responsible for mechanical engineering aspects of construction projects dealing with steam generation, chilled water, cooling towers, water treatment and process cooling.

Facilities Engineer, FMC Corporation, 1966 to 1973. Directed efforts of architects, engineers and contractors in the planning for and construction of a chemical research and development center.

Project Engineer, Ortho Pharmaceutical Corporation, 1959 to 1966. Responsible for the engineering facets of various production projects, including comfort and environmental air conditioning systems; material handling; dust collection and exhaust systems; distilled and pyrogen-free water systems; steam and gas sterilization facilities; biological production and sterile packaging facilities; and, boiler water and cooling water treatment programs.

Chief Operating Engineer, United States Rubber Company (now Uniroyal), 1953 to 1959. Responsible for the management, operation and maintenance of a steam power plant and allied equipment.

Professional Affiliations:

Member, ASME Committee on Nuclear Air and Gas Treatment and ASME Executive Committee on Nuclear Air and Gas Treatment.

Past Member, ASME Committee on Cranes for Nuclear Power Plants.

Licensed Stationary Engineer, State of New Jersey.

RICHARD BARLEY

Business Address:	Metropolitan Edison Company Three Mile Island Nuclear Station P.O. Box 480 Middletown, Pennsylvania
Education:	B.S., Chemistry, Pennsylvania State University, 1969. U.S. Naval Nuclear Power School and Prototype Training 1969-1970. Graduate courses in reactor plant engineering.
Experience:	Lead Mechanical Engineer, TMI-1, Metropolitan Edison Company, 1976 to present. Responsible for the support of plant operations and maintenance activities relating to mechanical systems and components including review of safety related operating test and maintenance procedures. Member of Plant Operations Review Committee. Engineer, TMI-1 Operations Department, Metropolitan Edison Company, 1974 to 1976. Duties included providing technical support and engineering assistance to the Supervisor of Operations. U.S. Navy, 1970 to 1974, Naval Officer aboard operating nuclear fleet ballistic missile submarine. Positions held include Main Propulsion Assistant; Damage Control Assistant; Reactor Controls Division Officer. Throughout this period, duties included direct supervision of nuclear power plant operations and maintenance.

JAMES P. MOORE, JR.

Business Address: GPU Service Corporation
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Education: B.S., Marine Engineering, State University of New York Maritime College, 1956.
Completed all requirements except thesis for M.S., Nuclear Science and Engineering, Catholic University of America, 1968.

Experience: Mechanical Components Engineering, Manager, GPU Service Corporation, 1978 to present. Responsible for areas relating to mechanical components, water chemistry systems, HVAC and fire protection.

Mechanical Systems Engineering Manager, GPU Service Corporation, 1971 to 1978. Responsible for areas relating to mechanical systems and structural design of power plants.

Senior Project Engineer, GPU Service Corporation, 1968 to 1971. Technical cognizance over the design of power plant fluid systems, including establishment of design criteria, design review and coordination and evaluation.

Senior Engineer, Allis-Chalmers, Atomic Energy Division, 1964 to 1968. Responsible for supervising fluid system modifications and installation of a redundant reactor core spray system at the LaCrosse Boiling Water Reactor Project; served as fluid systems consultant for the Pathfinder Atomic Power Plant Project.

Lead Engineer, Allis-Chalmers Atomic Energy Division, 1964 to 1966. Responsible for coordinating work on the LaCrosse fluid systems; performed heat transfer, fluid flow, stress and safety analysis designs for LaCrosse fluid systems.

Various engineering positions, Allis-Chalmers Atomic Energy Division, 1960-1964. Performed design engineering work for the Pathfinder reactor and turbine plant systems; responsible for design of feedwater temperature control system which maintained a constant temperature at all plant loads.

U.S. Navy, 1957 to 1958. Served as Damage Control Assistant and Engineering Officer aboard the USS Lester.

Allis-Chalmers Graduate Training Course, 1956 and 1959-1960. Received on the job training in the Hydraulic Turbine, Steam Turbine, Centrifugal Pump and Nuclear Power Departments.

CHARLES A. PELLETIER

Business Address: Science Applications, Inc.
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Rockville, Maryland 20850

Education: B.C.E., Sanitary Engineering, Rensselaer Polytechnic Institute, 1956. M.S., Radiation Biology, University of Rochester, 1957. Ph.D., Environmental Health, University of Michigan, 1966.

Experience: Division Manager, 1973 to 1978 and Operations Manager, 1978 to present, Science Applications, Inc. Manages the activities of a group providing technical research, services and consultation to the nuclear industry and government. Activities include studies of iodine behavior, charcoal testing, occupational radiation exposure reduction, leak detection methods for condensers and steam generators and effluent measurements.

Chief, Environmental Inspection Branch, Directorate of Regulatory Operations, U.S. Atomic Energy Commission, 1971 to 1973. Planned, organized and directed work of branch responsible for the development of AEC-Regulatory effluent and environmental inspection programs involving both radiological and non-radiological considerations.

Chief, Environmental Branch (Idaho Operations Office), U.S. Atomic Energy Commission, 1967 to 1971. Directed the activities of a branch involved in environmental monitoring and research and the National Reactor Testing Station (NRTS). Activities included routine monitoring of atmosphere and lithosphere at the NRTS; research on deposition of airborne materials on natural surfaces; doses from clouds of gamma emitting radionuclides and movement of radionuclides in soil. Directed independent environmental monitoring programs around several AEC licensed nuclear facilities in the U.S. for the AEC's Division of Compliance. Planned and directed emergency response activities for accidents at the NRTS involving releases to the environment.

Instructor and Assistant Professor, University of Michigan, 1960 to 1966. Taught and performed research mainly in area of environmental behavior of radioactivity. Developed and executed environmental survey for the Enrico Fermi Power Plant and Ford Research Reactor. Health Physics consultant to industry.

Radiation Control Engineer, Bethlehem Steel Company, 1958 to 1960. Developed company-wide programs for personnel monitoring and testing of sealed sources. Performed Health Physics surveys of industrial and medical x-ray units and radiography sources.

Health Physics Consultant, ASTRA, Inc., 1957 to 1958.

Honors and Professional Affiliations:

Certified by American Board of Health Physics, 1966.

Health Physics Society; President-elect, Delaware Valley Chapter, 1958 to 1959; Education and Training Committee, 1967 to 1970 (Chairman, 1970); Secretary, Eastern Idaho Chapter, 1968; Chairman, 5th Mid-year Symposium, 1970; Symposia Committee, 1972.

Appointed to the American Board of Health Physics, January 1971 (5 year term).

Member, ANS 18.1 working group for standards development on Effluent Sources at LWRs, 1974 to present.

Honorary Societies: Sigma Xi; Delta Omega; American Men and Women of Science; Who's Who in Ecology; Who's Who in Technology Today.

Publications:

"Environmental Surveys for Nuclear Facilities," Nucleonics, January, 1959.

"Maximum Permissible Weight Concentrations for Enriched Uranium," Nucleonics, October 1958.

"Pre-Operational Environmental Survey for the Enrico Fermi Atomic Power Plant; 1958-1962," with G. Hoyt Whipple, American Industrial Hygiene Association Journal, 24, 172-179, 1963.

"Concentrations of Radioactive Particles in Surface Air, November, 1962 through March 1963," with A. V. Wegst, and G. Hoyt Whipple, Health Physics, 10, 917-921, 1964.

"Use of Surface-Air Concentration and Rainfall Measures to Predict Deposition of Fallout Radionuclides," with G. Hoyt Whipple and H. L. Wedlick, Proceedings of November, 1964 Conf. on Radioactive Fallout from Nuclear Weapons Tests, A. W. Klement, Jr., Editor Conf-765.

"Detection and Quantitation of Fallout Particles in the Human Lung," Science 143, 957-959, 1964 with A. V. Wegst and G. Hoyt Whipple.

"The Sensitivity of Environmental Surveys to Atmospheric Releases from Nuclear Facilities," Ph.D. Thesis, University of Michigan, 1966.

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"Kinetics of Environmental Radioiodine Transport through the Milk-Food Chain," with J. D. Zimbrick, Ibid.

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"Comparison of External Irradiation and Consumption of Cows' Milk as Critical Pathways for Cs-137, Mn-54 and Ce-Pr-144 Released to the Atmosphere," to be published in Health Physics with P. G. Voilleque.

"Sources of Radioiodine at Boiling Water Reactors." EPRI, NP-495, February 1978, with others.

"Sources of Radioiodine at Pressurized Water Reactors," EPRI, NP-939, November 1978, with others.

"Compilation and Analysis of Data on Occupational Radiation Exposure Experienced at Operating Nuclear Power Plants," AIF/NESP-005, September 1974, with others.

"Potential Benefits of Reducing Occupational Radiation Exposure," AIF/NESP-010, May 1978, with P. G. Voilleque.

"Long-Term Performance of Charcoal Absorbers Removing Radioiodine in Ventilation Exhaust Air," EPRI NP-534, July 1978, with others.

"Surface Effects in the Transport of Airborne Radioiodine at Light Water Nuclear Power Plants," EPRI NP-876, September 1978, with R. N. Hemphill.

"Location of Condenser Leaks at Steam Power Plants," EPRI NP-912, October 1978, with others.

"Evaluation of Radioiodine Measurements at Pilgrim Nuclear Power Plant," NUREG/CR-0395, October 1978, with others.

"131I studies at TMI Unit 2," EPRI, NP-1389, April 1980, with others.

MR. BAXTER: The witnesses are available for cross-examination.

CROSS-EXAMINATION

BY MR. LEWIS:

Q Reading from my cross-examination plan, but not all of it, of course, essentially both -- one bit of background. The NRC testimony has not been received into evidence, but do you four gentlemen have copies of it?

A (WITNESS PELLETIER) Yes.

CHAIRMAN SMITH: Is there a chairman on the panel? It might be helpful.

WITNESS MOORE: I will volunteer.

BY MR. LEWIS: (Resuming)

Q The problem I have partially is to compare these two. Reading from my cross-examination plan, essentially both testimony submittals come to the same conclusions: two leaks found at TMI-2 will not occur at TMI-1, for various reasons. I use the term "leaks" as a general term meaning both cracks in vent header and I believe degradation was used, in your testimony on the action of the absorber, charcoal absorber. So that is a term I am using generally to cover those two items.

I am looking at "for various reasons." Now, the NRC testimony on page 4 of the NRC testimony, the last paragraph --

MR. BAXTER: Is this the testimony on your contention? They have two different pieces.

MR. LEWIS: This is the NRC testimony on the Lewis contention. It is dated NRC staff 9/15, I believe. I don't have the front page. I believe it is dated NRC staff 9/15.

Page four, last paragraph, quote: "Presently, all plants are being or will be, when required to test all engineered safety feature gaseous effluent treatment systems at regular intervals by technical specification requirements." Quote.

BY MR. LEWIS: (Resuming)

Q Now, in the Licensee's testimony you refer to technical specification requirements, but you do not refer to it specifically as engineered safety features, ESF. Is any part of the filters covered by Lewis contention, or the vent header, going to be or is on TMI-1 an engineered safety feature?

A (WITNESS MOORE) I will ask Mr. Itschner to answer that.

A (WITNESS ITSCHNER) No, they are not.

Q The entire vent header, the entire charcoal absorbers --

A (WITNESS ITSCHNER) The charcoal absorbers, the filters and the ventilation system for the auxiliary and fuel handling building are not engineered safety feature ventilation systems.

Q I must have read the NRC staff's testimony incorrectly. Then can you perhaps tell me -- and I would have to admit that it has been told to me already, but I would like to go over it anyway -- what are the particular measures by which the testimony -- page 1 you say, quote: "The quantity of radioactive gases required to be transported outside of the TMI reactor building for processing by the waste disposal system will be reduced from that experienced at TMI-2." Quote.

MR. BAXTER: What page?

MR. LEWIS: Page 1 of the Licensee's testimony, the sentence that states, quote: "The testimony shows that."

MR. BAXTER: Is this the outline?

MR. LEWIS: Yes. It's page i. I'm sorry, page i.

BY MR. LEWIS: (Resuming)

Q I cannot see how any of this will come about because you say it will come about. If it is not an engineered safety feature, what will cause all of these things that you have following, shows that will actually happen?

If it is an unfair question, please tell me.

MR. BAXTER: Do you understand the question?

WITNESS BARLEY: I think I understand your question, Mr. Lewis, to be what requirements are on the system. Mr. Itschner's answer refers to the auxiliary and fuel-handling building ventilation system, and he is technically correct that they are not designed as engineered safety feature systems.

But the testimony is correct that the technical specifications nonetheless require testing of the charcoal absorbers in the system. It is a condition of our license that we check test the charcoal for its performance in those systems.

WITNESS MOORE: I would add something. Technical specifications do apply to systems other than just engineered safety feature systems.

BY MR. LEWIS: (Resuming)

Q But this technical specification requirement to test the charcoal I believe also applied to TMI-2, and in the testimony itself you point out -- I forget which one had the charcoal, but in the testimony on the charcoal in this Licensee's testimony, it is pointed out that it wasn't tested, I believe, for 18 months.

Now, here's my problem. At TMI-2 it wasn't tested. At TMI-1 it is going to be tested. How am I supposed to trust it? Why? Give me a rationale?

A (WITNESS ITSCHNER) Mr. Lewis, it was not a requirement to test the charcoal at TMI-2 as a condition of the license.

Q I don't believe that, because I understand from one of the -- I forget if it was the Pogovin report or the Kemeny report. They both -- I think they both said it -- or one of them -- that the filter media was not tested, with the concurrence of the staff, for some reason.

Now, if it was not a requirement, why did you have to get the concurrence of the staff not to test it?

A (WITNESS ITSCHNER) If my recollection is correct, in the technical staff position in the Kemeny report it was pointed out that the charcoal that was in place in the filters in Unit 2 was purchased and installed prior to the requirements that are in the reg guides and the technical specification requirements. Therefore, the staff gave dispensation not to test in accordance with those requirements, due to the fact that the charcoal was purchased and in place prior to the promulgation of the requirements.

Q What you are saying is the staff can give dispensation when it well pleases, which is correct. But that still doesn't answer my question, why should I believe, therefore, that you are going to do anything?

Let me explain my reasoning. You have a case in court right now saying the staff wasn't doing its job properly, and here we are arguing a point that on TMI-2 the staff didn't do its job properly. Why should I believe the staff will do its job properly to make you do your job properly on TMI-1 in the testing of the charcoal? I don't see it.

MR. BAXTER: Mr. Chairman.

CHAIRMAN SMITH: Mr. Lewis, it may be a question better addressed to the staff.

MR. LEWIS: Not really, because --

CHAIRMAN SMITH: You want to know what basis any member of this panel has for believing that the staff is going to do its job.

MR. LEWIS: That's a little turned around. That's a question that I will ask the staff.

My question here is to the Licensee. The Licensee is going on record in another court --

CHAIRMAN SMITH: Let's rephrase your question with a one-part question, if possible. Ask the question, a single question, and see if he can get a single answer.

BY MR. LEWIS: (Resuming)

Q If the NRC staff is as inadequate as your present court case suggests, why should I believe that the NRC staff is going to make you check out these filters correctly?

A (WITNESS ITSCHNER) Amendment 55 to the operating license for TMI Unit 1 includes technical specifications that are in force that now require us to test the charcoal in the auxiliary and fuel-handling building ventilation systems at periodic intervals.

Q Again that goes back to the point that the staff is going to have to make you do it.

CHAIRMAN SMITH: You think the staff will make you comply with that regulation?

WITNESS ITSCHNER: We have every intention of complying with the technical specifications of the license.

CHAIRMAN SMITH: Mr. Lewis' question, however, is -- we are not going to go very far into it, but he would like to know why you think that the staff will make you comply with the regulation. If you don't know, that's all right. You just say that.

But if you have a reason to believe that the staff will make you comply, that is the answer Mr. Lewis is seeking. That is the answer he is seeking. But if you think --

WITNESS BARLEY: This is better addressed to the NRC. But the Inspection and Enforcement agency of the NRC is not empowered to change regulations that are issued --

CHAIRMAN SMITH: Let him finish his answer.

WITNESS BARLEY: They are not empowered, the I&E inspectors are not empowered, to audit the tech specs. They only audit our compliance to the letter of the technical specification. Therefore, if we do not comply with the technical specifications we would be subject to the enforcement actions of the I&E division of the NRC.

CHAIRMAN SMITH: You are still not appreciating the fine thrust of Mr. Lewis' question.

WITNESS MOORE: I will address the issue. The main difference between TMI-1 and TMI-2 is that there was not a technical specification requirement to do this surveillance on TMI-2. There is in force a technical specification requirement for us to do this surveillance on Unit 1.

The I&E inspection people were not burdened, or were not empowered, to check us to do it on Unit 2 because it was not a requirement in the tech specs. On Unit 1 it is a requirement and they will be doing it.

BY MR. LEWIS: (Resuming)

Q In other words, it has been formalized?

A (WITNESS MOORE) That's right, it has been formalized.

Q I guess that's what I'm after on that question.

A (WITNESS BARLEY) In addition, it is the policy of the company to comply with tech specs and we have an independent auditing organization that audits ourselves for compliance with the technical specifications, regardless of what the NRC does.

Q I hope so. Now let me get on to other items here, if I can remember them.

(Pause.)

Q Yes. This business about how much iodine got out. In discovery I was handed -- I was mailed a document that showed some laboratory results. I have it here, but I don't want to dig it out.

My problem with it is this. It appeared to me -- and maybe I was very unfair, but it appeared to me that the information, the testing from the various beds of charcoal to get the numbers that were gotten, was picked and chosen. I forget the person who is on iodine, but would that person like to defend the laboratory data and try to show why that particular method used in the report on the iodine analysis in the TMI-2 trays was correct?

MR. BAXTER: If you think you know what data the questioner is referring to.

MR. LEWIS: I will dig it out.

WITNESS PELLETIER: I assume you are referring to the measurements made by NUCON for Met Ed on the efficiency of the charcoal taken out of the TMI-2 filter banks. And what was your question?

BY MR. LEWIS: (Resuming)

Q The methodology used leaves me cold. It seems to be picked and chosen to get numbers, and I would like some justification for the methodology that was used in that report and whether you still consider that report justifiable?

A (WITNESS PELLETIER) The methodology used to test charcoal and the methodology that was used by the NUCON people is a methodology worked out by a group of -- it is an ASTM committee. It is composed of industry, government, suppliers of charcoal, users of charcoal.

As I remember, they ran two tests. One was at 30 degrees Centigrade and 95 percent relative humidity, and that is a fairly -- that is a standard test in the ASTM protocol of testing.

As I remember, and as I put in my part of the testimony, the charcoals didn't do very well under those tests. That is a very stringent test.

The only other test I remember being done is one in which they tested it at 30 percent relative humidity. As I remember, the justification was that may be a better indication of the conditions under which the charcoal was exposed during the accident at TMI-2.

Those are the only two tests I am familiar with. I have no reason to suspect that there was any selection with the tests.

Q You have gotten to the point I wanted to get to, wonderful, namely, why do you feel that 30 percent humidity is a more justifiable humidity level for the TMI-2 accident for the air going through the filters and charcoal?

A (WITNESS PELLETIER) As I understood their report, they chose 30 percent because 30 percent was the relative humidity that had been measured over at the airport, at the Harrisburg Airport, roughly over this time, late March, early April. I have no firsthand knowledge of why they chose 30 percent. I think that was the reason.

DR. JORDAN: These tests you are speaking of, then, were attempts to measure the actual filtering efficiency as experienced at the time of the accident; is that right?

WITNESS PELLETIER: That is what was said in the report, yes.

DR. JORDAN: All right.

BY MR. LEWIS:

Q That is a point that I have a little trouble with. As I understand it, the air or the volume going through the filters doesn't come from the outside inside; it goes from the inside outside, obviously.

A (WITNESS ITSCHNER) My recollection is the system runs around 128,000 cubic feet a minute, so you will have 128,000 cubic feet a minute going in and out of the plant. For every minute there will be 128.000 cubic feet coming in and going out.

Q That will give me enough information on the record now to develop what the turnover rate for the building is. I can easily find other dimensions.

A (WITNESS ITSCHNER) The volume of the building and so on.

Q That answers my question.

A (WITNESS ITSCHNER) It will come out to somewhere about between two and five air changes per hour, which is a standard normal ventilation air change.

Q That gives me enough on the record for that group of questions.

DR. JORDAN: Is the air heated as it comes in?

A (WITNESS ITSCHNER) The air is capable of being heated. If it is necessary on a temperature basis it will be preheated.

DR. JORDAN: That would, if anything, lower the relative humidity.

A (WITNESS ITSCHNER) That would lower the relative humidity, the increase in temperature, yes.

CHAIRMAN SMITH: Does that mean, then, if a test is made on the presumed outside humidity, that that would be conservative?

A (WITNESS PELLETIER) I am not sure they didn't take into consideration this heating of the air in the building. I am not sure it was in the report. They did refer to the measurement at the airport, but they may have taken into consideration the fact that it was heated, which would lower the relative humidity.

BY MR. LEWIS: (Resuming)

Q Finally, on the Lewis contention we were asking for supplementary filters. Your testimony says, of course, that you don't need to stick a supplementary filter on top of TMI-1 vent stack; am I correct?

A (WITNESS ITSCHNER) That's correct.

Q At the same time, isn't your testimony saying that you have upgraded the present TMI-1 system so that there isn't a need for this extra filter on the outside?

A (WITNESS ITSCHNER) In what way do we upgrade the system.

Q Now you are saying that you are going to check the carbon for efficiency, you are going to check the flanges and the vent header for leaks. Isn't this in effect an upgrading?

A (WITNESS BARLEY) Upgrading of our operating practices. They don't necessarily result in any system design changes.

Q I didn't say a system design change.

A (WITNESS BARLEY) That is what the term "upgrading" is understood --

Q Effectively was something upgraded.

A (WITNESS BARLEY) Our operating practice as regards testing and inspection, that was upgraded, yes.

Q Testing and inspection. That is exactly what I wanted to know. Except for the change from one form of adsorber on the charcoal to another form of adsorber on the charcoal, was there any other design change? Although that isn't considered a design change, was there any other physical design change?

A (WITNESS ITSCHNER) There have been no hardware changes.

Q That is what I'm asking.

A (WITNESS ITSCHNER) No hardware changes.

Q So this leaves design and inspection as the only two areas, really, of major difference from TMI-1 before the TMI-2 accident to TMI-1 when it restarts if it restarts.

A (WITNESS ITSCHNER) I didn't get the first part of your question.

Q In reference to the filters and vent header only, the upgrading of design and inspection are the only changes on the filters, only design changes on the filters and vent headers.

A (WITNESS ITSCHNER) To my knowledge. I didn't think we stipulated there were any design changes. There have been maintenance procedures upgraded and testing procedures upgraded.

Q All right, you are clarifying, maintenance and testing.

DR. JORDAN: In addition, there was a requirement for quality control of the charcoal itself. Hasn't that been upgraded?

A (WITNESS BARLEY) The charcoal that we used for the ventilation system will be procured to a specification and the procurement will be subject to our normal quality controls.

BY MR. LEWIS: (Resuming)

Q I hate to go back to a point, but I have got a lot of questions on this iodine. They revolve pretty much around the middle paragraph on page 5. One of my questions is the sentence: "Also there were uncertainties concerning the source of the iodine 131 in ventilation air."

Can anybody explain the word "uncertainties" or what it refers to?

A (WITNESS PELLETIER) The impression I was trying to get across in that paragraph was why they put filters on the roof at TMI-2, the added filters on the roof. One of the factors involved in that decision was that at the time -- and this was in the first day or so of the accident -- there were uncertainties as to where the iodine was coming from.

For example, it wasn't known whether it was coming from leaky valves in the letdown line. It wasn't known just how well the charcoal filters were operating. Those are the uncertainties I am referring to.

Q How are these uncertainties overcome at TMI-1 now?

A (WITNESS PELLETIER) In several ways. The leak testing program that Mr. Barley refers to in his section is one. Now, before the fact there will be positive indications, if there were leaks, where they are. That was not the case at TMI-2.

Q May I interrupt?

A (WITNESS PELLETIER) Yes.

Q Where they are. Are you saying that there is some kind of new instrumentation, monitoring instrumentation?

A (WITNESS PELLETIER) I will let Mr. Barley answer that.

A (WITNESS BARLEY) What Mr. Pelletier is referring to are new test procedures to meet the requirements of 0578, which requires the establishment of the leakage reduction program. It requires you to test the systems, that is, to inspect the systems at normal operating conditions for leakage, to identify and quantify that, the various sources of leakage that you may have, and to reduce by maintenance means those sources of leakage to as low as reasonably achievable.

Q I see we are back to maintenance and testing as an upgrading tool. Proceed with how these uncertainties are overcome at TMI-1 now.

A (WITNESS PELLETIER) Another area is the testing of the charcoal filters that we have alluded to. The efficiencies of these filters will be known. At TMI-2 there was doubt as to the involvement of the turbine side, condenser side in the release of the iodine. At TMI-1 it is my indication that, it is my understanding that the condenser off gas is -- gets filtered -- no -- that was another uncertainty at TMI-2.

Is that adequate?

Q I am waiting for you to end.

A (WITNESS PELLETIER) I will end.

Q I think that answers my question.

I believe, Dr. Pelletier, you were mentioning the efficiency of charcoal will be known, which brings us into the test program for the charcoal, which should be that Amendment 55 again, I believe. That is the case. It is Amendment 55.

Now, this brings me to the test and maintenance program, which -- Amendment 55. Are you sure it isn't Amendment 15?

MR. BAXTER: They are speaking of the amendment to the operating license.

MR. LEWIS: I am now looking at a letter Mr. Baxter sent me October 30th with a paragraph 2.1.1.8 of Licensee's -- Mr. Baxter, what do you call this?

MR. BAXTER: Restart Report.

BY MR. LEWIS: (Resuming)

Q And I believe these two pages tell me how this maintenance and testing program will be -- well, will be scheduled and will be implemented. Am I correct on that?

A (WITNESS BARLEY) Essentially yes.

Q Good. Please correct me if I make a wrong assumption. Please stop me before I build some kind of illogical pyramid on it.

One of the problems I have with this program is on page 2.1-29(c), which is the second page, beginning of the third paragraph: "Phases number 2 and 3 of this program will be completed prior to TMI-1 restart." Except for that, there doesn't seem to be too much of a scheduling of this maintenance and testing program. I admit it has been formalized, it has been agreed to by the Licensee, this maintenance and testing program. It is now in the Tech Specs Amendment 55.

But I am still weak on how and when this will be phased in, if at all.

A (WITNESS BARLEY) The statement in the restart report commits us to complete the program prior to restart. The program consists of several system tests which require in some cases different system lineups and different system configurations and operating conditions. Those will dictate the precise scheduling of the tests on the building spray system or the decay heat removal system or the makeup system or the waste gas system.

It is imprudent to put those sorts of details into this because they are determined by day-to-day events at the plants. The main commitment you should be interested in is that all of the system tests will be done prior to restart and leave the daily day-to-day scheduling to us at the plant.

Q I appreciate that. I appreciate that you are not going to put "Mechanic Jones tightened up bolt 3 on subsystem A" in some restart report or in tech specs or anywhere, really; but at the same time, I have no meat to bite into to tell me exactly what and when of this maintenance and testing upgrading will be incorporated when, except sometime prior to restart.

CHAIRMAN SMITH: Mr. Lewis, perhaps I can be somewhat helpful in the procedure which I think is anticipated in the Commission order, and that is when it has been determined what is required before restart, either otherwise by the staff, by agreement or in this hearing, the director of Nuclear Reactor Regulation will have to certify to the Commission that those necessary actions have been taken. That is on page 13 of the mimeographed, Xeroxed order of hearing.

Is that the nature of your concern?

MR. LEWIS: Partially.

CHAIRMAN SMITH: If that is not helpful, continue.

MR. LEWIS: Here is what is getting to me. What is going to be done on the vent header in the filter system is not going to be a matter of certification to the Commission. It is going to be a matter, as the Licensee has just stated here, pretty much of -- well no, I shouldn't say the Licensee has just stated. It seems to be implied to me the Licensee has agreed to a formalization, and therefore a lot of this then falls into the Licensee's hands.

For instance, on page 1, if you look at what these actions are, what the Licensee is going to do on the vent header and the filter system, a lot of this is merely a paperwork maneuver: develop a schedule, develop a method, develop a testing procedure, determine nature of the -- well -- determination of the best method to measure leakage, not necessarily have that system in place before startup, but have a determination of that system before startup. At least this is the way I am -ding it.

A (WITNESS BARLEY) Let me correct you. What you are referring to is what we have described as Phase I, the scoping in the plant and the development. Phase II states that the actual leakage measurement tests will be performed for those systems identified, and in Phase III the data collected during the tests will be evaluated and the necessary corrective actions performed.

The results of the Phase II tests will be reported to the NRC within sixty days of completion of Phase III. So there is follow-through to do the tests and to report the results.

MR. ROBERT ADLER: I am sorry to interrupt the cross examination, but I was under the impression or Mr. Lewis gave the impression that he was going to cross examine now on the charcoal testing system, the testing system of the charcoal filters. The section of the restart report that we are now referring to refers to the leak reduction testing program, and I wonder if Mr. Lewis is aware that there are two different testing programs.

MR. LEWIS: Yes. Yes, I finished my cross on the charcoal as far as I wanted to go. I haven't finished on other parts of the filters. In fact, this would be a good time for me to stop my cross examination of the Licensee. I have got what I want.

DR. LITTLE: I want to ask one question. Is what you are after if they say periodic testing, you want to know what that period is, how often it is conducted and how they are actually going to do the test? Is that what you are trying to get at?

MR. LEWIS: That is what they don't have that yet, and that is what they have omitted.

WITNESS BARLEY We have that. The procedures are drafted although not all of them are fully through the approval chain. The program is set up for testing of those systems on a refueling interval basis. Those procedures will involve physical walkdown of the system at operating pressures and temperatures to identify leakage, and where leakage is identified, to collect and measure that leakage.

BY MR. LEWIS: (Resuming)

Q That doesn't change my point. It is not in place at this point.

A (WITNESS BARLEY) Some of the tests -- and you might be interested to know that we have done both nitrogen and pressure drop tests on the vent header, and also a helium mass spectrometer test to identify leakage on the vent header, and both of those tests have indicated that we had no leakage on the vent header at TMI-1.

Q I believe I have seen those tests. I appreciate your bringing it up.

One short, easy question, please.

Just for the record, you have no familial relationship with Susan Barley, my associate in this case.

A (WITNESS BARLEY) No, I don't. I have a sister in law with that name, but she is not in this case.

CHAIRMAN SMITH: One thing I can concerned about on your cross examination plan, Mr. Lewis. Under the protocol that we arrived at that the cross examination plans would be available for inspection by the other party, in your cross examination plan you indicate some of your plans with respect to filing proposed findings. That had not been anticipated. You are not required in advance to reveal what your proposed findings are going to be. Let me see if I can -- for the moment, I can't locate -- all right.

So, if you would like to remove that reference -- I see. That is fine. I just had recalled that I wanted to check it.

MR. LEWIS: I believe I only went as far as number 2 under background in my entire cross examination today. I really didn't cover anything else. I didn't believe I needed to.

CHAIRMAN SMITH: You are aware that the cross examination plan will be available for inspection of the parties at the end of the proceeding and before proposed findings?

MR. LEWIS: I gave a copy to the reporter to incorporate in the record.

CHAIRMAN SMITH: Okay.

(The Lewis Cross Examination Plan follows:)

Lag-in #4

Lewis 10-15-80.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
BEFORE THE ATOMIC LICENSING AND SAFETY BOARD

Inthe matter af	)	
METROPLITAN EDISON COMPANY	)	Docket No. 50-289
(TMI #1)	)	(Step Restart)

Cross Examination Plan of Intervenor Lewis on Direct Testimony of Licensee and NRC Staff.
(Filters)

Background : Licensee and Staff have submitted Testimony on the Lewis Contention.(LIC 9/15/80 and STAFF 9/15/80) Essentially both testimony submittals come to the same conclusions:

1. Supplemental filters such as used on TMI#2 after the 3-28-79 accident will not be needed on TMI#1.
2. Leaks found at TMI#2 will not occur at TMI#1 for various reasons
3. Filters will handle iodine adequately at TMI#2 because of changes in monitoring andinspection.

In coming to these conclusions, both the licensee and the Staff make the very admissions that weaken their conclusions.

1. Supplemental filters were needed after the accident at TMI#2
2. Leaks did occur at TMI#2.
3. Filters did not perform as well as possible at TMI#2.

4 Several others which will be incorporated in Intervenor Lewis's submittal concerning findings of fact after close of direct testimony.

Due to the Staff and Licensee's admissions in their respective direct testimony, Intervenor Lewis sees no need at this time for cross examination except in these limited areas:

1. To verify that the witnesses are actually speaking for the Licensee or NRC and not ~~xxxxx~~ merely giving a personal opinion which has no bearing on the case.
2. To set the important admissions in the respective direct testimonies in concrete
3. to ensure that the important admissions in ~~the~~ respective ~~te~~ testimonies are not vacated during the verbal or oral presentations. For Instanse , if a better justification ~~of~~ for using a value of 30% relative humidity is given during direct , I examination on this point would be necessary. The same could be said for almost any point in the direct written submittal.

Marvin I. Lewis

CHAIRMAN SMITH: Ms. Bradford, do you have questions?

MS. BRADFORD: No questions.

BY MR. ROBERT ADLER:

Q On page 6 of your testimony, first referring to the bottom paragraph on the page, you say with regard to employing heaters to reduce moisture in the effluent air, tests have shown that maintaining the relative humidity at 50 percent to 70 percent can extend the effective life of charcoal adsorbers, and you go on to say that this is merely an economic consideration, not a safety consideration.

However, near the top of the page you say it has been shown that the higher the relative humidity, the lower the efficiency for retaining methyl iodide, which would indicate that under any circumstances, reducing humidity would increase the efficiency of the filters in terms of retention of iodine.

Could somebody please explain that apparent inconsistency?

A (WITNESS PELLETIER) There are two considerations. One is a long-term consideration. When you expose charcoal for long periods of time -- and by that I mean months, years -- to humidities higher than 50, 70 percent, you weather the charcoal and it becomes less efficient for adsorbing iodine at the time of insult. It is a long-term phenomenon. That is what I was referring to in the last paragraph. In the top paragraph I am referring to the conditions that prevail during the insult, during the test, as I have indicated there, and it isn't linear.

You can have a very high efficiency for removing methyl iodide, up to efficiencies as high as 95 percent, and it isn't until you get above 95 percent that the charcoal's ability to retain the methyl iodide will begin to decrease.

Does that clear it up?

Q It clears it up in my mind. The sentence at the top of the page is simply very incomplete according to that testimony.

A (WITNESS PELLETIER) Pardon?

Q That is fine. I think you have answered the question.

I have a few questions on the testing and maintenance of the charcoal filters described at pages 7 and 8. First, can you describe what is involved in the test of the charcoal filters, both the initial and the periodic tests?

A (WITNESS ITSCHNER) The tests are described in the technical specifications, and they are further described in detail in ANSI-N510, which is referenced in the reg guide that the tech specs were modeled on.

Q Can you describe the nature of the physical test?

Is it something more than a visual test?

A (WITNESS ITSCHNER) Are you in particular talking about the test of the charcoal, the HEPA filters?

Q The charcoal.

A (WITNESS ITSCHNER) The charcoal is tested in a laboratory for efficiency, number one. There are tests --

DR. JORDAN: In the laboratory you measure test efficiency -- you measure efficiency for removing iodine?

WITNESS ITSCHNER: Yes. The tests in place would be to verify the leak tightness of the adsorbers and housings in which they are contained to assure there was no leakage. This is done with a halite type of gas.

BY MR. ROBERT ADLER: (Resuming)

Q During the in-place testing program, do you have any procedures for measuring the efficiency of the charcoal?

A (WITNESS ITSCHNER) No.

Q After the time the charcoal filters are installed in the plant, there is no way to retest the efficiency?

A (WITNESS ITSCHNER) The charcoal is purchased and installed in accordance with the reg guide requirements for charcoal for this purpose. It then has demonstrated its efficiency. Depending on the system and the tech spec requirement, the period for testing is selected on the basis of verifying adequate capability for the time period and the use to which it is put.

These procedures are spelled out in the standards I referenced and the Reg Guides 1.52 and the tech specs. Periodically we are required to test this charcoal and verify its capability and replace it upon determination that it is inadequate.

A (WITNESS BARLEY) Let me add that once the charcoal is installed in place, there are test trays provided with charcoal that allow you to pull the test trays and retrieve an individual sample of what was physically within the filter housing and subject to the airflow stream conditions. That is what is sent off to the laboratory for the iodine efficiency analyses that Mr. Itschner referred to earlier.

Q That is what I'm getting to. You actually remove a physical portion of the charcoal in the implant filter during the periodic tests, take that to the laboratory?

A (WITNESS BARLEY) That is a requirement of the technical specification, yes.

Q Was it ever determined -- was the cause of the degradation of the filters at TMI-2 ever determined?

A (WITNESS PELLETIER) I don't think so specifically, other than just normal weathering.

DR. LITTLE: How long had that particular batch of charcoal been in there at the time of the accident?

WITNESS ITSCHNER: My recollection is the charcoal was purchased in 1975, and if I remember in the Kemeny Report, the technical staff portion of the Kemeny Report, I believe it referred to that it had been in place for approximately a year to 18 months prior to the accident. So this was during a portion of construction.

DR. LITTLE: How long had it been since it had been tested for its adsorption capacity?

WITNESS ITSCHNER: The only time it had been tested was at the time of purchase.

DR. LITTLE: All right.

WITNESS ITSCHNER: Until subsequent to the accident when the testing was done to determine its efficiency at that time.

DR. LITTLE: Then I will ask again: how frequently are these trays removed to see how much remaining adsorption capacity there is?

WITNESS ITSCHNER: It depends upon the system. The frequency is determined by the tech specs, which are based upon the regulatory guides. If it is an engineered safety feature system, then it is required every 720 hours of operation or every 18 months or refueling outage, wherever comes first. If it is Reg Guide 1.40 system, which is normal ventilation system, it is required every 18 months or at each refueling outage, whichever comes first.

DR. LITTLE: What is the turnaround time on the analysis?

WITNESS ITSCHNER: My recollection of the samples that were taken subsequent to the accident and analyzed were in the order of magnitude of two to four weeks. Maybe Dr. Pelletier could shed some light on the physical time required to do these types of analysis and what the optimum time may be.

WITNESS PELLETIER: The test itself takes about a day, and so the critical path is getting the sample out of the stallation and to the laboratory for testing. So that is p. bably why it takes a week. We have done it faster than that.

DR. LITTLE: And then once it has been determined that the capacity has been exhausted, how long does it take to replace the charcoal in the filter if a problem is noted. How much time elapses between the time it is recognized and the solution to it?

WITNESS ITSCHNER: Depending on the circumstances of the change out of the filters and the complexity of the ventilation system, it can take a matter of days or a matter of weeks. If it is a relatively small system involving two to six trays, it could be done in a matter of a day or two.

If it is a complex system, a large system such as the one for the auxiliary and fuel handling building, which has something like 600 trays, this could take a matter of weeks. And as was experienced at TMI-2 under the conditions of radiation, this process was quite lengthy. But under normal conditions for TMI-1, I would say two to three weeks.

DR. LITTLE: All right.

Excuse me, Mr. Adler, for interrupting you again.

CHAIRMAN SMITH: You are finished?

BY MR. ROBERT ADLER:

Q On Table 2.1 of the Restart Report, the leakage reduction program test summary, you list on the right-hand column the acceptance criteria, and for the makeup and purification system you list one gallon per minute as the acceptance criterion.

Can you please explain the basis for that criterion?

A (WITNESS BARLEY) That particular system criterion was derived from the technical specification on reactor coolant system leakage, which allows a total of one gallon per minute total unidentified leakage for the reactor coolant systems. Since the portion of the makeup systems under test are portions that are normally connected to the reactor coolant system and not isolated, we applied the same criterion to that. So it is really in reality a summation of reactor coolant and makeup system leakage that ends up to one gpm.

Q I'm sorry; can you repeat the last sentence?

A (WITNESS BARLEY) It is in reality the one gpm applies to the total RCS system leakage, with the makeup system portions that are not isolated from the reactor coolant system included in that total.

Q "It" refers to the total RCS leakage?

A (WITNESS BARLEY) Unidentified.

Q Were any of these acceptance criteria based on off-site exposure?

A (WITNESS BARLEY) They were inasmuch as they related to tech specs that already governed system leakages, such as in the case of the RCS unidentified leakage of one gpm and the decay heat removal system leakage.

Q Isn't the whole purpose of the leagage reduction program to reduce off-site exposure?

A (WITNESS BARLEY) It is. Its purpose is to reduce and identify the system and component leakages in the system that would be expected to contain radioactive fluid under transient conditions, and yes, the ultimate objective is to reduce the off-site exposures. The technical functions group in Parsippany has some studies under way to provide the plant staff with a correlation between system leakage amounts and the resulting impact on off-site exposure. Those will be used in evaluating and prescribing the appropriate corrective actions for leakage amounts that we identify in the course of this program.

BY MR. DORNSIFE:

Q I have two questions. Mr. Moore, first of all, your testimony on page 4, the last paragraph of your part of the testimony. In the middle of that paragraph you say, "This reduces the need to transport large quantities of radioactive gases outside the reactor building via the makeup tank for processing by the waste gas disposal system."

Are you aware of any intentional use of the makeup system for that purpose during the TMI-2 accident? Is that really what you meant to say?

A (WITNESS MOORE) Yes.

Q Was the makeup system used to deliberately vent radioactive gases out of the system?

A (WITNESS MOORE) The makeup system is a portion of the reactor coolant system in normal operation. With the hydrogen within the reactor coolant system, there was every intent to remove that hydrogen from the system, and one of the mechanisms used was to transport it to the makeup tank.

Q Mr. Pelletier, in your testimony on page 6, you talk about the efficiencies of the charcoal for methyl -- the other form is elemental iodine; is that correct? Can you give us a ballpark idea of what the relative efficiencies of a new filter charcoal filter will be for methyl versus elemental iodine, and what the differences between the two species are, why one is more important than the other, what the potential effects of the two are?

A (WITNESS PELLETIER) You said a new filter?

Q A filter qualified in accordance with Reg Guide 1.52, let's say.

A (WITNESS PELLETIER) This is a ballpark estimate, but charcoal is much more efficient for elemental iodine, typically, than for methyl iodide. It depends on many factors. But I would say a factor of 10 or 100 times more efficient wouldn't surprise me for elemental compared to methyl iodine. For the accident situation there isn't a heck of a lot of difference between the methyl iodide and elemental iodine since the critical path is assumed to be the person breathing, and biologically elemental and methyl iodine don't behave any differently.

In the case of a normally operating plant, however, elemental iodine is much more obnoxious in the sense that it gets out and stick to things, and particularly grass. The cows eat the grass, it ends up in milk, and the critical path is the grass-cow-milk-baby food chain. Is that what you are after?

Q Yes.

One other point I would like to bring up. Isn't it true that methyl iodine usually is an aged form of iodine? The longer the iodine stays around, the more will typically turn to methyl versus elemental?

A (WITNESS PELLETIER) That's true.

MR. DORNSIFE: Thank you.

MR. ROBERT ADLER: I have one more question.

BY MR. ROBERT ADLER:

Q This is a follow-up to Mr. Lewis' question regarding the scheduling of the leak reduction program. Mr. Lewis was referring to Amendment 21, I believe, of the restart report. In Amendment 7 there was an additional paragraph that had a schedule for the completion of this program. It says that Phase I, it was expected to be completed -- to be begun the week of December 3, 1979, and it goes on from there.

Can someone explain what the cause of the delay was, why this was postponed?

A (WITNESS BARLEY) The reasons for the delay were primarily determined by the other delays in the plant schedule: that is, that the number of systems were out of service for maintenance for various repairs, that there were other maintenance priorities to be accomplished at that time that forced the attention of my staff to other items at that time.

MR. ROBERT ADLER: I have no more questions.

EXAMINATION BY THE BOARD

BY DR. LITTLE:

Q On page 7 of the testimony, as we have already mentioned, the statement is given that the charcoal appeared to have only been exposed to air with an average humidity of 30 percent. You have explained were the 30 percent number came from. I am interested in how much confidence you have that the filters themselves saw 30 percent humidity.

A (WITNESS PELLETIER) The filters at TMI-2 at the time of the accident.

Q Yes. How much confidence do you have that actually what was going through those filters had a average humidity of 30 percent

A (WITNESS PELLETIER) As I remember, it was fairly cold. It was in March.

Q March 28th and 29th.

A (WITNESS PELLETIER) I don't exactly know how cold it was. If you take air at, say 30 or 40 degrees and you heat it to the air that -- in the auxiliary building, it was probably 70 degrees. We start with a relative humidity of 70 percent, say. I would say that you can get it down -- it sounds a little low to me, but 30 or 40 I think would be reasonable.

Q Taking into consideration the turnover time in the building and the conditions prevailing?

A (WITNESS PELLETIER) Sure. I don't think there was any humidity being added in the building. I think the air was just being heated and it retained the water that it had when it came in.

Q Were there any conditions inside the building that would result in the humidity being dumped into the atmosphere?

A (WITNESS PELLETIER) I would say not if you are referring to the possibility of leakage affecting the relative humidity. I would say absolutely not. You have to have a lot of water to raise relative humidity of 120,000 cubic feet of air a minute very much.

Q You are confident that it was not as high as the 50 to 70 percent range at which the adsorption capacity would be seriously affected. You are confident that it never maintained humidity that high for any appreciable length of time?

A (WITNESS PELLETIER) It may have gotten to 50. It might have gotten to 50. I am not sure I understand what you are after.

Q The page before indicates that if you maintain the relative humidity somewhere in the vicinity of 50 to 70 percent and don't exceed that, then the filters are going to be more effective. So you are confident that it did not exceed that range for any appreciable length of time.

A (WITNESS PELLETIER) I should clarify something. In that last paragraph the studies I am referring to that show the performance of filters degrade if the relative humidity is above 70, 50 to 70 percent, they are done for a long period of time, months, even years. What was present at the time of the accident, just so it wasn't above 95 percent, which I think we can say with some assurance that it wasn't.

Q You are confident that it did not exceed 95 percent.

A (WITNESS PELLETIER) Yes.

Q You have some feeling that 30 percent may be reasonable to somewhat low average humidity.

A (WITNESS PELLETIER) That would be my guess, yes.

CHAIRMAN SMITH: Mr. Cutchin.

MR. CUTCHIN: I have no questions of these witnesses.

CHAIRMAN SMITH: Mr. Baxter.

MR. BAXTER: I have nothing further.

CHAIRMAN SMITH: Mr. Lewis, anybody else, any further questions?

(No response.)

CHAIRMAN SMITH: You are excused, gentlemen. Thank you.

(The witnesses were excused.)

CHAIRMAN SMITH: All right. Let's go on the record.

Whereupon,

PHILLIP G. STODDART,

called as a witness by counsel for the NRC staff, having first been duly sworn by the Chairman, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. CUTCHIN:

Q Mr. Stoddart, do you have a copy of a document labeled NRC Staff Testimony of Phillip G. Stoddart Regarding Rapid Filtration for Large Volumes of Contaminated Gases and Fluids and Effluent Pathways (ANGRY Contention V D) before you?

A Yes, I do.

Q That document consists of 12 pages, does it not, and is accompanied by a one-page statement of your professional qualifications?

A Yes.

Q Was that document prepared by you?

A Yes, it was.

Q Do you have any corrections that you wish to make?

A Yes, I do.

Q Would you state them, please?

A On the first page, bottom line, it says "Order of May 25, 1979." It should read "Order of August 9, 1979."

On page 7, the last paragraph, beginning "At

TMI-1," it should be struck.

CHAIRMAN SMITH: Would you repeat that, please?

THE WITNESS: On page 7, the last paragraph on the page, beginning "At TMI-1," strike the last paragraph.

MR. BAXTER: Is that a new paragraph on page 8, then, at the top of the page?

THE WITNESS: No, I'm sorry. That need not be a new paragraph. It was originally a continuation of the first but it fully applies to the preceding material, preceding the struck paragraph.

BY MR. CUTCHIN: (Resuming)

Q Are you then saying, Mr. Stoddart, that we should strike the material at the bottom of page 7 beginning with "At TMI-1," and how far should that deletion extend?

A To the bottom of the page, through the words "removal is concerned."

CHAIRMAN SMITH: One moment. Turn to page 7 of the testimony on your contention. There are two testimonies. This is the one on your contention. You don't have it?

MS. BRADFORD: No.

CHAIRMAN SMITH: Well, you borrow mine and I will share Dr. Little's. You have the testimony on Mr. Lewis' contention.

MS. BRADFORD: Yes.

CHAIRMAN SMITH: Here is the testimony on ANGRY's contention.

Do you have any more contentions?

THE WITNESS: Yes, on page 11.

CHAIRMAN SMITH: I will make the corrections and give it to you.

THE WITNESS: Page 11, the middle of question 16, line 2, reading "There are other cryogenic systems." The word "cryogenic" should be struck there; it is a little misleading. And on the third line, regarding cryogenic solvent extraction. Those words should be eliminated, "cryogenic solvent extraction," and be replaced by "selective absorption."

DR. LITTLE: And what was the next word? You said selective absorption.

THE WITNESS: It refers to systems techniques such as cryogenic distillation and selective absorption. That is the extent of my changes on that piece of testimony.

MR. CUTCHIN: These changes have been provided in the reporter's copy.

BY MR. CUTCHIN: (Resuming)

Q With those modifications, is this testimony true and correct, to the best of your knowledge and belief?

A Yes, it is.

Q Do you adopt it as your testimony on ANGRY

Contention 5(d) in this proceeding?

A Yes, I do.

Q Do you also have before you a document consisting of ten pages, to which is attached another copy of your professional qualifications, and the document is entitled NRC Staff Testimony of Phillip G. Stoddart Regarding Need for Heaters on Ventilation Exhaust Filters for TMI-1 (Lewis Contention)?

A Yes, I do.

Q Was that document prepared by you?

A Yes, it was.

Q Are there corrections or modifications to be made to it?

A Yes, there are.

Q Would you state them, please?

A On page 4, eight lines from the bottom, the line reading "Efficiency of charcoal for the adsorption of noble gases" should read "for the adsorption of iodine."

Q "Noble gases" should be deleted and the word "iodine" substituted.

A That is correct.

On page 7 in answer to question 10, line 6, a word should be added there. "Charcoal is also briefly effective in retaining noble gases." And on the next line, beginning with the word on the previous line, "Efficiency is not as great as for iodine." The phrase "not as great as for iodine" should be struck and replaced with "essentially zero."

On page 8, question 17, at the bottom of the page, starting third line from the bottom, it reads "will reduce." Change "will" to "may."

On the next to the last line, starting with "Efficiency," the words "will not" should be struck and replaced by "but the staff is not aware of published data on release." Strike the word "all" and replace it with "of." It should read: "but the staff is not aware of published data on release of the radio-iodine collected on the adsorber."

Q With those modifications, is the testimony on the Lewis Contention now true, to the best of your knowledge and belief?

A Yes, it is.

Q Do you adopt it as your testimony in this proceeding on the Lewis contention?

A Yes, I do.

MR. CUTCHIN: Mr. Chairman, I ask that Mr. Stoddart's testimony just identified be received into evidence and bound into the transcript, along with copies of the accompanying outlines.

CHAIRMAN SMITH: If there are no objections, it will be so received.

(The testimony of Philip G. Stoddart follows.)

OUTLINE

This testimony of Phillip G. Stoddart contains the NRC Staff's response to the Lewis Contention.

The purpose of this testimony is to demonstrate that, contrary to the assertions of the contention, neither new filters, nor preheaters on filters, in the auxiliary building are necessary to provide reasonable assurance of no undue risk to the health and safety of the public.

Conclusions to be drawn from this testimony:

The supplemental gaseous effluent treatment systems installed on the roof of the TMI-2 auxiliary building are no longer in use.

The charcoal impregnant to be used at TMI-1 will be more efficient than that used at TMI-2 at the time of the accident.

New periodic test requirements for gaseous effluent treatment systems are to be required at TMI-1.

These actions will improve the operating characteristics of these systems to the extent that installation of supplemental treatment will not be necessary.

The filters at TMI-2 did not get "wet" during the accident of 3/28/79.

Preheaters can reduce the efficiency of charcoal adsorbers in some circumstances.

Preheaters would have been of no effect on the releases of radioactivity that occurred during the TMI-2 accident.

Installation of preheaters on filters at TMI-1 is not necessary.

STAFF
9/15/80

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
METROPOLITAN EDISON COMPANY, *ET AL.*	)	Docket No. 50-289 (Restart)
	)	
(Three Mile Island Nuclear Generating Station)	)	

NRC STAFF TESTIMONY OF PHILLIP G. STODDART
REGARDING NEED FOR HEATERS ON
VENTILATION EXHAUST FILTERS FOR TMI-1

(Lewis Contention)

Q.1. Please state your name and position with the NRC.

A. My name is Phillip G. Stoddart. I am an employee of the U.S. Nuclear Regulatory Commission assigned to the Effluent Treatment Systems Branch, Division of Systems Integration, Office of Nuclear Reactor Regulation.

Q.2. Have you prepared a statement of professional qualifications?

A. Yes. A copy of this statement is attached to this testimony.

Q.3. Please state the nature of the responsibilities that you have had with respect to the Three Mile Island Nuclear Station, Unit No. 1.

A. I was responsible for reviewing part of TMI's response to the Commission Order of August 9, 1979. Specifically, I reviewed their proposed methods for achieving separation and/or isolation of the inventory of radioactive liquids at TMI-2 from TMI-1. I was also responsible for reviewing and evaluating TMI-1's conformance with Appendix I of 10 CFR Part 50 and for reviewing and evaluating portions of TMI-1 responses to NUREG-0578.

Q.4. What issues are you discussing in this testimony?

A. I am addressing the Lewis Contention, which states:

"Filters: There are new filters on the auxiliary building of TMI#2. There are no similar structures on the auxiliary building of TMI#1. Further, preheaters must be placed on the filters of the auxiliary building because they got wet during the accident on 3/28/79 in TMI#2. To mitigate a similar accident in TMI#1, preheaters on the filters in the auxiliary building of TMI#1 are necessary.

Q.5. Have new filters been installed on the roof of the TMI-2 auxiliary building?

A. Yes. Four essentially identical trains of a supplemental gaseous effluent treatment system were installed on the roof of the TMI-2 auxiliary building in the period immediately following the TMI-2 accident of March 28, 1979.

Q.6. What purpose do these filters presently serve?

A. At this time, the supplemental system is not in use and has been disconnected from the TMI-2 ventilation system; the system is now in a "standby" or "mothballed" status.

Q.7. Why was the supplemental air treatment system installed?

A. In the period immediately following the TMI-2 accident, some iodine-131 was being released from the TMI-2 auxiliary building and fuel handling building gaseous effluent treatment systems; to minimize this release and to reduce future potential exposures to the offsite population, the plant operators, with NRC concurrence, located an available treatment system, had it flown to Pennsylvania and installed it on a "crash" basis. The system was connected in series with the existing gaseous effluent treatment systems and was placed in operation on or about May 15, 1979.

Q.8. Did the supplemental air treatment system reduce releases from TMI-2?

A. The system was successful in reducing the amount of iodine-131 released from the plant subsequent to installation. However, by the time installation was complete, the release of radioiodine from the accident was nearly complete. At a later date, when no more iodine-131 was being released and after the previously installed gaseous effluent treatment system components had been "changed-out", the supplemental system was disconnected.

Q.9. In your opinion, should "new filters" be installed on the roof of the TMI-1 auxiliary building?

A. In my opinion and the opinion of the staff, a supplemental filter system on the roof of the TMI-1 auxiliary building is not necessary. A number of factors entering into the limited performance of the existing treatment system at TMI-2 during and following the accident have been identified and steps have been taken to compensate for deficiencies. For example, the charcoal in place at TMI-2 at the time of the accident had been treated with a potassium iodide impregnant. It has been found that a duel or "co-impregnant" treatment using both potassium iodide and triethylenediamine (TEDA) is more efficient than either potassium iodide or TEDA for certain conditions.

At both TMI-1 and TMI-2, all charcoal used in the future will be of the co-impregnant variety unless a more efficient material can be developed. At TMI-2, the charcoal had been in place for more than 18 months, which included about 12 months during which construction activities were taking place. Under such circumstances, it may be assumed that adverse conditions existed for a portion of that time, such as spray painting and the use of solvents, in areas serviced by the ventilation treatment system. Paint fumes and organic solvent vapors are known to seriously degrade the efficiency of charcoal for the adsorption of iodine ~~noble gases~~; as a precautionary measure, the adsorbers should have been either tested immediately prior to commencing power operations or should have been replaced but neither action was taken.

Presently, all plants are being, or will be, required to test all engineered safety feature gaseous effluent treatment systems at regular intervals by Technical Specifications requirements. It is my opinion and the opinion of the staff that these actions will improve the operating characteristics of treatment systems, under both normal and accident conditions, such that the installation of supplemental treatment systems will not be necessary.

Q.10. Describe the filter system in use at the TMI-2 Auxiliary Building at the time of the accident.

A. The filter system in use at the time of the accident is best described as a multiple-bank ventilation exhaust treatment system incorporating three levels of filtration or treatment in series flow. Air from the auxiliary building ventilation system flows first through a pre-filter, sometimes called a "roughing filter", which is similar in appearance to a fiberglass home furnace air filter; the purpose of this filter is to remove large particles and dusts from the airstream to minimize the "loading" of the next filter in line. After passing through the pre-filter, the air next flows through a "high-efficiency particulate air" filter, or "HEPA" filter; this filter is analogous to the filters used in "clean rooms" in the electronics industry or "germ-free" rooms in hospitals. From the HEPA filter, the air flows next through trays of charcoal and passes through a two inch depth of impregnated activated charcoal to remove radioiodine; this layer of charcoal is sometimes referred to as a "filter" but is technically an "adsorber", rather than a filter.

Q.11. Has the design of the TMI-2 auxiliary building ventilation air treatment system been modified in any way since the accident?

A. As described in the responses above, a supplemental treatment system was placed in series with the TMI-2 auxiliary building ventilation treatment system shortly after the March 28, 1979, accident, but was later disconnected. The exhaust line from the TMI-2 condenser air ejector was routed through a new treatment system located in the lower level of the TMI-2 turbine building, with the effluent being routed to the main exhaust stack. The charcoal adsorbers in all gaseous effluent treatment systems have been modified by changing the type of charcoal impregnant to a co-impregnant of potassium iodide and triethylenediamine but this action is not considered to be a design change. Changes have been proposed for the bypass dampers but no action has been taken on this item.

Q.12. Has the design of the TMI-1 auxiliary building gaseous effluent treatment system been changed?

A. The design has not been changed. The charcoal adsorber impregnant has been changed to KI and TEDA.

Q.13. Did any of the filters or adsorbers in any of the gaseous effluent treatment systems at TMI-2 get wet during the accident?

A. No. There is no indication or record that any of the filters or adsorbers were wet or even moist at any point in the accident.

Q.14. Why would anyone assume the filters were "wet"?

A. During the accident, the concentrations of radioactive noble gases (that is, gases such as argon, xenon, and krypton) in the ventilation exhaust stream were quite high. Charcoal adsorbers are usually thought of as being specific adsorbers of iodine. One should be aware, however, that charcoal is also briefly effective in retaining noble gases, although the efficiency is essentially zero ~~not as great as for iodine~~. During the initial phases of the TMI-2 accident, it is theorized that the relatively high concentrations of noble gases in the ventilation exhaust, passing through the charcoal, resulted in the holding or retention of noble gas molecules in the charcoal. This phenomenon had not previously been considered in the design of adsorber systems and was described, for lack of a better term, as "saturated" with respect to xenon and krypton.

Q.15. Doesn't the term "saturated" usually mean "wet"?

A. That's the definition that would be assumed by most people. However, a technical or scientific definition is that saturation is "the most concentrated solution that can persist in the presence of an excess of the dissolved substance".

Q.16. The contention claims that preheaters should be placed on the TMI-1 auxiliary building "filters" because the "TMI-2 filters" got wet in the TMI-2 accident. In the event that the "filters" were to become wet, would a preheater either prevent wetting of the "filters" or correct any adverse effect of wetting?

A. No. In order for a "filter" to become wet, the presence of water droplets or spray is required for an extended period of time. A preheater does not have sufficient heat exchange capacity to accomplish the purpose of converting water droplets in the airstream to sub-saturated air during limited contact with moving air. Such a function can only be accomplished by a device called a "demister" or "moisture separator" which functions by inertial entrapment of water droplets or particles.

Demisters are used in applications such as BWR condenser air ejector systems, where entrained water droplets are a condition of normal operation in parts of the system. Demisters are not required for building ventilation treatment systems because entrained water droplets are not a condition of normal or anticipated operation.

Q.17. Under what conditions would preheaters be used?

A. Heaters are useful only where the influent air has a humidity of greater than 70% for an extended period of time. Section 4.1.e of ANSI/ASME Standard N509, Revision 6, April 1979, states "heaters are required for units having adsorbers if the relative humidity of air to the adsorber is potentially greater than 70% for sufficient time to cause iodine release to exceed guidelines". The ANSI standard provides no other guidance on this matter. With other factors equal, high humidity ~~will~~ may reduce the charcoal adsorber radioiodine collection and retention efficiency, but the staff is not aware of published data on ~~will not~~ release ~~all~~ of the radioiodine collected on the adsorber.

Q.18. Does a preheater improve the performance of charcoal adsorbers?

A. If the influent air is of high humidity, that is, above 70% relative humidity, heating the influent air could lower the relative humidity to 70% or less at which level the adsorbers show improved adsorption characteristics.

Q.19. Can the use of preheaters have a negative effect on charcoal adsorbers?

A. Yes. The retention efficiency of charcoal is inversely proportional to temperature. Raising the temperature of the air actually reduces the retention efficiency for iodine. However, for a set of circumstances where high humidity is an expected condition of operation, the loss of retention efficiency through heating is more than offset by the increased retention efficiency for air streams containing less than 70% humidity.

Q.20. In your opinion, are preheaters necessary to mitigate the consequences of an accident similar to the TMI-2 accident of March 28, 1979?

A. According to the summary of releases given at p. II-3-10 of NUREG-0600, ten million curies of noble gases, and about 14 curies of iodine-131 were released from the TMI-2 facility during the accident of March 28, 1979, and during the month following the accident. The use of preheaters would have had no effect whatever on the releases and would, therefore, have had no effect in mitigating the consequences of the TMI-2 accident or any other potential accident. In my opinion, and on the basis above, preheaters are not necessary to mitigate the consequences of accidents similar to the TMI-2 accident of March 28, 1979.

Q.21. In your opinion, does the design of the existing TMI-1 exhaust gas or air treatment systems meet the established NRC criteria without installation of preheaters?

A. Yes. The design of the exhaust air or gas treatment systems at TMI-1 meets the applicable criteria of Regulatory Guides 1.52 and 1.140, and of Standard Review Plans 6.5.1, 9.4.2, 9.4.3, and 11.3. In meeting these criteria, preheaters are not a requirement for the conditions of service projected for the various treatment systems. Therefore, installation of preheaters is not required in the design and the design is considered acceptable to the staff.

Phillip G. Stoddart

Effluent Treatment Systems Branch
Division of Systems Integration
Office of Nuclear Reactor Regulation

My name is Phillip G. Stoddart. I am a senior nuclear engineer in the Effluent Treatment Systems Branch, Division of Systems Integration in the Office of Nuclear Reactor Regulation. I attended the New Mexico School of Mines from 1947 to 1949. From 1949 to 1953 I was on active duty with the United States Air Force, assigned as a radiological instrumentation specialist with the Armed Forces Special Weapons Command and as a radiological safety instructor with a Strategic Air Command special weapons unit.

From 1953 to 1973 I was on the radiation safety staff of the Argonne National Laboratory, working from 1953 to 1957 at Argonne's Illinois site and from 1957 to 1973 at Argonne's test facilities at the National Reactor Training Station, Idaho Falls, Idaho. My duties there included conduct of radiation safety programs, including effluent control and waste management, for several research and test reactors and a fuel recycle facility.

In 1973 I joined the Nuclear Regulatory Commission (formerly Atomic Energy Commission) as a nuclear engineer in the Effluent Treatment Systems Branch, Division of Systems Integration. In this position I am responsible for the review and evaluation of radioactive waste systems and for the calculation of releases of radioactivity from nuclear power reactors. I am also responsible for determining the adequacy of instrumentation provided for maintaining the radioactive discharges from nuclear power plants and for providing technical bases for guides and standards. I have participated in generic studies of the relationship between reactor operation and radioactive waste generation and in the preparation of staff reports related to effluent control technology and effluent monitoring.

ho-in #5

OUTLINE

This testimony of Phillip G. Stoddart contains the NRC Staff's response to ANGRY Contention V(D).

The purpose of this testimony is to demonstrate that, contrary to the assertions in the contention, installation in effluent pathways of additional systems for filtration of radioactively contaminated gases and fluids is not necessary to provide reasonable assurance of no undue risk to the health and safety of the public.

Conclusions to be drawn from this testimony:

The TMI-1 design includes in all potentially radioactive gaseous effluent pathways systems for rapid filtration of all the radioactively contaminated gases which could be released through those pathways.

Filtration is only marginally effective as a treatment method for decontamination of liquid effluents.

The TMI-1 design includes means for collection, retention and treatment, by methods other than or in addition to filtration, of all liquids prior to their release to the environment.

The TMI-1 design includes in its effluent release pathways means to reduce radioactivity in gaseous and liquid releases to levels which are as low as can be reasonably achieved.

STAFF
9/15/80

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
METROPOLITAN EDISON COMPANY, et al	)	Docket No. 50-289 (Restart)
	)	
(Three Mile Island Nuclear Generating Station)	)	

NRC STAFF TESTIMONY OF PHILLIP G. STODDART
REGARDING RAPID FILTRATION FOR LARGE VOLUMES
OF CONTAMINATED GASES AND FLUIDS IN EFFLUENT PATHWAYS

(ANGRY CONTENTION V(D))

Q.1. Please state your name and position with the NRC.

A. My name is Phillip G. Stoddart. I am an employee of the U.S. Nuclear Regulatory Commission, assigned to the Effluent Treatment Systems Branch, Division of Systems Integration, Office of Nuclear Reactor Regulation. However, from June through November 1979, I was assigned as a member of the TMI-2 Lessons Learned Task Force, Office of Nuclear Reactor Regulation.

Q.2. Have you prepared a statement of professional qualifications?

A. Yes. A copy of this statement is attached to this testimony.

Q.3. Please state the nature of the responsibilities you have had with respect to the Three Mile Island Nuclear Station, Unit No. 1.

A. I was responsible for reviewing part of TMI's response to the Commission Order of ~~May 25, 1979~~ August 9, 1979. Specifically, I reviewed their proposed methods for achieving separation and/or isolation of the inventory of radioactive liquids at TMI-2 from TMI-1. I was also responsible for reviewing and evaluating TMI-1 in conformance with Appendix I of 10 CFR Part 50 and for reviewing and evaluating portions of TMI-2 responses to NUREG-0578.

Q.4. What issues are you addressing in this testimony?

A. I am addressing ANGRY Contention V(D), which states, "The NRC Order fails to require (as) conditions for restart (the) following modifications in the design of TMI-1 without which there can be no reasonable assurance that TMI-1 can be operated without endangering the public health and safety: (D) Installation in effluent pathways of systems for the rapid filtration of large volumes of contaminated gases and fluids".

Q.5. Does the design of TMI-1 include systems in the gaseous effluent pathways for the rapid filtration of large volumes of radioactive gaseous effluents?

A. Yes. All potentially radioactive gaseous effluent pathways at TMI-1 are provided with exhaust air filtration systems having the capacity for the rapid filtration of all of the radioactively contaminated gas or air which could be released through those pathways.

Q.6. Does the design of TMI-1 include systems in the liquid effluent pathways for the rapid filtration of large volumes of radioactive liquid effluents?

A. No. Filtration is only marginally effective as a treatment method for decontamination of radioactive liquid effluents and is not credited with any capability to remove radioactivity from liquid streams by the NRC staff. The method of treatment used in the design of TMI-1 provides for the collection, retention, and treatment, by methods other than or in addition to filtration, of all liquid radioactive wastes prior to either re-use in the plant or release to the environment. These methods are many times more effective than filtration alone.

Q.7. In your opinion, is there any merit in the installation of rapid filtration systems for filtering large volumes of contaminated fluids?

A. Little. Filters following demineralizers are effective for removing resin fines. As a means for removing radioactivity from a liquid stream prior to discharge, however, the NRC assumes the filter is ineffective. Rapid filtration would have an adverse effect in its potential for the release of large quantities of soluble radioactive wastes which are not removed by filtration.

Q.8 What methods of radioactive liquid waste treatment are credited for removal of radioactivity?

A. All sources of liquid radioactive waste within the plant should be collected and piped to holding tanks where radioactive decay occurs. From the holding tanks, fluids should be treated where necessary by a combination of treatment systems incorporating filtration, ion exchange or demineralization, and evaporation and distillation.

Q.9. Of the methods noted in the response to Q.8 which ones are used in the design of TMI-1?

A. All of them. Some plant systems use filtration. ion exchange, and evaporative distillation. Other systems use only filtration and ion exchange if that combination is sufficiently effective in reducing plant effluents.

Q.10. Has the staff performed any studies to determine if any additional methods or items of equipment could be added to the TMI-1 design to improve system performance in the treatment of liquid radioactive waste resulting from normal operations or from anticipated operational occurrences?

A. Yes. In order to satisfy the requirements of Appendix I, 10 CFR Part 50, the staff performed a cost-benefit analysis of the liquid radioactive waste system for TMI-1. A summary of that analysis appears at page C5-2 of the TMI Restart SER (NUREG-0680). In the analysis, it was determined that there were no items of equipment which could be added to the TMI-1 liquid radioactive waste system which would reduce plant releases and therefore reduce potential radiation doses to the population at a cost of less than $1,000 per man-rem or $1,000 per man-thyroid-rem, which are the cost-benefit criteria of Appendix I for determining the need for augmenting plant systems.

Q.11. In the event of an accident at TMI-1, what would be the principal effluent pathways in which large volumes of contaminated (radioactive) gas and liquids might be present?

A. Depending on the type of accident, contaminated gases could be present in the ventilation exhaust from the Auxiliary Building and the Fuel Handling

Building; if the Reactor Building purge line were open at the instant of an accident, this could provide another release path for contaminated (radioactive) gases until the isolation valves close (in about five seconds following an isolation signal). Liquids would be retained within plant systems, tanks, and sumps; there are no postulated accident scenarios in which large volumes of radioactively contaminated liquids might be present as plant effluents.

Q.12. Are all of these release pathways filtered?

A. Yes. All of the gaseous release pathways are serviced by high efficiency particulate air filter systems and also by charcoal adsorber systems for iodine retention. As noted previously in Q.11., there are no anticipated liquid release pathways for large volumes of contaminated liquids.

Q.13. Are all of these filtration systems always in service where the release pathway is available?

A. Yes. The Reactor Building purge line is always filtered when being operated, which is normally only a small fraction of the time. The filter systems for the Fuel Handling and Auxiliary Buildings operate continuously.

Q.14. Are the filtration systems that are installed in these effluent release pathways adequate to provide filtration of contaminated gases?

A. Yes. The systems now in place are as effective as any that could be installed. To show that this is true, we need to first describe the system and tell how it works. The gaseous exhaust "filters" at TMI-1 can best be described as multiple stage series-connected gaseous exhaust treatment systems. The first component in the system is called a "roughing" filter. This is similar in appearance to the fiberglass filters used in home heating systems and has the function of removing large particles of dust from the airstream. From the roughing filters, air flows next to a bank of high efficiency particulate air filters, called "HEPA filters". These are very similar to the filters used in hospital "germ-free" rooms or in the "clean rooms" used in the electronics industry. Such filters have a rated efficiency of greater than 99.97% for removal of small particles and are even more efficient for larger particles. From the HEPA filters, the air next passes through trays containing a two-inch depth of impregnated activated charcoal. The charcoal serves to trap and retain radioiodine by the adsorption process. The charcoal trays are called "adsorbers" because they are not filters in the technical sense. The charcoal adsorbers "adsorb" or remove more than 90% of the radioiodine present in the airstream.

There are basically three forms of radioactive material present in the gaseous effluent stream in the accident condition. In order of increasing magnitude of radioactivity content, these are (1) particulates; (2) radioiodines; and (3) noble gases. Particulates are readily removed from the gas stream by the prefilters and by the HEPA filters. Relatively little particulate matter appears in the gaseous airstream after an accident and only about one part in 10,000 or less passes through the HEPA filters. The dose to the population from particulates released from a HEPA filtered system in an accident approaches zero and is not distinguishable from background, therefore, the staff considers that additional filtration is not required.

Radioiodine has the peculiar characteristic of behaving sometimes as a gas and sometimes as a particulate - and of changing form from one to the other. While a HEPA filter will stop the particulate form of radioiodine, it is not capable of retaining it in the form of a gas or vapor, so that a HEPA filter or any other filter is not effective in retaining radioiodine. The method used at TMI-1 for removing radioiodine from gaseous effluent streams is adsorption on activated charcoal. Charcoal has an affinity for radioiodine and will retain either particulate or gaseous iodine within its porous structure. This affinity, as well as the period of retention, is increased by the use of impregnants such as potassium iodide (KI) or triethylene diamine (TEDA). TMI-1 uses a combination of KI and TEDA impregnant in all air treatment adsorber systems. The charcoal adsorbers used at TMI-1 have a design rating efficiency of 90% or greater for all forms of radioiodine.

~~At TMI-1, the auxiliary building, containment purge, and fuel handling building treatment systems, are provided with an additional stage of HEPA filtration for the express purpose of retaining any charcoal fines or dust which may be given off by the charcoal adsorbers; the HEPA filters also provide another factor of particulate filtration at the end of the treatment train which is superfluous as far as particulate removal is concerned.~~ delete

The efficiency of the treatment system just described is almost 100% for removal of particulates and greater than 90% for radioiodines. For noble gases, however, the efficiency of removal is, for all practical purposes, zero.

For one of the potential sources of noble gases, however, there is an effective means for, in effect, removing radioactive noble gases from the effluent path. A smaller volume source than those noted above, but one which can contain more radioactive material in the form of noble gases, is the system known as the primary coolant offgas system. As primary coolant circulates through the core of the reactor, a small volume of fission product gases is continually escaping from the fuel and is swept out of the reactor vessel with the circulating coolant. To minimize the accumulation of these gases in the primary coolant, the primary coolant letdown system is employed to separate the gas from the liquid coolant. As the liquid coolant is stored in the reactor coolant bleed tanks and in the miscellaneous waste storage tank, the fission product gases diffuse out of the liquid coolant and mix with the other gases in the gas space at the top of the tanks. As necessitated by changes in the tank level, the gas mixture containing the fission product gases is bled out of the system into a surge tank and then compressed into a series of holdup tanks. At TMI-1, there are three such tanks, each with a design capacity of 1,125 cubic feet. At an estimated input of 130 standard cubic feet per day, the system has the capacity to store or "hold-up" radioactive gases for over 90 days under normal operating conditions. "Hold-up" or storage is a recognized and acceptable method for reducing radioactive plant releases.

By storing these gases for 90 days, the process of radioactive decay results in the effective disappearance of approximately 99.8% of the gases that were present at the initial removal from the primary coolant system. The only radioactive noble gas remaining is Kr-85, which is released to the atmosphere under carefully controlled meteorological conditions. These releases, incidentally, are also treated by filtration and absorption through HEPA filters and charcoal absorbers to remove any remaining traces of particulates and radioiodine.

The systems just described are contained in the design of TMI-1 and have been evaluated by the staff and have been found to be acceptable in that they meet the criteria of Appendix I to 10 CFR 50 in reducing effluents to as low as reasonably achievable (ALARA) levels. The evaluation is detailed in the TMI-1 Restart SER in Section V.

Q.15. Cryogenic systems are said to be effective in reducing releases of noble gases from nuclear plants. Most of the radioactive material released in gaseous effluents from the TMI-2 accident was composed of noble gases. Is cryogenic treatment of noble gases in high flow rate streams cost-beneficial and practical?

A. No. Cryogenic systems have been used in certain nuclear plant applications for temporary holdup or storage of noble gases. However, all of these systems have been of small volumetric capacity and are expensive to operate. At San Onofre, Unit No. 1, for example, a cryogenic system has been used to holdup the primary coolant system offgases for 60 to 90 days prior to release. The same function is accomplished at TMI-1 with greater efficiency and at lower ost by using large storage tanks holding the offgases under pressure for longer periods of time.

A pı incipal path for release of noble gases from the TM.-2 accident was the ventilation exhaust from the TMI-2 auxiliary building and fuel handling building, which had a nominal exhaust flow rate of approximately 100,000 standard cubic feet per minute. The existing technology of cryogenic treatment of airstreams for removal of noble gases is limited to flowrates on the order of 10 to 100 cubic feet per minute, with the limitations being principally cost of equipment, size of equipment, operating costs, and maintenance costs.

The best available cost data for cryogenic treatment systems are those obtained concerning the San Onofre, Unit 1, system. The equipment cost was approximately $300,000 with an estimated additional cost of $300,000 allotted for building space, labor, and utilities installation. In 1976, the operators reported the cost of liquid nitrogen, used for cryogenic cooling, to be $40,000 for one year of operation.

Based on the methodology in Regulatory Guide 1.110, the estimated annual cost of the cryogenic gas treatmen: dys'em at San Onofre, Unit 1, was calculated to be $180,000. Extrapolation of :e and cost of such a unit sufficiently large to treat a volumetric flow r. .e of 100,000 standard cubic feet per minute would not be sound engineering practice.

The releases of noble gases at TMI-2 were largely the result of poor operating practice in permitting the continued existence of known leaks of primary coolant systems and of primary coolant system cover gas recirculating systems. To address this problem the NRC has required licensees to minimize potential leakage at the point of origin by more rigid control of system leaks. This is one of the lessons learned from TMI-2 and is the basic approach used at TMI-1 and approved by the staff.

Q.16. The cryogenic system used at San Onofre, Unit 1, was a liquid-nitrogen cooled charcoal bed. There are other ~~cryogenic~~ systems and techniques such as cryogenic distillation and selective absorption ~~cryogenic solvent extraction~~. Where these considered as systems for removing noble gases from the gaseous effluent streams?

A. Yes. All of the known cryogenic techniques for removing noble gases from effluent air and gases were considered. All of the techniques have approximately the same limitations, e.g., high initial costs, high operating and maintenance costs, and the absence of applied technology in the design of large volume systems.

Q.17. In your opinion, does the TMI-1 design incorporate sufficient treatment in the effluent release pathways to reduce effluents to levels which are as low as reasonably achievable?

Yes. The staff's evaluation of the plant design for treatment of radioactive effluents is presented at p. C5-1 of the TMI-1 Restart SER (NUREG-0680). In that evaluation, the staff concluded that there are no cost-effective augments to plant systems which could reduce the cumulative population dose at a favorable cost-benefit ratio and that the plant systems for the treatment of radioactive effluents meet the requirements of Appendix I to 10 CRF Part 50 with respect to the as low as reasonable achievable criteria.

CROSS-EXAMINATION

BY MR. LEWIS:

Q In your testimony on page 4, the last paragraph -- page 4, the last paragraph, quote: "Presently all plants are being or will be required to test all engineered safety feature gaseous effluent treatment systems at regular intervals by tech spec requirements." Quote.

Were you here when I asked the Licensee's panel if any part of the filter or vent header system at TMI-1 was safety grade engineered safety feature?

A Yes, I was here.

Q Do you remember their answer?

A Yes.

Q Do you agree with it?

A Their answer is correct. Since the time of preparation of this testimony, I have become aware of discussions between another group and the Three Mile Island 1 people regarding the technical specifications, and I have become aware that technical specifications have been adopted regarding the scheduling of testing of the HEPA filters, charcoal absorbers, on a regular basis, even though those systems are not ESF filter systems.

This is a technical specification which is not required of other plants so far as I know at this time.

Q I am trying to mesh your answer concerning engineered safety feature systems being required in any plant -- is that correct? Is an engineered safety feature system not required in any plant on the filter and vent header at this time?

A What I meant to say, if I didn't misspeak, was that non-ESF filter systems at other plants are not required to be tested on a specific basis. We do have a Regulatory Guide 1.140 which recommends that filters and absorbers be tested at 18-month intervals, but does not require that testing.

Q Let me explain what I am trying to get at. I am trying to find out if there is a philosophy, policy, treatment within the NRC which would at some future date or at some -- at some future date, change the requirement for the filters and vent headers, or part of them, from non-safety grade to safety grade at TMI-1?

Have I asked that reasonably?

A Would you repeat that, please?

Q What I am trying to figure out is, is there a chance that somewhere along the way suddenly the NRC is going to say TMI-1 must have safety grade vent header and filter systems?

A I have not been a party to any such discussion. I think it would be maybe more appropriate to perhaps discuss the difference betweenn ESF filter systems and non-ESF filter systems. It is really not a practicable sort of thing to convert a non-ESF system to an ESF system. This primarily lies in the quality assurance and testing requirements which must follow an ESF system all the way through its initiation through the procurement of materials, through the testing of components, through the very highly inspected installation of the system, to the final testing and so forth.

The only way in which you could convert an existing non-ESF system to an ESF system would be to completely rip it out and start over from scratch.

Q You brought up a problem that worries me, but I am not ready to go into that yet, namely that the Licensee has said that they will do maintenance and testing on this system. I am just wondering if that maintenance and testing could be qualified without it being -- you know, could be adequate without it being an engineered safety feature. I am not ready to go into that yet.

I am still on the sentence that caused me confusion in my questioning of the Licensee.

DR. JORDAN: Perhaps one of the points of confusion is that, why did you refer to plants that have -- with the engineered safety feature gaseous effluent systems? How does that bear on your testimony when we are talking about a system that is not engineered, an engineered safety feature? Why did you bring that up at that point?

THE WITNESS: It was brought up more in a generic sense, in that it talks about plants with engineered safety feature systems being required to have that done. I believe also that there is perhaps some discussion of a proposal to install an engineered safety feature system in the fuel-handling building, which is shared by Units 1 and 2 at TMI.

BY MR. LEWIS: (Resuming)

Q That did confuse me. Namely, there are other references to engineered safety feature systems. Whether they were incorporated or not, I can't say. But there are other references throughout these documents I have in front of me on engineered safety features on the gaseous effluent treatment systems.

That worries me. It worries me. As you pointed out, you just about have to tear this filter system out and start from scratch, or do an awful lot of maneuvering to turn a non-ESF system to a ESF system, as you pointed out.

I am just wondering -- and I hate to be on this sentence so much -- all plants are being or will be required. Now, is that in any way, shape or form suggesting that at some future date, the ACRS is suggesting or whoever is supposed to be suggesting, is suggesting that the vent headers and filters become safety grade at some future point?

CHAIRMAN SMITH: Let's take a short break.

(Recess.)

DR. JORDAN: Before you answer Mr. Lewis' question, in that sentence that he is questioning you about, which says, "Presently all plants are being or will be required to test all engineered safety feature gaseous effluent treatment systems at regular intervals," are you implying there or stating there that many plants, including TMI-1, do have engineered safety feature gaseous effluent systems connected to, say, the containment or other parts of the plant, and that that is what you are referring to?

What engineered safety features are you talking about?

THE WITNESS: The gaseous effluent systems, the processing systems for the filtration or charcoal absorption of gases which are being released from the plant to the atmosphere. There are in some cases systems which are internal to the plant, in some reactor containments, for example, which act as a kidney filter system. And while these in some cases are engineered safety feature systems in that they are within the containment itself, they are not accessible for testing except during shutdowns, and therefore the -- that type of system is not required to be tested on the same frequency as the effluent systems.

DR. JORDAN: So there are a numbe of engineered safety feature gaseous filter systems. But you are not referring now to the filter system in the roof of the auxiliary building?

THE WITNESS: That's correct. that system is not an engineered safety feature system.

MR. CUTCHIN: I think for the record we may need to clarify something, because my understanding is a little different from what I just heard here. I want to be sure that in answering that question -- whether or not Mr. Stoddart is referring to the fact that there are indeed some filter systems at TMI-1 which are engineered safety feature systems, rather than to plants generically. We need to get that clarified.

Are there engineered safety feature filter systems at TMI presently? In the response you just gave, were you referring to TMI-1 systems or were you referring to systems which you know to be present in other plants?

THE WITNESS: Principally to systems which I know to be present in other plants. An example would be a control room recirculation filter system, which in most plants is an engineered safety feature system. It is not, however, a gaseous effluent system. It is only for internal use.

MR. CUTCHIN: Are there such engineered safety feature systems at TMI at which you are aware that are presently installed?

THE WITNESS: I am sorry, I am not sure whether the control room system is such a system. It may well be. I did not review that system and I am not familiar with it.

MR. CUTCHIN: You are not referring to TMI-1 systems when you are answering this question?

THE WITNESS: That is correct.

MR. CUTCHIN: Thank you.

BY MR. LEWIS: (Resuming)

Q I appreciate that clarification, but there are other things -- not confusing me; they seem to be contradictory in this answer.

A Mr. Lewis, perhaps I am speaking out of turn. The NRC at this time is not empowered to require testing of non-engineered safety feature filter systems. We can recommend such testing, but we are not empowered to require it.

Q You are not empowered to require testing of non-ESF systems? Did I get that right?

A That is correct.

Q Correct me when I get to a point where I am wrong. Jump in, interrupt.

The Licensee, as far as I can remember, has just testified that they are going to test their gaseous effluent filters and vent header. If the NRC is not empowered to require testing of non-ESF systems, gaseous effluent vent headers and filters, and these vent headers and filters are not ESF, why can't the Licensee just turn around and say, we ain't going to do it?

A In the particular case of TMI-1, this, as I understand, was an agreement which was reached in discussion between the Commission and the Licensee with regard to restart, and that the Licensee did agree to regularly test the systems, even though they were not ESF systems. We are happy to see this sort of agreement, but it is not something we can mandate at this time in the present regulatory structure.

CHAIRMAN SMITH: If it becomes a technical specification, however, you can enforce it.

THE WITNESS: Certainly, yes.

BY MR. LEWIS: (Resuming)

Q Is amendment 55, technical specification, such an agreement that is enforceable at this time?

A Yes.

Q So you can force inspection, the new inspection schedule, the new maintenance schedule, the new testing schedule, which is now presently being incorporated, has been incorporated, I believe it is still being incorporated in the amendment 55 technical specifications?

A Yes.

Q But it has been incorporated by agreement only?

A That is correct.

Q Can that agreement be rescinded unilaterally by the Licensee?

A I am afraid I cannot address the legality of that question. I don't know the answer.

CHAIRMAN SMITH: Mr. Lewis, it would be my impression that if you were to convince this Board that such a tech spec would be a condition of restart, that they could not unilaterally renounce the tech spec. But I can't comment beyond that.

MR. LEWIS: That was one of my findings of fact which you would have to then --

CHAIRMAN SMITH: If you were to persuade us that such a tech spec were necessary as a condition for restart and it survived throughout the reviews and everything, it is my view that they could not unilaterally walk away from it. Now, the process by which they could get it removed I don't know. I don't know if it would require another full hearing or not. But it would require something other than just sending this tech spec back.

MR. LEWIS: An Appeal Board could always reverse the decision of this Board.

CHAIRMAN SMITH: No, I am not talking about that. I am talking about if such a condition were to survive this entire hearing and be imposed by the Commission and the courts and all of the review process and it becomes a final order of this case as a condition of the restart, the Licensee in my view could not unilaterally renounce the tech spec.

They could seek relief, but I would imagine that that would in and of itself require an opportunity for a hearing. There could be other processes. There would have to be full opportunity for NRC objection and concurrence if they tried to change the tech spec.

MR. LEWIS: The Board has answered my line of questioning.

BY MR. LEWIS: (Resuming)

Q I would like to get on to another line of questioning, but, believe it or not, on the same paragraph. I'm sorry, I know it is getting to be a familiar paragraph.

CHAIRMAN SMITH: Even if it were not a Board condition, I think there might be other relief that an Intervenor could have, request a show cause order, for example, if the agreement were renounced of that nature.

MR. LEWIS: The problem with that is that it is very difficult to get access. I would have to go down to Washington and watch the library in the Potomac Building to come up with a timely show cause order. It is a good suggestion, of course.

Let me go on to something else.

BY MR. LEWIS: (Resuming)

Q I think your statement here about engineered safety feature gaseous effluent treatment systems is very pertinent after a proper -- it confused the issue, because it isn't ESF yet.

But I have been following ACRS and a few other things in this proceeding, and I believe that a lot of these systems are being aimed at ESF, which brings me to the problem that you pointed out about changing ESF to -- non-ESF to ESF systems.

Would it be impossible to change the filters -- forget about vent headers, just filters -- to an ESF system?

A You said filters? Is that intended to include the filter system, or just the physical filter itself?

Q The housing, the HEPA and the charcoal, not the roughing, r-o-u-g-h-i-n-g?

A Mr. Lewis, to all intends and purposes the non-ESF and ESF systems are identical. The components which go into the systems are identical. The methods of construction are identical. The materials used are identical.

The only real difference between an ESF and a non-ESF filter system such as we are talking about here is the degree of quality assurance which goes into the procurement of the materials, the building of the assembly of the item and so forth.

To meet the present ESF criteria, there is no real way that you can modify a system short of tearing it out and starting over, unless you change the rules of what makes an ESF system.

Q Hasn't that been done on other systems at TMI-1?

A Not to my knowledge.

Q Haven't other systems at TMI-1 been changed from non-ESF to ESF?

A I don't know.

Q To put it simply, my worry about going to an ESF system is a lessons learned generated accident along the lines of Crystal River. I don't believe I have a right to nail you with those questions. Let's go on to other points in your testimony.

I believe you agree with the Licensee. And at this point I would like to put it on the record that I really didn't mean that you have to have a great big box on top of the roof to meet -- to upgrade the filter system. But I believe that you agree with the Licensee that you do not need a supplementary, supplemental filter at TMI-1 such as were used after the accident at TMI-1. Am I correct?

A To put that in the proper context, Mr. Lewis, I wrote my testimony first. I made my statement. The Licensee subsequently wrote his testimony. I would put it that he agrees with me.

Q All right, you're correct. The dates are correct.

MR. BAXTER: I thought they were submitted simultaneously.

THE WITNESS: I had not seen the Licensee's testimony when I prepared mine.

BY MR. LEWIS: (Resuming)

Q I am worried about the part that the staff played in okaying at TMI-1 an 18-month time period where the charcoal was untested.

CHAIRMAN SMITH: You mean TMI-2.

MR. LEWIS: You're right. I am worried about the 18-month time period at TMI-2 where the charcoal went untested.

BY MR. LEWIS: (Resuming)

Q My question is, what prompted or caused -- what was the rationale the staff used to allow an 18-month period where this charcoal was exposed to all sorts of things, to go by without it being tested?

A The rationale for that has been past experience in quite some number of other installations wherein the charcoal has been periodically tested under typical operating conditions and the life, the efficiency of the charcoal over periods of as much as four or five years has been shown to be satisfactory and to meet the general criteria we use in determining the acceptability of charcoal absorber systems.

We believe the probable degradation of the charcoal that we are speaking of at TMI-2 was the fact that the charcoal had been put in place some number of months prior to the completion of construction at Three Mile Island 2. We speculate only that the charcoal may have been exposed to painting fumes, solvent fumes, perhaps some other organic materials, which, with air either diffusing through the filter systems or perhaps even being exhausted through the filter system-- that these materials were in fact passing through the charcoal and probably caused the charcoal to degrade.

Again, this is only speculation. Our recommendation when charcoal is installed is that it be installed either simultaneously with the end of construction or shortly after construction, such that such fumes are not exposed to the charcoal. In fact, we recommend that in any case where such exposure has occurred that either testing be done or that the charcoal be replaced.

CHAIRMAN SMITH: Mr. Lewis, does that bottle at your hearing table have any relationship to the hearing?

MR. LEWIS: It is charcoal from an FSF filter. I don't know if I will use it or not. I may. I can put it away if --

CHAIRMAN SMITH: No. I was debating whether it was charcoal or iodine.

(Laughter.)

MR. LEWIS: I promise, I will not bring elemental iodine into this hearing.

BY MR. LEWIS: (Resuming)

Q The NRC recommends that the charcoal be put into the filter -- stop me when I'm wrong -- when the filter housing is in place in the nuclear power plant and most of the painting on the filter and the painting that might go on in the plant is over; is that correct?

A That is correct, and the painting which is in areas contiguous or connected in any way to the filtration system.

Q Have you ever seen one of these filters being built?

A Many times, yes.

Q Are you familiar with whether the charcoal does go in at this time?

A The plants that I have seen under construction have placed the charcoal after every possible exposure to such fumes has occurred.

Q Have you seen the filters that were going into place at TMI-1 handled in that manner?

A I was not present to see that, no.

Q Do you know where the filters are built that go to TMI-1?
A Excuse me? Where they are built?
Q Yes, what manufacturing firm and what city?
A I don't recall.
Q Unhappily, I am not an expert witness on this or I would tell you which manufacturing firm in which home city, and I would tell you that the charcoal goes in long before they are even shipped out. But since I am not an expert witness, I c nnot tell you that.
MR. LEWIS: No further questions.
CHAIRMAN SMITH: Mr. Adler, Ms. Bradford, do you have questions?
MR. BRADFORD: On Mr. Lewis'? On ours?
CHAIRMAN SMITH: On Mr. Lewis'?
MS. BRADFORD: No.
CHAIRMAN SMITH: Mr. Adler?
MR. ROBERT ADLER: We have no questions for this witness.
CHAIRMAN SMITH: Mr. Baxter?
MR. BAXTER: No questions.
(Board conferring.)
CHAIRMAN SMITH: Mr. Cutchin?
MR. CUTCHIN: Yes, sir. I have no further questions.

CHAIRMAN SMITH: You may step down. However -- we will take the next one. But Dr. Little may have questions later on the Lewis testimony. We will proceed.

MR. CUTCHIN: He is available here now for both.

CHAIRMAN SMITH: Dr. Little isn't ready, so we will proceed and if she has questions on the Lewis contentions later she will ask them later.

So let's begin with your examination of Mr. Stoddart on your contention.

CROSS-EXAMINATION

BY MS. BRADFORD:

Q I have a couple of questions which are just to see if we are speaking the same language. I hope you will forgive my inadequacies. I am never quite sure what you are talking about.

On page 11 in your testimony, question 16, you made a change?

A Yes.

Q Can you explain to me what the difference is?

A The reason for the change? A cryogenic system is an extremely low temperature system, temperatures on the order of minus 200 degrees Fahrenheit, minus 225. The reference to the selective absorption should not have been to a cryogenic system. It should be to a cooled system.

Q That would be not as cold?

A Not as cold. Typically on the order of zero degrees Fahrenheit perhaps to 20 degrees would be a chilled system, not a cryogenic system. The cryogenic distillation operations at extremely low temperatures; selective absorption, at temperatures such as we have been exposed to in the past few days, 20 degrees, on that order.

Q So when you say all of the known cryogenic techniques for removing noble gases were considered, you are limiting that answer to cryogenic techniques?

A Well, this specific answer. However, other techniques were considered.

Q Such as?

A Well, for example, chilled charcoal bed systems, which are useful in delaying noble gases such as the condenser offgas systems at a boiling water reactor. Such a system requires a very large volume mass of charcoal and is not compatible with a high-volume system such as we are discussing here for treatment of a building exhaust system.

Q When you talk about a high-volume system, can you quantify that for me?

A Typically, a cryogenic system, such as the one used at San Onofre, has a throughput on the order of one to perhaps three standard cubic feet a minute. The exhaust system for the ventilation of the auxiliary building was quoted by one of the previous witnesses at about 150,000 cubic feet per minute. They are grossly different in volumetric flow rate.

The cryogenic systems we are talking about probably could be increased in size a factor of 10, maybe 20, and still be manageable so far as size, cost of the cryogenic material to cool the system and so forth. But it is my opinion that to try to extend the technology of some of these cryogenic systems to the sort of flow rates you would require for a ventilation of a building is beyond any logical engineering estimates.

Q So you are saying that the large system you would have examined or considered in this question 16 was something on the order of 30 standard cubic feet per minute?

A Pardon me. I didn't hear that.

Q I'm sorry. The largest system you would have examined or considered was on the order of 30 standard cubic feet per minute?

A Not a large system. I would say that a large system such as you might need to treat a -- any sort of a building -- would be perhaps a minimum of 1,000 standard cubic feet a minute, if you had a very tight building and a lot of time to treat the effluent.

In most cases your buildings are not that tight. If you reduce the volumetric flow of a ventilation system, say to a building of the size of the auxiliary building, down to 1,000 cubic feet per minute, you would lose all control of the air. The air would tend to exfiltrate out through cracks in the building, through cracks in the floor and so forth. You would no longer have control of the atmosphere in the building.

(Pause.)

Q I am looking at page 5, the top line on page 5, talking about, "Depending upon the type of accident, contaminated gases could be present in the ventilation exhaust in the auxiliary building and the fuel-handling building if the reactor building purge line were open at the instant of an accident." Quote.

Can you tell me what the reactor building purge line is?

A Yes. The reactor building is normally a field containment. Most pressurized water reactors are provided with what is called a purge system, which is used periodically to remove iodine -- well, actually, to clean up perhaps the building atmosphere before an entry is made, sometimes to control the pressure within a building, sometimes to -- excuse me, I lost my train of thought.

Q What volume is this line? What volume?

A As I recall, that is on the order of 10,000 to 15,000 standard cubic feet a minute.

Q Did you consider filtration for that?

A That system is normally filtered whenever it is being used, whenever it is being purged. The air, the gases that are being removed from the containment building, are passed through HEPA filters, hard charcoal adsorbers, before being released to the atmosphere.

This is not a system designed for prolonged use. It is typically used for one or two hours at a time.

In some plants there is a continuous purge system on the order of perhaps 1,000 cubic feet per minute. However, the purge system for both TMI-1 and TMI-2, both of those systems are designed for intermittent use.

Does that answer your question?

Q It does about that.

(Pause.)

Q I have one more question. It seems as if ANGRY has filed testimony on a subject different from what the staff and the Licensee were expecting. I am wondering if you are familiar with a study that is called "Post-Accident Filtration as a Means of Improving Containment Effectiveness."

The study was prepared under a grant to UCLA, and the number is -- I don't believe it has a NUREG. It has a number, UCLA 7775. It was prepared under the direction of a Dr. Okrent, 1975.

A I have not read that study, no.

Q You are not familiar with that?

A No.

Q Thank you.

(Board conferring.)

CHAIRMAN SMITH: Mr. Adler?

MR. ROBERT ADLER: No questions.

BOARD EXAMINATION

BY DR. LITTLE:

Q In your response to the Lewis contention, on page 9 of your testimony in your answer to question 20, you refer to the consequences of the accident at TMI-2. Now, let's assume that an event occurs at TMI-1 and there is a similar amount of iodine-131 which is available for release.

What is going to prevent the release from occurring? Just briefly recap what changes are going to be in place that would prevent release of the iodine from TMI-1?

A If we ignore for the moment the administrative control procedures in reducing leaks and just address the filtration, assuming the same situation were somehow to exist at Three Mile Island 1.

Q That's what I want.

A Yes. The charcoal adsorbers, adsorber units at TMI-1 and also at TMI-2, have had the charcoal changed to what we would call a different mix of charcoal. Now, the charcoal that was in use at both TMI-1 and TMI-2 at the time of the accident had what we called an impregnant of potassium iodide.

Now, in investigations which were going on at the same time as the accident and subsequent to the accident, it was determined that a mixture of impregnants, approximately half of the charcoal being impregnated with potassium iodide and approximately half of the charcoal being impregnated with a proprietary mixture called TEDA, or triethylene diamine, that such a mixture of impregnants was much more effective regarding the retention of the organic iodide, which was the principal concern about release during the accident.

Q How much will this improve the capacity? What kind of numbers, ballpark?

A Ballpark, I would hesitate to guess. I would say probably a factor of two. It would principally affect the release of the organic fraction, which in the case of immediately following an accident would be a relatively small percentage of the total iodine.

The more probable form would be either the elemental form or what Dr. Pelletier refers to as the hypoiodous acid form of iodine.

Q Do those improved impregnants affect the absorption capacity of the elemental iodine?

A I haven't seen any figures on that. The charcoal that was in place even at Three Mile Island at Unit 2 after the accident retained something on the order of 90 percent of the -- of all the iodines, even after some decradation had previously occurred.

With charcoal that had not undergone similar degradation and that did have the 50-50 mixture of the TEDA and the potassium iodide impregnants, I would venture that the retention of the elemental would be on the order of 98 to 99 percent, on the order of 90 to 95 percent of the organic. These would be what you might call educated guesses.

Q Continue with the safeguards that are now in place to ensure that the iodine will not be released?

A The safeguards in place?

Q I asked you how we could be sure that release of iodine would not occur from TMI-1 with the changes that have been given, if the same amount was released in an event there that was released in the TMI-2.

A The assurance that is given is in the number of inspections that take place to assure that the proper type of iodine is actually in place, to ensure that the proposed testing is done at the proper time, the proper sequence, and the proper manner, and ensuring that the systems are used in the way in which they are intended to be used.

MR. BAXTER: I think the witness said iodine when he meant to say charcoal. Did anybody else hear that?

You talked about testing to make sure that the iodine was in place.

THE WITNESS: I meant to say the charcoal, which does remove the iodine, to ma sure that the charcoal is in place.

BY DR. LITTLE:

Q Are you confident that in the proposed testing program there will be assurances that the charcoal that is there will be of sufficient absorption capacity, and that if it is not that this fact will be recognized on a timely basis and that corrective actions can be made?

A Yes.

Q Do you have an idea how often these tests are going to take place?

A The technical specification which was testified to earlier requires that the testing be done every 18 months. Past experience has shown that unless there is some challenge which occurs to the charcoal, such as referred to before, painting taking place within the building serviced by those systems, really, there is very little probability that the charcoal itself would be degraded.

Q Suppose that by some failure, that the charcoal is in fact exhausted, or that sufficient iodine release occurs so that the capacity is exhausted in the course of an event. Is there any way that there can be assurance that the persons who have to make the change can be protected, or the public health can be protected during this change of the charcoal?

A The changeout of [illegible] charcoal is typically done under conditions where ther[illegible] no flow through the particular bank of charcoal adsorbers that is being moved. The systems are blocked off, closed off so that there is no flow at the time that the charcoal is being removed.

The drawers in the assemblies in which the charcoal is lodged are brought out and wrapped in several layers of plastic to prevent any possible desorption of the iodine retained on the charcoal. The people who are doing the actual changing themselves are supplied with respiratory protective equipment, either in the form of charcoal filters on a face respirator or are supplied with fresh air supply by mask, as the job is being done, to prevent their own exposure to any iodine that is being released.

It is considered a safe operation.

Q That is preventive maintenance or routine changeout. What about under accident conditions? Can this be done under accident conditions?

A Accident conditions are essentially done the same way, yes. I was basically discussing the type of changeouts that were done at TMI-2 following the accident. I was there onsite and did observe some of these operations myself.

(Pause.)

BY DR. JORDAN:

Q Ms. Bradford asked if you were familiar with a report -- would you state it again?

MS. BRADFORD: It is called "Post-Accident Filtration as a Means of Improving Containment Effectiveness."

BY DR. JORDAN: (Resuming)

Q You answered that you were not familiar. Is this not a system that might be used to prevent a release of radioactive gases from say a containment vessel in case the pressure should become very high? Did you address that at all in your testimony, and if not why not?

A No, I did not. My testimony was responsive to the question addressing existing systems. The system which is being discussed -- and perhaps I might qualify my previous answer, in that I, in reading the testimony of Dr. Beyea, did make reference to that particular report, as I recall.

I have read brief summaries of other work in the area. These are proposed systems to accommodate accidents, which are highly speculative as to whether they would ever occur. I do [illegible] feel I am perhaps the qualified witness to address this particular area. I do have some peripheral knowledge of it, but that would be about the extent of it.

Q When you wrote your testimony, did you consider the possibility that this is what ANGRY had in mind?

A I did not at the time. When I read Dr. Beyea's testimony, I could see that perhaps by extension this was what was intended. But just in reading the basic contention, I didn't really feel that it addressed that point.

I might point out that there are a number of other factors involved in such a discussion. Again, I am not party to these items, but there are discussions going on within NRC and with other groups concerning the actual releases from accidents. There are studies which are being proposed, perhaps to modify the existing accident source terms.

It is thought, I believe, by Dr. Stratton of Los Alamos and some other people who prepared a report submitted by EPRI, who claim that the iodine source terms in the event of an accident are grossly exaggerated. If such studies are followed up, it would perhaps have a great effect on the discussions on the sorts of venting systems we are talking about here.

And again, I am perhaps -- I am certainly not the staff's knowledgeable witness in these areas.

Q But you have not made any attempt to address the contention in considering that as a possibility of what was meant?

A No, I have not, in that the NRC has not adopted a firm position on this. And really, as an expert witness, I can only address those areas that the NRC and the staff have developed positions on and have gone through the procedures of the Standard Review Plan, regulatory guides, and so forth.

Q Thank you.

CHAIRMAN SMITH: Anything further?

MR. BAXTER: Excuse me.

CHAIRMAN SMITH: Ms. Bradford has an additional question.

CROSS EXAMINATION ON BOARD EXAMINATION

BY MS. BRADFORD:

Q Mr. Stoddard, when you were given ANGRY's contention to study so you could prepare testimony on it, were you given the interrogatory and response that we made to the Licensee, further specifying the contention? We made the response in March of last year.

A I don't recall.

Q Do you know whether all the information you were given on our concern was just the contention as it was filed in October?

A I had access to most of the interrogatories that were put out. I don't recall any interrogatories working on this particular question. I'm sorry, I don't recall.

Q In the answer to that interrogatory, we did cite this study that you are not familiar with. And I was just wondering whether you noticed that at the time.

MR. CUTCHIN: I think the witness has already answered the question, Mr. Chairman. He doesn't recall.

CHAIRMAN SMITH: She is trying to refresh his memory.

THE WITNESS: I don't recall anything relative to containment filtered venting that I read, no.

MS. BRADFORD: He said he was not familiar with the study. He didn't say that he didn't know that we cited that study.

CHAIRMAN SMITH: He says he couldn't recall. You are allowed to inquire a reasonable amount to try to prod his memory.

MR. CUTCHIN: If this is going to go on much further, I think we are now starting to delve into matters which the Board has not yet ruled on as admissible within the scope of this contention.

CHAIRMAN SMITH: It may be that the Board -- the Board, if it goes much further, will have to have a conference on that very point.

Mr. Baxter?

CROSS EXAMINATION ON BOARD EXAMINATION

BY MR. BAXTER:

Q In discussing the frequency of testing of charcoal filters and the potential concern for the need to remove them during an accident situation, is the concern that the charcoal filters can be depleted or are likely to be depleted by iodine, or that their effectiveness might be diminished for some other reason?

A Primarily, their effectiveness might be depleted by some other reason. The capacity of filters -- of charcoal adsorbers for iodine is substantially higher than that encountered in the accident at TMI-2.

Q Thank you.

CHAIRMAN SMITH: Anything further of Mr. Stoddart by anybody?

(No response.)

CHAIRMAN SMITH: You are excused, Mr. Stoddart. Thank you.

(Witness excused.)

CHAIRMAN SMITH: I understand you want to talk about scheduling. Ms. Bradford has a report she wants to make on what the Intervenors are doing on emergency planning.

Mr. Lewis, thank you very much for coming.

(Pause.)

MS. BRADFORD: The parties interested in emergency planning have met several times, and most recently the Licensee gave us another copy of our contentions, with suggestions about which ones, which suggestions we might drop. We have gone through these and also gone through several turnings around of how to order these contentions, how to number them, all this.

In resolution of all that, I would like to see whether it would be acceptable to the Board and the parties if I Xerox the surviving contentions by the 12 categories that Mr. Cunningham outlines in his filing docketed December 18th, which we thought was a reasonable order to put the contentions in because it goes chronologically as you would go through the actions during an event.

The Licensee didn't have objections to that sequencing, but they will order their testimony as they wish.

I will undertake to provide everyone with a copy of all of the contentions, so divided and marked with Mr. Zahler's notation as to whether he considered it an offsite or an onsite contention, since that was a notation that he found useful. And then we can somehow number them within those categories, or I can just go ahead and number them.

CHAIRMAN SMITH: These will be the surviving contentions?

MS. BRADFORD: Right.

I would like to also like the Board if ANGRY may formally adopt Mr. Sholly's emergency procedure contentions.

CHAIRMAN SMITH: I think this will be too complicated. Maybe Mr. Tourtellotte and Mr. Baxter should schedule a meeting with Mr. Zahler present and Mr. Gray to take it up. Mr. Tourtellotte?

MR. TOURTELLOTTE: We will see if we can do that some time in the near future, and maybe we can just sit down and reach agreement with Ms. Bradford about these matters.

CHAIRMAN SMITH: It certainly cannot be addressed tonight.

MS. BRADFORD: We agreed that we would go through with and give an answer about what we thought about his comments on our contentions by this week, with Mr. Zahler. And I would like to do that, just communicate directly to Mr. Zahler. But I thought it would be best to communicate with everyone by giving a new copy of the documents, so that everything was still there.

CHAIRMAN SMITH: Maybe the better thing to do is for Mr. Tourtellotte or Mr. Zahler to initiate a conference with Ms. Bradford and take the initiative for seeing that her recommendation is given consideration.

MR. TOURTELLOTTE: We will do that.

CHAIRMAN SMITH: There is not much that can be done tonight. With the exception of Dr. Little, I don't think there is anyone that is in the room that is as familiar with the emergency procedure contentions as you are now. There are the wrong people here.

MS. BRADFORD: I understand.

CHAIRMAN SMITH: Thank you.

MS. BRADFORD: And you will take up our request, or should I just take it up with the other parties?

CHAIRMAN SMITH: Mr. Sholly has made that request and you will make that a formal motion. That is perfectly appropriate. You can do that right now on the record. On behalf of ANGRY, you wish to adopt the Sholly contentions. And we will have to give the parties an opportunity to respond to that. But you don't have to file anything in addition for that.

If you have any arguments you want to make in support of that request, you can either make them now or file a paper on them. Your position is that you have an interest in his contentions as well as he does.

MS. BRADFORD: The only contentions, emergency procedure contentions, we were not interested in were the ones related directly to Cumberland County. I believe he has already dropped those. That is just for clarification. That was it.

CHAIRMAN SMITH: I don't believe either the Licensee or the staff is in a position to object or agree to your motion. I just want to let it ride there. The motion is deemed made and they can respond to it either according to the rules, in writing, or they can be addressed in the context of the meeting that you are going to schedule when you come to the Board and report.

I think somebody -- there is going to have to be a coordinated report to the Board, isn't there?

MR. CUTCHIN: Yes.

CHAIRMAN SMITH: Then let's leave it this way. Notwithstanding other provisions of rules or earlier Board orders, you can respond to the Board, answer Ms. Bradford's motion, at the time you report to the Board.

MR. TOURTELLOTTE: Very well.

CHAIRMAN SMITH: Any problems with that?

(No response.)

MR. CUTCHIN: Before we go into the schedule, I would like to identify for the record the documents which I passed out during the break to the Board and the parties who are present today, including UCS. We got them in their hands before they departed.

In anticipation of Dr. Ross' then-planned attendance next Tuesday and because of discussions that had taken place last week or so about the LOFT test that took place early in December, Mr. Ross wished to place in the hands of interested parties and the Board copies of these two documents.

First is a memorandum for Mr. Ross from a Mr. B.W. Sherin, and the subject is "Preliminary Conclusions from

LOFT Test L3-6 (Small Break LOCA With Reactor Coolant Pump Delayed Trip)." That is dated December 12th, 1980.

The second document is from a Mr. L.P. Leach, manager of the LOFT department of EG&G, and it is addressed to Mr. R.E. Teller, director. The subject is "Quick Look Report for LOFT LOCA L3-6/L8-1-LTL-164-80." That document is dated December 22nd. It says 1981, but I am sure it meant 1980. Thank you.

MR. TOURTELLOTTE: If we could have just a few minutes to meet with the applicant and discuss the schedule, and then perhaps we could tell you how we think we might be able to proceed. It won't take very long.

CHAIRMAN SMITH: Go ahead, take a break.

(Recess.)

CHAIRMAN SMITH: On the record.

MR. TOURTELLOTTE: Mr. Chairman, I want to report a development that has an impact on next week's schedule and then discuss next week's schedule. Licensee has requested and the senior staff at NRC has agreed to a meeting at the end of next week on Friday.

CHAIRMAN SMITH: Next Friday?

MR. TROWBRIDGE: Next Friday, at which we will seek clarificatin and also discussion of the staff's position on scope and schedule of restart, pre-restart requirements. Under these circumstances, it seems to us premature to bring on Messrs. Ross and Capra, as was planned for this coming Tuesday, to discuss their answers to Board Question 2, among other things.

And Mr. Tourtellotte, at my request, has agreed to defer that testimony. Looking at next week's schedule, the following two items that were planned to be discussed were separation and the beginning, at least, with Licensee's testimony on control room design.

Our witnesses cannot be available on control room design until Thursday, which is the schedule we have been thinking about. And unless the Board thinks that the separation testimony, on which we have no remaining contentions, but considerable Board interest, unless the Board thinks that that is going to take substantially more than a day, or for sure a couple of days, we would simply propose to drop Tuesday as a hearing date, start with separation, as we presently visualize it, on Wednesday, in the expectation that it is quite possible that that would be a one-day matter, and then begin on Thursday and Friday, with half of Friday with our control room design testimony.

That I think is the schedule which we have just discussed and is agreeable to all of the staff and ourselves, and I think to the Commonwealth.

CHAIRMAN SMITH: You would suggest that we start the first thing Wednesday morning?

MR. TROWBRIDGE: But I am looking at Dr. Little and trying to get a sense of whether she has more than a day's worth of interest in our testimony.

CHAIRMAN SMITH: Every panel member who had never been to a hearing or had toured a plant had planned to be here to watch the proceeding on Tuesday and tour the plant on Wednesday. And we saw our issues slipping away as it was.

We certainly don't want to have a hearing just to entertain panel members.

MR. TROWBRIDGE: Did you say the panel members were going to look at the plant on Wednesday?

CHAIRMAN SMITH: They were going to observe the hearing on Tuesday.

MR. TROWBRIDGE: Would it be possible for the panel member to just switch that around?

CHAIRMAN SMITH: And do it Thursday?

MR. TROWBRIDGE: See the plant on Tuesday and come to a hearing on Wednesday.

CHAIRMAN SMITH: I guess that would be possible, depending on the time. Is that possible for Met Ed?

MR. BAXTER: You might consider having them visit the plant on Thursday, when there will be an Intervenor involved.

CHAIRMAN SMITH: There are many of them who have complicated schedules, just as we do.

(Pause.)

DR. LITTLE: One of them happens to be the new chairman of the panel.

MR. TROWBRIDGE: Mr. Wallace informs me that we will indeed reschedule our end of the tour if the panel members want to take the tour Tuesday instead of Wednesday.

CHAIRMAN SMITH: They have devoted both days to it and I can't see how it would make any difference unless one or the other one of them had decided to skip a plant tour or a hearing day.

In any event, I think that is probably the better arrangement. All right, so we will begin again Wednesday morning.

MR. TROWBRIDGE: We don't have UCS traveling in the morning from Washington. Should we not go back to our 9:00 o'clock --

CHAIRMAN SMITH: 10:00 o'clock -- 9:00 o'clock Wednesday.

(Board conferring.)

CHAIRMAN SMITH: All right. We will resume at 9:00 a.m. We will meet here at 9:00 on Wednesday, with what -- separation.

MR. TROWBRIDGE: With separation.

CHAIRMAN SMITH: And then we will have control room design.

MR. TROWBRIDGE: To be followed by Licensee witnesses on control room design.

MR. BAXTER: On Thursday.

MR. TROWBRIDGE: On Thursday.

CHAIRMAN SMITH: Is there any chance that could be set for Wednesday? They are not just just not available?

DR. JORDAN: I suspect we will be able to use the time very usefully on Wednesday afternoon if we have any, because there is a lot of testimony on control room design. It is that thick (Indicating). I don't see how I can get through it between now and then anyhow. I would be delighted if we get Wednesday afternoon off.

CHAIRMAN SMITH: Let's make one -- as far as the hearing is concerned, we will begin Wednesday at 9:00 o'clock. As far as switching the tour for the panel members is concerned, we set that tentatively for Tuesday. However, let me check with them tomorrow. And they have a reference. They have a person, I believe, to call at the plant. And if that is not satisfactory, if scheduling it Tuesday is not satisfactory, what do we do, what should they do? Call the person whose name was given?

MR. TROWBRIDGE: That's fine. We will talk to that person and alert him.

CHAIRMAN SMITH: Let's go off the record. And so we will adjourn until 9:00 a.m. Wednesday.

(Whereupon, at 7:07 pm., the hearing was adjourned, to reconvene at 9:00 a.m. on Wednesday, January 14, 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: January 8, 1981

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.

Barbara Whitlock

Official Reporter (Typed)

Barbara L. Whitlock

Official Reporter (Signature)