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NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF:

THREE MILE ISLAND
SPECIAL INTERVIEWS

WITNESSES:

CRAIG FAUST
ED FREDERICK
FRED SCHEIMANN
WILLIAM ZEWE

Place - Middletwon, Pennsylvania

Date - Tuesday, September 11, 1979 Pages 1 - 272

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CRAIG FAUST
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Trailor No. 138
Three Mile Island
Middletown, Penna.

Tuesday, September 11, 1979

BEFORE:

For the Nuclear Regulatory Commission:

GEORGE T. FRAMPTON, JR., ESQ.
RON HAYNES
RON BELLAMY
MARK CUNNINGHAM
MICHAEL WORAM
RUSSELL SACKETT
PETER SICILIA

For Metropolitan Edison Company:

DELISSA A. RIDGWAY

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E X H I B I T S

EXHIBIT NUMBER:	IDENTIFIED
7	40
8	175

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PROCEEDINGS

MR. FRAMPTON: On the record.

This is a deposition being conducted by the NRC Special Inquiry Group on September 11 at Three Mile Island of Mr. Bill Zewe, Mr. Fred Scheimann, Mr. Ed Frederick and Mr. Craig Faust.

Gentlemen, we have given you to read a one-page witness notification which states the purpose and authority of our group and certain matters about the confidentiality of this deposition and the Privacy Act.

Have you read that one-page statement?

MR. FAUST: Yes.

MR. FREDERICK: Yes.

MR. SCHEIMANN: Yes.

MR. ZEWE: Yes.

MR. FRAMPTON: Do you understand it?

MR. FAUST: Yes.

MR. FREDERICK: Yes.

MR. SCHEIMANN: Yes.

MR. ZEWE: Yes.

MR. FRAMPTON: Ron, could you swear each of the witnesses indivioually?

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Whereupon,

CRAIG FAUST

ED FREDERICK

FRED SCHEIMANN

WILLIAM ZEWE

were called as witnesses and, having been first duly sworn, were examined and testified as follows:

MR. FRAMPTON: Mr. Zewe, can you tell us as best you recall what hours you were on and off, beginning with March 28 and going through until Sunday after the accident, so we can get those times down?

WITNESS ZEWE: On the 28th, I was there from midnight until about 6:00 p.m. that evening. I had arrived at about 10:30 on the previous evening, on the 27th. I came back on site about a quarter after 3:00 in the morning on the 29th, and I left about 2:00 p.m. in the afternoon.

On the 30th -- well, I came back about 10:30 that night again and worked until around noon or 1:00 o'clock in the afternoon on the 30th.

The next couple of days, Saturday, I just worked a normal 11:00 p.m. until 7:00 a.m. the next morning. Sunday, I was off, but I was on the site for most of the day, either at the observation center or the plant itself on Sunday. Anywhere from about 9:00 in the morning until about 5:00 in the afternoon, but I didn't have the duty responsibility.

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MR. FRAMPTON: Mr. Scheimann, as best you can recall, can you go through the same?

WITNESS SCHEIMANN: Okay. March 28, actually it was the 27th, I started 11:00 p.m. Actually, I got here about 10:30. I was here until about 5:00 o'clock, 5:30, the next afternoon. The 29th, due to an unfortunate misunderstanding as to the time of scheduling, I wasn't even out. The 30th, I am having a hard time remembering when I was here, but I was probably here from 11:00 p.m., to 11:00 a.m. And that is all I can really remember as far as timewise.

MR. FRAMPTON: That would have be from 11:00 p.m. on Friday through until Saturday morning?

WITNESS SCHEIMANN: Yes. Other than that, I couldn't really remember an exact time, being six months from the time now.

MR. FRAMPTON: Thank you. Mr. Frederick?

WITNESS FREDERICK: I arrived at 2245 on the 27th of March. I left at 1607 on the 28th. I arrived again at about 2230 and left about 1000 on the 29th. I believe the next day I worked the same thing. I am not sure. Was it Sunday we were here together? So I worked probably noon to 5:00 or something on Sunday.

MR. FRAMPTON: Let me go back and make sure about that again. You came back on at 10:30 p.m. on the 29th, on

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Thursday?

WITNESS FREDERICK: 28th.

MR. FRAMPTON: I am sorry. On the 28th. That is Wedneday. You were on again beginning at 10:30 p.m.

WITNESS FREDERICK: I was not on the panel. I was not on the control room as operator. I was controlling the auxiliary operators that night.

MR. FRAMPTON: That was until Thursday morning?

WITNESS FREDERICK: Yes, until about 7:00 or 8:00. I was tied up with something else until about 10:00 in the morning. I don't remember what.

MR. FRAMPTON: Okay. Then were you on again at all during Thursday or Friday?

WITNESS FREDERICK: Thursday night I should have been back out on the 11:00 to 7:00.

MR. FRAMPTON: 11:00 to 7:00 Thursday night over into Friday morning?

WITNESS FREDERICK: 2300 at night until 7:00 in the morning on Friday. I believe I stayed over a little bit Friday morning too. Saturday, I don't know, I know I was on site sometime during the day, but I don't know what time. I was back again. Both off-scheduled days, but I was here. Like I say, Sunday, I think, it was something like noon to 5:00 or 6:00, something like that.

MR. FRAMPTON: On Thursday night-Friday morning,

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were you in the control room or were you controlling auxiliary operators at that time too?

WITNESS FREDERICK: I don't remember.

MR. FRAMPTON: Mr. Faust, do you recall your hours?

MR. FAUST: Well, Ed and I go hand in hand on the 28th, 29th and 30th, about. The weekend, I think I was off.

MR. FRAMPTON: All right. Let me begin asking you some questions about the venting of the makeup tank on Thursday and Friday.

Mr. Zewe, do you recall when that began to occur during the morning or early afternoon of Thursday the 29th? Was the pressure beginning to build up in the makeup tank before you left around 2:00 p.m. on Thursday?

WITNESS ZEWE: I really don't recall when it was, but I am sure that we had the higher pressure build up in the makeup tank that had started to occur before I left. Exactly what time -- I believe it was earlier on Thursday tht we began to vent the makeup tank more than what we owuld normally do.

MR. FRAMPTON: When you say "more than what you would normally do," would any venting normally be required at full power operation, let's say?

WITNESS ZEWE: Really, the only time we would vent the makeup tank is if we filled up the makeup tank a

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abnormally and it just got a higher than normal pressure in the makeup tank or if we had a low hydrogen atmosphere in the makeup tank to where we would vent it off and reapply the nitrogen overpressure. Normally, there was very little venting done in the makeup tank normally.

MR. FRAMPTON: During normal operation, had there been any indication at all of any leaks in the system going from the vent header onto the compressor and waste gas decay tanks?

WITNESS ZEWE: I really don't recall, because prior to the accident, all right, the waste gas header really wasn't very hot radioactively and really the only way we could detect leakage from any part of the system header is basically thorugh our RMS system, or if we run the waste gas compressors and if they don't build up pressure in the waste gas decay tanks themselves.

We did have some problem with the waste gas compressors and the cross-connect leakage that we had between two waste gas tanks, and we had had previous leakage from some of the instruments on the waste gas tanks that had been repaired.

So at this point, on the 28th, I am not certain of exactly that we knew that there existed a leak that existed after the accident.

MR. FRAMPTON: I understand if you don't have a lot of activity in the normal waste gas, you would not find

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it as easy to detect any small leaks that might exist, but you said there had been some problems in the past in the cross-connect between the waste gas decay tanks, but you think that had been fixed?

WITNESS ZEWE: Well, I am going back to where we did the start-up testing on it all right. Like all systems, there were some leaks that existed and that were repaired, and other ones appeared after this period. All right?

So after the 28th, I had no reason to believe that our waste gas vent header system had any leaker.

MR. FRAMPTON: Do you recall whether prior to the time you left on the afternoon of Thursday the 29th, there weas any awareness that the build-up of gas in the makeup tank might become an increasingly serious problem? That it might tend to substantially impair makeup and let-down flow? In other words, was this perceived as a problem that was going to potentially get greater as time went along?

WITNESS ZEWE: We were still trying to evaluate the full accident and the controllability of the plant at this point. Yes, we knew if you have a higher pressure in the makeup tank that you would reduce your let-down capability. Certainly, we were having a lot more gas come back in the let-down system than what we were normally accustomed to. We knew at this time we had a leak in the vent header, because each time we did try to vent off the

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makeup tank pressure, we did have a release that was noticeable in the auxiliary building. We knew we would be venting more and more, because the gas build-up seemed to increase, so that the frequency between venting was increasing all the day of the 29th, as I remember, but we were trying to minimize the venting, so we would minimize the release of the radioactive gases to the building.

MR. FRAMPTON: Do you recall then that during the day on Thursday people had made a connection between the venting of the tank and the activity levels in the aux building or in the fuel handing building?

WITNESS ZEWE: As I recall, yes. I might have, you know, the 29th early morning versus late at night, you know, a little out of context there, but, yes, I believe we did know it on the 29th, yes.

MR. FRAMPTON: Do you know whether anybody was drawing a direct correlation between venting the makeup tank and any off-sites levels of activity?

WITNESS ZEWE: Every activity that you vent from the makeup tank went into the auxiliary building, and it would ultimately go to the atmosphere, yes.

MR. FRAMPTON: I understand, but the question I am asking is whether anybody was drawing a connection between venting the makeup tank and actual readings taken by monitoring teams someplace off-site or was the correlation

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that was observed the correlation between the activity in the building --

WITNESS ZEWE: We could see it off-site. Every time we would vent, there would be about 30 minutes to 40 minutes of a delay between the opening of the vent to where we could actually monitor external to the plant.

MR. FRAMPTON: Okay. Do you recall whether anybody was saying on Thursday, "Gee, the gas will continue to build up. This will be an increasing problem we will have to deal with down the road in 12 or 24 hours." Do you remember any consciousness of the fact it would be a bigger problem the next day?

WITNESS ZEWE: We were discussing the present problems that we had. I don't believe that we discussed how much greater it may become at some point in the future.

MR. FRAMPTON: Do you recall what your awareness was on Thursday of how much hydrogen gas was probably in the primary system? Can you recall anything about what you knew or were told about that on Thursday?

WITNESS ZEWE: On Thursday was the first time that I had received the information that the pressure spike that we had the previous day was due to hydrogen burn in the reactor building. Knowing that that would have to be a considerable amount of hydrogen in order to have the burn in the reactor building, we were certain that we had a

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considerable amount of hydrogen in the reactor coolant system itself. But I really didn't have a feel for what that concentration actually was other than we had a lot of hydrogen.

MR. FRAMPTON: Well, did you think that most of the gas that was coming off into the let-down lines was hydrogen, or did you think -- did you reach any view about that? What did you think the gas was as of Thursday that was building up in the makeup tank?

WITNESS ZEWE: I really didn't know, other than fission-produced gases. Xenon, krypton, and so forth, along with some hydrogen and all the other fission-produced gases we might have. I really didn't try to encompass it with a quantitative type, you know, half of the gas is hydrogen, or so many ccs per kg or something of this nature. We were still concerned with trying to control the plant in the situation we were in, more so than trying to do analytical evaluations of it.

MR. FRAMPTON: Do you recall while you were there during the morning and early afternoon of Thursday the 29th what the command and control line was with respect to the Unit 2 control room?

WITNESS ZEWE: Most definitely, yes.

MR. FRAMPTON: Who were you reporting to and who was your immediate superior reporting to. Can you recall

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that for us?

WITNESS ZEWE: Yes. My immediate superior was James Floyd on the 29th. He was the supervisor of operations. And then above him was a unit superintendent, Joe Logan or Gary Miller or Jim Seelinger, depending on who was there at that point in time.

MR. FRAMPTON: Do you recall who was there on Thursday?

WITNESS ZEWE: Thursday morning?

MR. FRAMPTON: Yes.

WITNESS ZEWE: Jim Floyd was my immediate supervisor, and I can't remember who the unit superintendent was, though I believe it weas Joe Logan, but I don't call exactly, because they were not changing at the same time as we were, and we had several of them there at any one time, and I don't recall at that point exactly, because in the late morning hours of the 11:00 to 7:00, when we entered the makeup tank, it was right around where you have a normal shift change.

MR. FRAMPTON: Friday morning?

WITNESS ZEWE: We are still talking about Thursday morning.

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MR. FRAMPTON: Let's go to Thursday night when you came back on. What was your understanding then of the supervisory chain of command in the control room? Do you recall from 10:30 p.m. to noon on Friday who was your immediate supervisor and what other management people were in the control room in charge?

WITNESS ZEWE: It was the same. Jim Floyd.

MR. FRAMPTON: Did he come back on around 10:30 or 11:00 Thursday night?

WITNESS ZEWE: I am not sure of Jim's exact time, but he was working opposite Mike Ross, the Unit 1 supervisor of operations and Jim and Mike were on and they relieved each other.

I am not sure of what hour they relieved each other that particular day, but in the morning hours of the 30th, Jim Floyd was the supervisor of operations and my immediate suprevisor.

MR. FRAMPTON: Sometime early morning of the 30th, Mike Ross went off and Jim Floyd came on?

WITNESS ZEWE: I think around midnight, but I am not sure on that.

MR. FRAMPTON: Was it your understanding that Floyd and Ross were trading off on the 12 on-12 off basis?

WITNESS ZEWE: As I remember, they were, yes.

MR. FRAMPTON: Above them, Gary Miller and

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Joe Logan.

WITNESS ZEWE: And Jim Seelinger. Well, they weren't strictly on 12 to 12, I don't believe. They overlapped a considerable amount of time. For certain periods of time, we would have two superintendents there at one time.

MR. FRAMPTON: But the three of them -- Miller, Seelinger and Logan -- were trading off at one level -- in effect, superintendent -- and below them, Floyd and Ross were trading off. Is that your perception?

WITNESS ZEWE: Yes.

MR. FRAMPTON: All right. On Friday morning, the 30th, Jim Floyd was your immediate supervisor?

WITNESS ZEWE: Yes.

MR. FRAMPTON: Do you recall whether Joe Logan was there at, say, 6:00 or 7:00 a.m. on Friday morning?

WITNESS ZEWE: I couldn't say with much assurance because at that time I really didn't keep track of what time one came and what time one left. Some of them changed shifts at like 4:00 in the morning and I get the days for the ensuing two weeks pretty much confused on who was there at any one point.

At the particular time, there was no question what the chain of command was at any particular period.

MR. FRAMPTON: Now, I think in previous

testimony, you have said that during the early morning hours, the makeup tank was being burped in the sense that the valve was just being cycled until it hit open and then it would be cycled back closed; is that correct?

WITNESS ZEWE: That is true.

MR. FRAMPTON: I think some of the reactimeter data or strip charts we have show a couple of venting periods that are a little longer than that at about 2:00 o'clock and 3:00 o'clock a.m. on Friday morning. 20 or 25-minute time periods when the valve was left open and then closed again.

Does that ring a bell with you?

WITNESS ZEWE: No.

MR. FRAMPTON: Does that seem right?

WITNESS ZEWE: No. All that morning on our shift, I recall no instances at all that it was open longer than cycle only.

WITNESS FAUST: That would have been me.

MR. FRAMPTON: Do you recall whether that sounds accurate?

WITNESS FAUST: It doesn't to me, because we were -- when we made the major release, so to speak, we ere under the guidelines just to cycle it short durations and shut off the valve and wait.

We were sending a guy in the building. Be right back to

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start the waste gas compressors at the time of venting, so we could hopefully hold the pressure down to pt it right into the waste gas tanks.

MR. FRAMPTON: The individual who was being sent to start up the waste gas compressor had to be suited up?

WITNESS FAUST: Yes. It took him a good deal of time to get in there and get back out. They weren't spending much time in the building at that period.

WITNESS FREDERICK: Can I asked a question? What piece of reactimeter is giving you the valve position?

MR. FRAMPTON: Apparently there is a gentleman name. Jerry who was at some point assigned to keep a log to make notes in the control room and his notes, I am told, are what indicate the longer periods of opening the valve.

WITNESS FREDERICK: That is not reactimeter data.

MR. FRAMPTON: That is correct.

WITNESS FREDERICK: We are going by what a man wrote in a log.

WITNESS FAUST: Whether he knew -- he might have missed -- gotten the information wrong on what we were doing at the time.

MR. FRAMPTON: That is correct. That is why I am asking you what your understanding of it was.

WITNESS FAUST: I don't remember going through anything longer than just cycling the valve.

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MR. FRAMPTON: Fine.

Mr. Zewe, let me ask you to describe what it was that happened that caused you to go into a mode of venting the tank over a continuous period. What was the first thing that happened that made you change your tack?

WITNESS ZEWE: Well, Mr. Faust and myself were mainly involved in this along with Greg Hitz, another shift supervisor. When that happened, we had lost the makeup tank level because of the increasing pressure that was built up into the makeup tank.

We had to increase our frequency of venting the makeup tank to keep it less than 80 pounds which is the relief set-point on the makeup pump suction line from the makeup tank itself. We didn't want that relief to lift.

Plus the increased pressure was putting more back pressure on the let-down system flow and the let-down system flow was diminishing rapidly also.

So, at some point -- it was around 6:30 or 7:00, I guess it was -- the makeup tank, we lost the level from the makeup tank and we had reached the relief valve set-point of 80 pounds on this line. So, it had -- we had thought that it had lifted and discharged water from the makeup tank on its relief valve to the RC bleed tank header.

MR. FRAMPTON: Let me ask you a question about that. Would the fact that you lost the level in the makeup

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tank, would that be caused by the pressure forcing all of the water over into the reactor coolant bleed tank or would that -- could the loss of level occur simply because the flow stopped and whatever coolant was in there went on back into the primary system?

WITNESS ZEWE: I believe that as the relief valve discharged the water, it caused a rapid reduction in level. We weren't feeding at a very high feed right to the reactor coolant system.

Throughout the night we had allowed the makeup tank pressure to get substantially higher than what we had been controlling it at earlier and we had been bringing down the makeup tank level from where we had it before so we could minimize the required time that we would have to vent.

We got into that situation where we had the makeup tank somewhere around 25 inches or so and the pressure greater than 75 pounds to where we had an operator that was being dressed out in protective clothing to go in and start the waste gas compressors and follow the same procedures we followed all that night and the previous day, of him starting the air compressors by hand and us cycling the valve.

So before he was able to go in there and start this procedure of starting the waste gas compressors is when we

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reached the 80 pounds or above. It actually went up to about 82 or 83 pounds. The relief valve blew over to the reactor coolant drain tanks.

I had just came back from an interview with the GPU. I had left the control room for just about an hour. When I came back, we had the zero level in the makeup tank and it was reported to me that we had lost two or three feet from the BWST and the bleed tanks were pressurized and appeared to be overflowing with a high level.

MR. FRAMPTON: Let me stop you a minute and ask you some more questions. When you say the relief opened from the makeup tank and dumped the coolant there, are you talking about a liquid relief valve that would dump that into the bleed tanks?

WITNESS ZEWE: Yes. The relief valve is between the makeup tank and the suction of the makeup pumps when always should be liquid. It was that night, too.

MR. FRAMPTON: Had the gas relief valve on the makeup tank, the automatic valve, opened prior to that time?

WITNESS ZEWE: Which automatic gas relief valve? There isn't one.

MR. FRAMPTON: There is no automatic gas relief?

WITNESS ZEWE: There is a manual control vent.

MR. FRAMPTON: That is the valve you were cycling.

WITNESS ZEWE: Right. There are other makeup

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let-down relief valves, all right? But there is none that will relieve the pressure in the makeup tank automatically. There is not.

MR. FRAMPTON: If you had not been controlling the manually operated gas relief valve on the makeup tank, how would gas have been released automatically upon overpressurization? Would the gas go into the reactor coolant bleed tank and up into the relief vent header?

WITNESS ZEWE: Through the relief valve, it lifted at 80 pounds. That is the only automatic valve that relieves the overpressure in that system in the makeup tank.

MR. FRAMPTON: That valve goes where?

WITNESS ZEWE: To the header to the RC bleed tanks.

MR. FRAMPTON: Gas would go with the water flow into the reactor coolant bleed tanks?

WITNESS ZEWE: Yes. Whatever carried over with the water would be the gas and it would go there also.

WITNESS FAUST: You understand what the valve is? It is on the bottom of the tank. Outlet piping. After you blow all the liquid out of it, then you get the gas.

MR. FRAMPTON: Would the gas blow through there or would the valve close?

WITNESS FAUST: If the pressure is high enough, it will blow through that relief valve if it gets down to that

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point. If it did, it would probably wipe out our makeup pumps, too, though.

WITNESS ZEWE: Whenever we lost the makeup tank level, we then switched our suction for the makeup pumps to a part of BWST so the makeup pumps were still operational from the BWST.

MR. FRAMPTON: When you came back, and I think you have previously testified, observed that the reactor coolant and the bleed tank level went up and the BWST level had gone down, the cause for that would have been the makeup pumps switched and took makeup flow from the BWST after the makeup tank itself drained over int the bleed tanks; is that correct? Or am I wrong?

WITNESS ZEWE: Whenever you open up the valve between the makeup tank and BWST, you would assume the makeup tank would take the suction from the BWST, but what we didn't perceive right on was that why was the BWST going down and the bleed tanks going up? How we were transferring the water from the BWST into the makeup tank system and into the reactor coolant bleed tank.

MR. FRAMPTON: So there is a route by which once you lose makeup level, you can be drawing water from the BWST right through into the bleed tanks.

WITNESS ZEWE: That is the design of the system, yes. Oh, no, no, no. Just to provide suction for the

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makeup pumps.

It is not designed or intended to function going from the BWST to the makeup to the bleed tanks. All right? That was a path we had never explored before.

But we had it and we then determined that because the relief valve was open, the makeup pumps were mainly on full recirc, all right? They were keeping that along with the high pressure from the let-down that was keeping the relief open.

The recircs for the running makeup pump was going into the makeup tank and going to the bleed tank. We developed a path from the BWST to the makeup pump through the recirc into the makeup tank, again blowing out the relief. We had a large transfer of water in that path.

That was not a design or intended path by any means.

WITNESS FREDERICK: One of the difficulties of determining that path was actually that flow of water that should take place at the bleed tank level indication was not really designed to indicate that small a level change. We were already high on the level indicators when we started this.

A one-foot change is something like 30,000 gallons. So you would have to wait a long period of time before you would know this was going on. That is why it was slow in discovering the path.

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WITNESS FAUST: If you lost makeup tank level, what they were working with, you were looking at the pressure change in the tank from that point on. Plus, you couldn't shut the suction path from the BWST because you didn't know what the level in the makeup tank was.

MR. CUNNINGHAM: I have a question. Do you have a feel for how much water you can put through one of those recirc lines? How much water can be transferred?

WITNESS FREDERICK: One line?

MR. CUNNINGHAM: However many would be used at that time.

WITNESS ZEWE: Flow required for the makeup pump is 90. The recirc flow is right around 100 GPM. It is a flow orifice. So in the neighborhood of 100.

MR. FRAMPTON: So one of the reasons for having to vent the makeup tank with the manually operated vent valve was to prevent the direct transfer of BWST inventory through the makeup tank over to the bleed tanks; is that right?

WITNESS ZEWE: At this point, right. We wanted to prevent that uncontrollable path through the relief valve. We had no positive or manual control of controlling of that path. The only way we could regain control of the system was to force that relief valve to shut on its blowdown setting.

So that, in fact, is what we did. We opened up the vent,

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which was still shut at this time, to try to reduce the pressure so we could force water into the makeup tank and then regain suction of the makeup pumps on to the makeup tank. That is what we did.

We vented the makeup tank to reduce the pressure and shut the relief valve. We put on some de-min water transfer pumps to try to force water into the makeup tank.

As soon as we recovered some visible indication in the makeup tank, we switched the suction from the BWST back to the makeup tank. Then we continued to vent the makeup tank down knowing that it was still controllable, that at any point, we could shut that vent and stop the present release path that we had.

But we felt we were monitoring it and that we had more of a controllable situation other then the fate of the relief valve, which was not controllable.

MR. FRAMPTON: Let me go back to the time when that decision was made. Who basically made the decision to vent the makeup tank for a limited period of time? Was that you and Mr. Hitz?

WITNESS ZEWE: We made the ultimate decision to go ahead but it was recommended by Mr. Faust. We were exploring alternatives to the situation and then Mr. Faust said that we just got to get the pressure down. Let's just open up the vent.

I elected to do that. It was my ultimate decision to do that based on his input. Our first plans were to open it up just to reseat the relief valve and I picked 65 pounds to shut the vent again.

MR. FRAMPTON: Your initial intention was just to get the pressure down far enough that the liquid relief valve would reseat.

WITNESS ZEWE: Right. Once we got to that point under strong urging from Mr. Faust, and then Mr. Hitz and my own reasoning was since we have it controlled, let's go ahead and vent it off and leave open the vent is what we finally determined to do. To leave the vent open and monitor the release and then just take the gas buildup in small puffs from thereon instead of a great big release every so often. So that is what we elected to do and made that decision to do that.

MR. FRAMPTON: Mr. Floyd said, in some of his interviews, he made that decision. Was he consulted about that before you started to do it as far as you can recall?

WITNESS ZEWE: He was aware of the decision, but I don't recall that he made the decision. It was a decision that was made, you know, in the course of events, opening up to get enough water to stop the release. We did what I felt was the best course of action at the time and really I believe Jim's interface was more that he was aware of what we were doing and agreed with what we were doing rather than saying this is what I would like you to do.

The events there were somewhat rapid in succession and we just reacted to what we had more so than waited for a whole series of commands to be made.

WITNESS FAUST: You are aware of what it gained us by doing that. What we were looking for if we kept going with that relief valve popping open on us.

MR. FRAMPTON: Let me ask you a couple of questions about that.

MS. RIDGEWAY: Could you direct these questions to a specific individual?

MR. FRAMPTON: Yes.

Mr. Faust. I will direct these questions to you, Mr. Faust. Let me see if I understand correctly the reasons why the decision was made. Had you not opened the vent

valve, I take it you were afraid that you would continue to have that unplanned path by which water from the BWST would come into the makeup tank but then would go out through the automatic relief valve and transfer straight over to the bleed tanks; is that right?

That is one of the things that would have happened.

WITNESS FAUST: The other thing is that sooner or later if we left it like that, we would end up taking the suction off the reactor building at which time we knew we didn't want to go in there if we could help it.

We were already having problems with radioactivity we didn't care for.

MR. FRAMPTON: When you say that, what do you mean?

WITNESS FAUST: End up actually going on decay heat, going into a piggyback operation to supply water from the building through the makeup pump via the decay heat pump and go back into our seal injection.

MR. FRAMPTON: Is the reason for that that the makeup flow provides seal water for the reactor coolant pump?

WITNESS FAUST: At the time we were running the reactor coolant pumps. A reactor coolant pump. It stands a chance of not providing seal water within the building, is possibly wiping out the seal on the makeup pump. You have another flow of water, you will end up in the same place.

You have to supply water into the system just to keep the pressure up now. The fluid inventory in the system.

MR. FRAMPTON: What you are saying is without getting that relief valve closed, you weren't going to have any makeup flow at all.

WITNESS FAUST: The BWWT level would drop from a short period of time from an already low level of around 18 feet, we ended up somewhere 19 feet, we ended up with 15 feet.

No plants initially had been made to get that BWST replenished with water and we didn't know what we were faced with in the future. We were losing our last source of water there.

MR. FRAMPTON: With the makeup tank automatic relief valve open, is there any way of providing makeup flow from the BWST into the primary coolant system?

WITNESS FAUST: With the --

MR. FRAMPTON: With the relief valve open.

WITNESS FAUST: You can provide it in but you have to provide flow path for your makeup pump. If your minimum flow, we were supplying mainly just seals which would be less than the recirc capability needed for the pump to operate.

If we isolated the makeup tank, it would end up burning up the makeup pump. Possibly. We don't know that for a fact because we don't know the flow going into the RC pumps. Just

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seals isn't enough for the design of the makeup pump to keep it cool.

MR. FRAMPTON: All right. Mr. Zewe, let me go back and ask you what phone calls or notifications you can remember making before you made the decision to open the vent valve and leave it open. You, I believe, have said that you called the Unit 1 control room before you did this or as you began to do it in order to tell them to be alert for monitoring of releases; is that right?

WITNESS ZEWE: I didn't make any phone calls personally. Greg Hitz, the other supervisor, did, as I recall, call the Unit 1 control room to the ECS to inform them we expected to have a release because of the venting, more that we are doing it and to expect the release and make sure the helicopter is up to monitor the release. Which was done.

Any other calls made other than that one, I am unaware of. It was at that point where the station manager came into the control room.

MR. FRAMPTON: Who was that?

WITNESS ZEWE: Gary Miller. He assigned Craig for the notification and assigned me plant responsibility only.

MR. FRAMPTON: Mr. Miller knew you would do this just before you did it or as you were getting into it?

WITNESS ZEWE: It was already in the works. Mr. Hitz was there to relieve me as the normal course of events as we

did there. When Gary came in, he announced he was taking charge and that he instructed me to operate the plant or have plant responsibility and Mr. Hitz to make some of the necessary notifications, which he was already in the process of doing.

MR. FRAMPTON: Did Mr. Miller come in for any reason connected with this venting you were doing or did he just happen to come in at that time?

WITNESS ZEWE: I believe he was called in. He was already on site but I believe, just from what I heard, he was asked to come to the control room. I am not sure if he was in his normal rotation through the control room as superintendent or not. I don't believe so.

I think he came up knowing we had another problem and he was coming up to take charge of the situation.

MR. FRAMPTON: Had you asked Mr. Hitz before you started the venting to call the ECS and let them know this was coming?

WITNESS ZEWE: All together, we reacted to what we had and were taking care of it. That was just to inform them it was already in progress.

MR. FRAMPTON: And you are not aware of the call M Floyd said he made to the Pennsylvania Civil Defense people a little bit later on.

WITNESS ZEWE: My only knowledge there is what Mr. Floyd has said I have heard and what I have read some days

later.

MR. FRAMPTON: After the fact.

WITNESS ZEWE: Yes.

MR. FRAMPTON: Do you recall whether the helicopter got up pretty quickly after Mr. Hitz notified the ECS?

WITNESS ZEWE: Yes. I do. I am not certain where the helicopter was at the time we had requested it. I believe it was already flying and he positioned himself over the stack. And I recall hearing the first reading that he gave was 1200 MR directly over the stack. That was the first reading that I remember.

Then he flew around and gave his readings at certain marked intervals from the site. So I knew at that time that we had the teams out in the field plus we had at least one helicopter in the air with radiation instruments to monitor the plume we had.

MR. FRAMPTON: Do you know when that vent valve was closed?

WITNESS FAUST: It wasn't.

MR. FRAMPTON: Do you have any knowledge of that?

WITNESS FAUST: The vent valve wasn't shut. At least I was in the process of getting relieved after we initially got the makeup tank level reestablished and it was shortly after we performed this vent. I turn it over to Denny Olson with the understanding it was to stay open. Get makeup

tank pressure down, in other words, to zero pressure and leave it there.

MR. FRAMPTON: It was not at zero pressure when you went off.

WITNESS FAUST: Not quite. Somewhere around 30 pounds yet on the tank.

MR. FRAMPTON: About what time was that? Do you recall? On Friday.

WITNESS FAUST: Right around 7:00. Probably after the hour now.

WITNESS ZEWE: It was like 9:00 or 9:30 maybe at that time.

WITNESS FAUST: We didn't get out of there for a while.

MR. FRAMPTON: As far as your turning the status over to your replacement, you told him that it ought to stay open until you got -- until he got the pressure down to zero.

WITNESS FAUST: I told him to keep it open. The idea was once you get the pressure down, my reasoning was anyway, you no longer have any kind of release. If anything, it will be low. It will be a minimal release over a period of time. Just decay.

However long it takes. You won't have bursts we were giving every time you cycle it open and get a cloud going.

MR. FRAMPTON: It was your thought if the vent valve

was left open, you would get a very low level continuous release.

WITNESS FAUST: That is the way I looked at it anyway.

MR. FRAMPTON: Maybe I should ask Mr. Zewe, do you know when the vent valve was eventually closed or was it just left open indefinitely throughout the day and the next day?

WITNESS ZEWE: Essentially it may have been shut for a very short period of time. Being wasn't there, I wouldn't know. Essentially it was left open for that entire day and I believe for the great portion of the next several days, it was left open.

MR. FRAMPTON: When Mr. Miller came into the control room, did you brief him on the status of the plant, what was happening with the vent valve and so forth?

WITNESS ZEWE: I certainly did.

MR. FRAMPTON: What was his reaction? Do you recall?

WITNESS ZEWE: He concurred. I didn't brief him in great detail other than that we had transferred the water and what actions I had taken. Before I took any of these actions, I had announced to the control room what we were doing. If anyone had objections to it at this point, we had in the neighborhood of I would say 25 people in the control room, NRC staff, superintendents, so forth from the company. So I

announced I was going to open up the vent, that I was going to put on two de-min water transfer pumps and we were going to switch the suction back, to see if anyone had objections.

I felt it was necessary action. I told everyone together so if they had concerns, they would bring them forth then. Say no, that is wrong, do this. But I had no response that was negative at all from anyone. I did it in that light.

I consulted everyone there if they had objections. I didn't have very many inputs on suggestions on what to do so once I elected to do that, thinking that that was the best course of action, I just told everyone what I was going to do and what we had planned to do and there was certainly no objection at the time.

MR. FRAMPTON: Mr. Miller con urred when he came in, when you briefed him on what was happening.

WITNESS ZEWE: As I remember, he did. If not, he would have directed me otherwise.

MR. FRAMPTON: Do you recall whether he was aware at that time that you had decided to go ahead and keep it open and go on down to zero and try to solve the problem?

WITNESS ZEWE: I kept him informed as decisions were made at my level.

WITNESS FAUST: It did solve the problem.

MR. FRAMPTON: Did Mr. Miller continue to be in the control room for a while a er this period?

WITNESS ZEWE: Yes, he was in the control room for, up until the time I left.

MR. FRAMPTON: How about Mr. Logan? Do you recall whether he was there?

WITNESS ZEWE: I really couldn't say with certainty that he was or not. There were several people there. He could have come and gone and one or the other ones could have been there at that time. At that time I dealt with Mr. Floyd and Mr. Miller directly.

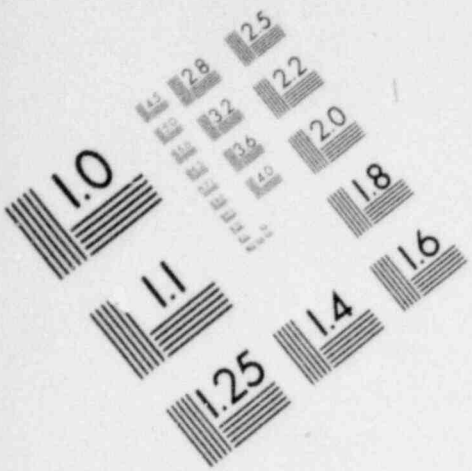
WITNESS FAUST: Everybody was aware of what that really did for us, though, I just wanted to keep you up with this.

MR. FRAMPTON: I want to ask you one other question, Mr. Faust, on the subject of what it did for you.

I have read in previous testimony some discussion of the fact that if the manual vent valve on the makeup tank had not been opened, that gas ultimately would have escaped on over pressure through a route that would take it into a relief vent header that bypasses some of the filtration.

Can you explain to me what that alternative path would have been? Where the gas would have gone?

WITNESS FAUST: For one thing it would have went to the bleed tank via another relief valve. In other words, your pressure in the system, the tank would build up to the point where not only would you go out possibly that bottom relief path, if for some reason that didn't relieve all the pressure



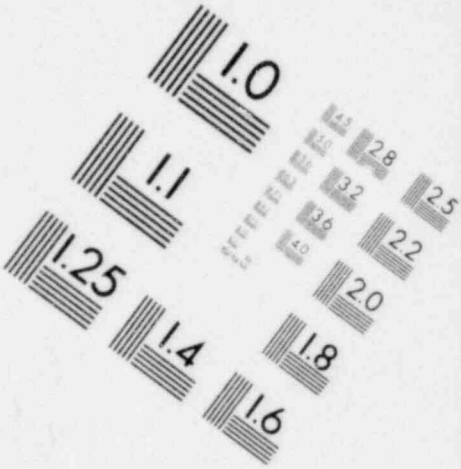


IMAGE EVALUATION
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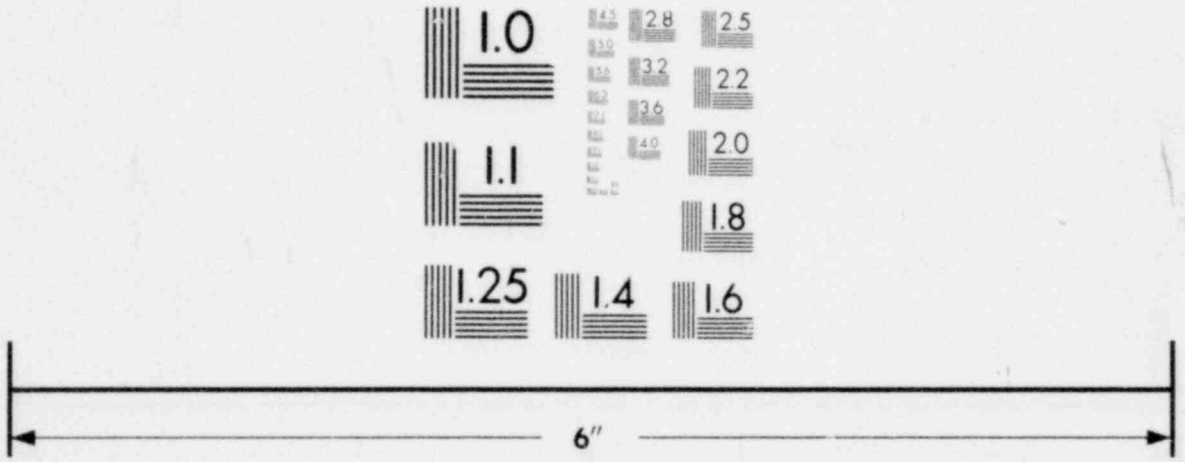

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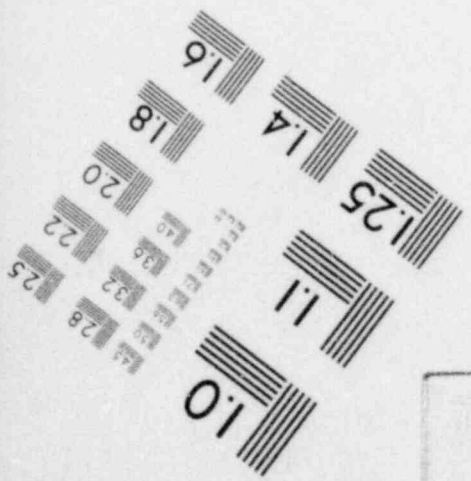

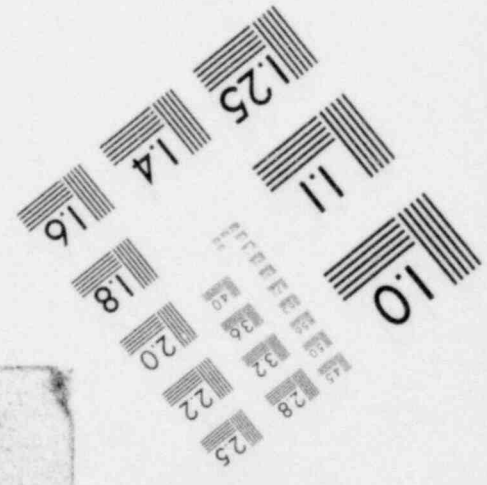

to the bleed tank, it would end up in a relief valve further up the makeup tank let down line which also vents here to the bleed tank, too, and that is to the waste gas header. Overpressurize the waste gas header and bypass the tank as well as the filter.

You go a straight path to 219 or vent path or our monitor at the stack.

MR. FRAMPTON: Further up the let down line there is a gas relief safety relief valve?

WITNESS FAUST: I don't know if it is looked at as a gas relief. This is a fluid system normally. It is a relief valve.

MR. FRAMPTON: That goes to the reactor coolant bleed tanks.

WITNESS FAUST: Yes.

MR. FRAMPTON: What happens with gas overpressure in the reactor coolant bleed tanks?

WITNESS FAUST: For one thing it goes to the vent header. The gas system.

MR. FRAMPTON: The relief vent header.

WITNESS FAUST: Yes. The tanks are designed for 20 pounds. The bleed tanks are designed, I believe, for 20 pounds pressure. I don't know what the rupture point is, but I am sure the vent header was already overloaded as far as being able to keep up with the gas pressure being jumped into it.

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I am just saying you got possibilities you can talk about here. It would have probably fully handled the capability of what we were venting off and just put it to the atmosphere, but you also stand a chance of maybe a rupture of the tank.

MR. FRAMPTON: Mr. Frederick, you were nodding your head. Did you want to add something to that?

WITNESS FREDERICK: Speculation about the relief through the let down line would have to be focused on whether or not the de-mineralizer bypass valve was open at that time. I think you would have to go back through the testimony and find out when the de-mineralizer bypass valve was open.

Otherwise the relief path wouldn't have existed back through that line. Those are stop-check valves. The only path you would have would be through the makeup tank relief discharging the tank which is a much larger line.

WITNESS FAUST: You are talking about isolating the makeup tank.

end 3

MR. FRAMPTON: What I am asking you is if you had not vented the makeup tank manually to let the gas off into the vent header and the makeup tank had simply overpressurized and the relief valve opened, which it did, the relief valve to the reactor coolant bleed tank; how would the gas from the makup tank then have escaped? What passageway would it follow?

WITNESS FAUST: The same one. We just vented it -- the open-end vent valve on top of the makeup tank vented to the gas header. We stood the same chance of venting it that way as if we let that relief valve keep going. The think about the relief valve, it took a lot of water from the BWST with it doing it manually. We weren't. We were venting the gas pressure off trying to get it down to where we could reestablish our voluntary control system, in other words.

We were heading also to another part, if you look at the primary, we weren't getting much water out for what we were putting in. And we were heading solid at the time of the primary. That is another headache we didn't need.

MR. BELLAMY: If this a good time, I have five or six questions.

MR. FRAMPTON: I have one more.

When you came on shift, Mr. Zewe, in the late evening of Thursday, were you told that there were any ground rules

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or procedures to be followed in connection with this venting?

That is, were you told that we are venting and we should continue to vent; or before we vent we have to ask somebody; or was the shift turned over to you in a way that that would be your decision to make?

WITNESS ZEWE: We had a procedure that directed us how to vent with the current plant conditions that we had.

MR. FRAMPTON: What was that procedure?

WITNESS ZEWE: Basically exactly what we said it was, to go ahead and send in an auxiliary operator into the auxiliary building to start the gas compressors and bring down the waste gas header down as low as he could. And then cycle the vent, open and shut, wait for the operater to reduce the gas pressure, which normally went up to about 12 or 15 pounds on that burst. And then he would manually operate the compressor again and bring down the pressure to about two or three pounds, cycle it again. And you might have to cycle it several times to reduce the pressure far enough to where he could come on out and there would be sometime before you would have to send him in again.

We were operating with that procedure.

MR. FRAMPTON: Let me show you something that I would like to have marked as Exhibit 7.

(Exhibit 7 identified.)

LPWros

MR. FRAMPTON: This is a one-page handwritten procedure called venting MU tank gas space to vent header, dated 3/29/79. This appears to be a procedure that someone wrote out for doing what you described.

Do you know what that is? Do you recognize it?

WITNESS ZEWE: That looks like the procedure that we had in effect at the time, yes.

MR. FRAMPTON: Do you recall whether somebody handed that to you?

WITNESS ZEWE: We had this available to us, yes.

MR. FRAMPTON: That was developed by somebody before you came on shift?

WITNESS ZEWE: Yes. We had developed this earlier on the 29th, as I remember. Yes, earlier on the 29th, before I left in the afternoon.

We changed our procedures somewhat because we had been opening up the vent as necessary. But then as it became apparent of the hotter release that we had, we had gone to the cycling of the valve. So actually as I remember it, we had had two different venting procedures up to this point. One had superceded the other one.

MR. FRAMPTON: Do you know who wrote this out? Do you recognize that handwriting?

WITNESS ZEWE: One of the two we had was written in part at least, by another shift supervisor, Joe Chwastyk.

LBWros

as I remember. Only what I believe I remember, so to speak.

MR. FRAMPTON: Did you and Mr. Chwastyk pretty much work out these procedures yourselves?

WITNESS ZEWE: Every procedure that was written we certainly had a definite input into it, because we had to perform that. Mr. Chwastyk relieved me on the 28th when I left, and then when I returned I in turn relieved him at a quarter of 3:00 on the 29th. We had a great deal of interface.

Every procedure always went through the shift foreman and shift supervisor to make sure if they had comments on them. That is standard procedurally. The shift supervisor has final approval on all procedures.

MR. FRAMPTON: When the decision was made to vent the tank at around 7:00 in the morning, I take it there was one or more NRC people in the control room: is that right?

WITNESS ZEWE: Yes.

MR. FRAMPTON: What was their role as you preceived it? Were they there simply to observe what was happening and report back to their supervisors? Or did they have more of an operational role?

WITNESS ZEWE: From my standpoint, I had very little input from them in the way of recommendations. I used them more as informing them, all right. How they interfaced with the emergency director and the unit

LCWros

super, I don't know, because we kept a pretty definite separation between operations of the plant and the use of the TMI emergency planners. So whether they had more input to the unit super or the station super in relationship to overall emergency plans, I don't know. But I had very little input and I really can't recall any specifics of help from the NRC, so to speak, on recommendations on what to do.

I really didn't look toward them for that help on a plant related nature because I know the plant and their plant knowledge is somewhat limited. All right? So I really couldn't ask them on general specifics, all right? But just overall guideance, all right?

Yes. But I don't recall asking for or receiving any.

MR. FRAMPTON: So there were NRC people in the control room at that time.

Now, had there been any kind of agreement or arrangement that significant operations action should be told to the NRC or cleared with any NRC people prior to 7:00 on Friday morning that you knew about?

WITNESS ZEWE: My understanding was to keep them informed and certainly if they had any objections or any comments, you know, to take them into account.

MR. FRAMPTON: When you say keep them informed, you understood that they should -- they were there to

LDWros

observe, and they should be informed as to what was happening so if they had any strong objections they had an opportunity to interpose them; is that right?

WITNESS ZEWE: Certainly. For any evolution, we hope that every evolution is planned and that we have a method of attack and a procedure to follow and observe. All right? In every case, we certainly informed them prior to the event or prior to the evolution.

MR. FRAMPTON: Do you know when that agreement or understanding was reached? Would that have been in effect from the first time these fellows showed up on Wednesday?

WITNESS ZEWE: From the beginning. We were at the point -- it's always that way, you know, that you are always open for suggestions from anybody because two heads are better than one, so to speak. And you certainly can never afford to ignore any judgment or any comments or any criticism from another source that may be valuable in helping you to reach your own conclusions and assessments. It's foolish not to do so.

I don't know if Mr. Miller, who was in charge, stopped everyone and said from now on we will do this. It was more of an understood thing and that is how we operated.

The senior management that was there were makir the decisions based on their inputs, just like any other evolution that we had, and they were always informed

before hand, if we could, naturally, because they were making the decisions and the NRC were there the whold time and were included in Mr. Miller's team that was making decisions and having the input to it.

MR. FRAMPTON: Would that have been the same, then, on Friday morning as it was when the NRC people got there to observe what was happening on Wednesday?

In other words, in your view the situation hadn't changed any in terms of your wanting to inform the NRC people of what you're doing between Wednesday and Friday. Was there a different regime that had come into effect between Wednesday when NRC inspectors were in the control room and Friday morning?

WITNESS ZEWE: I am not sure of the different regime, so to speak, but all the things we were doing on the 28th after the command team, so to speak, was established, all the direction came from them and we had input back.

But on the 30th, where we had a problem where we didn't have any clear direction, we dealt with the problem as best we could. We kept them informed in that light so that that mode of progress very logically to where you have an input and you have a decision and everyone is informed and everything, that really didn't take place on that level. It moved down to my level as the shift supervisor to handle immediate plant actions which Mr. Miller directed from the

LRWros

beginning, that any immediate actions I felt had to be taken were strictly our decisions at that time.

But certainly try to use the command team that we had. But anything that arose immediately we had to take card of in the normal course of action that we felt was warrented.

MR. FRAMPTON: If you recall on Friday morning, were there any NRC people in the control room who had enough knowledge about the plant to even be helpful on something like this?

WITNESS ZEWE: The only inspector there that I can remember on Friday was James Higgens, who I dealt with previously. He is an expert, so to speak, on containment for leak rate testing and for pressurizing the containment stems and the containment building itself. I had dealings with Mr. Higgens in unit one and unit two. He was fairly familiar with the containment structure as it was.

But by and large, the other ones that were there for the most part I didn't know them, and I really had no confidence level either way of how capable they were, other than they were outside people and any one that was not closely connected with the operations of the unit, I rather doubted their limited capability because of their knowledge level of the plant. Other than general type physics knowledge, or general radioactivity knowledge, or something like this. But not specifics.

LWros

MR. FRAMPTON: Was there any question in your mind as to whether they had any kind of veto authority?

In other words, suppose one of those NRC inspectors had said when you announced you were going to start venting the makeup tank: "Hey, I don't want you to do that. You shouldn't do that." Or, "I have a different idea. I don't want you to do that until we discuss it."

Would that have stopped it?

I mean, did they have, in effect, the authority to say you can't do something until I tell you it's all right? In your mind?

WITNESS ZEWE: In my own mind, I have the license and the responsibility for the unit. I take action deemed according to what I feel I must do, based on my own assessment.

I would have certainly taken into consideration anything or any alternatives he had. But where I had certain options, A, B, C, D, E, I would have applied the best options I had and taken that course of action which I hope would not have been vitally against what he had suggested.

But I was mainly, myself, Greg Hitz, the other supervisors there, Jim Floyd and the superintendent that was there, would have certainly went to them to say: "Hey," -- if it was a violent don't do this, "It's bad, and I forbid that from the NRC-type standpoint." All right?

LBWros

I would have certainly questioned that. Looking at the alternatives that we had, depending on what input they supplied. It's purely conjecture on my part. I couldn't see them raising a very sterm objection. If they had I would have certainly considered it.

MR. FRAMPTON: That didn't happen, however, at any time during their descent?

WITNESS ZEWE: I personally didn't have any response negative or really positively either from the NRC that was there. It was more of a question, of a problem, and I had the feeling that they would certainly have helped and provided input if they had one. I'm sure they would not have hesitated to come forth. But I didn't receive any.

MR. FRAMPTON: I'm sorry we have spent so long on this subject. I know Ron wants to ask some questions.

Let's take a break and then let Ron finish up, and we will move on to something else.

(Recess.)

MR. FRAMPTON: Back on the record. Mr. Scheimann, we were having a conversation during the break about your hours on duty and I think you said that you definitely recall that you came back on Thursday evening so you were Thursday at 11:00 p.m. to Friday morning at 7:00 a.m. roughly.

WITNESS SCHEIMANN: I think it was more like unti about 11:00 in the morning.

MR. FRAMPTON: So you were in the control room during the period we have been talking about that had to do with the venting of the makeup tank; is that right?

WITNESS SCHEIMANN: Yes.

MR. FRAMPTON: And Mr. Zewe, you wanted to -- counsel wanted you to make clear what you recalled about the paper we have marked as Exhibit 7.

Do you want to do that?

WITNESS ZEWE: Okay. The exhibit that you showed me here, which references the venting of the makeup tank gas waste to the vent header, it is the basic procedure,as I remember, that we followed, but I can't say with 100 percent certainty that this is the actual one I followed that day. But it is the same sequence and I have no reason to believe that it isn't, but I can't say that it is. Okay?

MR. FRAMPTON: Fine, thank you.

Mr. Frederick, at around 10:00 or 11:00 o'clock on Friday morning, you left the site to go into Middletown and get

something to eat; is that correct?

WITNESS FREDERICK: Yes.

MR. FRAMPTON: Could you tell us what happened when you got to the restaurant in Middletown?

WITNESS FREDERICK: I noticed some proprietors of local business packing their cars with their belongings and leaving town. Several of the construction workers at an adjacent construction site were running quickly to their vehicles and driving away.

MR. FRAMPTON: Did you go into the restaurant to find out what was happening?

WITNESS FREDERICK: Yes. I went in and asked them where everyone was going.

MR. FRAMPTON: What restaurant?

WITNESS FREDERICK: Augie's Sub Shop in Middletown. I asked them what was going on. They said they heard a radio announcement which said everybody should evacuate within a 20-mile radius of TMI.

MR. FRAMPTON: Within a 20-mile radius of the plant? Had they said what radio station they heard that on?

WITNESS FREDERICK: It was a York AM radio station I believe.

MR. FRAMPTON: What did you do then?

WITNESS FREDERICK: I tried to calm the people in the restaurant. There was only three workers there. Craig Faust

and myself. And I asked them to make me a sandwich. Then I called the plant. I tried to get a hold -- I used the outside phone number which wasn't used very often and got a hold of the shift supervisor.

MR. FRAMPTON: Mr. Hitz?

WITNESS FREDERICK: Yes. I told him people were evacuating Middletown as a result of a radio announcement, which these people said was from Civil Defense.

MR. FRAMPTON: These people said --

WITNESS FREDERICK: The people in the restaurant.

MR. FRAMPTON: They said Civil Defense ordered the evacuation?

WITNESS FREDERICK: Right. I had the radio on. I was trying to hear the announcement myself. They didn't repeat it while I was there. I told Mr. Hitz he ought to check with the Unit 1 and Unit 2 people to see if anybody ordered an evacuation we didn't know about.

I had just left the plant ten minutes before that and I knew we weren't evacuating at that time. I wanted him to check to see what the source of the announcement was.

WITNESS FAUST: All through this we have been hearing after we left the plant a lot of things that the media was putting out that wasn't what was going on at the plant.

MR. FRAMPTON: Mr. Zewe, you were present when Mr. Hitz got the phone call from Ed Frederick?

WITNESS ZEWE: Yes. We were still into the makeup tank venting which we talked about earlier and Greg was still handling some of the communications. And I was still in charge of the plant at that point as I remember. As soon as he received that call, I heard him say, What? You got to be kidding. Then I said, What is happening? He told me.

So I said, We better go in and tell Gary about it.

MR. FRAMPTON: What did you do then?

WITNESS ZEWE: We went into Gary Miller's office, which is the normal shift supervisor's office where he had his command team set up, and they were discussing -- I am not sure at this point exactly what, but they were involved in discussion at this point about something, and I just broke in and said that we just had a report from Ed Frederick, who is in Middletown, saying they are evacuating Middletown and the surrounding areas. What is wrong?

Gary said we didn't do anything. He turned to at least one NRC guy that was there that I recognized, and spoke to him directly.

MR. FRAMPTON: Higgens?

WITNESS ZEWE: Right. He said what are you people doing to us? Mr. Higgens said I don't know anything about it, but I will call and find out. So he made a few phone calls over to the other support NRC people near the observation center.

MR. FRAMPTON: Do you know what he found out from them?

WITNESS ZEWE: As I remember he didn't find out from them that they had issued any such statement at all. They were unaware at that point of where that actual statement came from. It didn't come from them. It hadn't come from us. And we had then made some other phone calls to the Dauphin County Civil Defense to ask if they had made anything.

MR. FRAMPTON: Had they? Do you know?

WITNESS ZEWE: As I remember, they had not made that either and were unaware of it, but they had been receiving reports of that but hadn't been directly involved. That is really as far as I could remember of the conversation. I left to go back to the control room to handle the evolution at hand.

MR. FRAMPTON: Mr. Frederick, did you get your sandwich?

WITNESS FREDERICK: Yes.

MR. FRAMPTON: Ron Bellamy, do you want to ask some questions on the subject of the venting before we move on?

MR. BELLAMY: Yes.

Mr. Zewe, prior to the 28th of March of this year was there a written procedure to vent the makeup tank?

WITNESS ZEWE: It is part of the normal makeup procedure that describes venting of the makeup tank for the purposes

of the nitrogen overpressure to establish a hydrogen overpressure. And in that regard only. Not really for the situation we were in. There was no previously written procedure for that as to my knowledge.

MR. BELLAMY: How often would you have vented this tank prior to the 28th? Once a shift? It normally doesn't happen during your shifts?

WITNESS ZEWE: Very infrequently. On the order of, you know, once every couple months maybe.

MR. BELLAMY: Couple months.

WITNESS ZEWE: Yes. There is really no regularity of venting the makeup tank. As long as you maintain the required overpressure and if you didn't overfill the makeup tank and get the pressure higher than what we would like to keep it at, there was no reason to vent it.

MR. BELLAMY: And you previously stated that sometime on the 29th, you concurred in what we have identified as Exhibit 7 as being technically an accurate representation of how you would continue from that time on in venting the makeup tank.

WITNESS ZEWE: At that point of time the procedures were constantly being revised as the need arose so that procedure was in effect, you know, for a certain period of time and it was superseded by other procedures. As the conditions changed or as we explored alternatives, we certainly changed

the procedures to reflect it.

MR. BELLAMY: Mr. Faust testified this morning that the first time there was anything more than a cycling of MUV-13 to vent the makeup tank was the 7:00 or 7:10 a.m. release.

Was there to your knowledge any written procedure to do that at the time that you did it?

WITNESS ZEWE: Written procedure to do what we did?

MR. BELLAMY: Correct. To go from the burping type of release to a continuous vent.

WITNESS ZEWE: There was no procedure, no. It was just action that was taken for the situation at hand.

MR. BELLAMY: You as shift supervisor would have had the authority to do that?

WITNESS ZEWE: I certainly do, yes.

MR. BELLAMY: Also you as shift supervisor would have had the authority to say, Mr. Faust, go open that makeup vent valve MUV-13. That's within your authority?

WITNESS ZEWE: Yes, it is.

MR. BELLAMY: A couple of technical questions on the recirculation of this makeup pump line back to the makeup tank. When the suction is taken from the borated water storage tank, is that an automatic shift from taking suction from the makeup tank or is there a manual valve that needs to be opened?

WITNESS ZEWE: It's automatic on engineering safety features actuation. It is automatic. But at this point in

time, it is strictly manual. This point in the sequence of events that we are referring to. Because it was strictly manual at this point.

MR. BELLAMY: The recirculation of this borated water or for that matter whatever is being used as suction for these makeup pumps back to the makeup tank, is that automatic or does that need a manual valve to be handled?

WITNESS ZEWE: The recirc lines are only automatic isolation. Not automatic opening up. There is two automatic closure ES valves in the recirc line that automatically go shut for engineering safety features so you don't divert any of the water that should be going toward the reactor coolant system, so you don't divert that back to the makeup system.

Those valves are not automatic open. They are automatic shut. Manually open.

MR. BELLAMY: Mr. Hitz is similarly titled as you are. He is also a shift supervisor?

WITNESS ZEWE: That's correct.

MR. BELLAMY: He was in the control room Friday a.m. to relieve you?

WITNESS ZEWE: Yes.

MR. BELLAMY: It was just because you were both there at the same time that it may appear there were two shift supervisors there. In effect there really should have been just

one, but he was there to relieve you and you were informing him of what was going on and at that time --

WITNESS ZEWE: He relieved me before I left the control room. I had left the control room for about an hour, for a period of about quarter to 6:00 to about 7:00 o'clock where I went for an interview with the GPU staff on the accident.

He was there to relieve me before I left.

MR. BELLAMY: He was the shift supervisor on record from 5:45 until --

WITNESS ZEWE: Until I returned.

MR. BELLAMY: You took your duties back as shift supervisor or was it time for you to go home?

WITNESS ZEWE: At this point we were into the area of transferring the water and then we really share the responsibility, so to speak. Then I assumed full control again once Mr. Miller came in the control room and designated me to have the plant responsibility and Mr. Hitz,the communications responsibility.

MR. BELLAMY: A little bit of a clarification on the reading from the helicopter on this Friday morning vent. You have indicated, Mr. Zewe, that Mr. Hitz made a telephone call to the Unit 1 control room as the emergency station to request the helicopter circle over the stack to determine the amount of the release; is that correct?

WITNESS ZEWE: To the best of my memory, I remember him calling them to inform them to expect a release and to ensure that a helicopter was available to monitor the ensuing release that we felt we would have. I am not sure if he specifically directed him to fly directly over the stack or not. I don't believe so.

It was more or less inform them to go up and track the plume. They had direction from the ECS, which was in Unit 1 at that point, on where the helicopter should go and what path he should follow and the readings were being transmitted by radio back for a plot.

MR. BELLAMY: Is this a request or an order -- you use the term informing. Is that to imply that Mr. Hitz would just call and say we are having a release. Good by? Or I want the helicopter up there? Please have the helicopter up there?

Is that the ECS decision?

WITNESS ZEWE: I think we are dealing in semantics here now. As I recall, there was no, you know, room for discussion, so to speak. He was telling them or informing them we were already into this venting procedure. We would have a release. And ensure we are monitoring it properly.

When he said have it in the air or would you ensure it is in the air or -- you know. It inferred that we were going to have the release and make sure we could properly monitor the

release we expected.

MR. BELLAMY: The timing of this phone call was as the release was in progress?

WITNESS ZEWE: Yes. It wasn't before the fact but during the fact.

MR. BELLAMY: There was piping, temperature piping installed from various tanks in the radwaste system back to the containment vessel during the period Wednesday through Friday or Saturday. What piping was installed and from what components was the piping installed?

WITNESS ZEWE: We knew we had a serious gas problem. We didn't consider the waste gas compressors to be totally that reliable.

Also the leak somewhere from the makeup tank vent line to the waste gas compressors was obvious from the releases. So we installed temperature piping from a line off of the makeup tank vent and also from one of the radiation monitoring instruments on the waste gas tanks.

We vented those to a building spray penetration which led right to the reactor building. So we could vent the makeup tank directly to the reactor building or the waste gas tanks directly to the reactor building.

As far as I can remember, we only vented the waste gas tanks and not the makeup tank directly to containment. We were just trying to use the reactor building as just a large volume

storage for our waste gas.

MR. BELLAMY: There was no line,to your knowledge, installed from the reactor coolant bleed holdup tanks back to containment to your knowledge?

WITNESS ZEWE: Not that I can remember. There could be a possible tie in to the same vent line off the makeup tank that could go back, being that you could get gas from the bleed tanks into the vent header and then go back into the lines off the waste gas tank or from the makeup tank line where it tied in, but those two lines from the makeup tank vent line and from the waste gas tanks are tied together and joined at one place.

I feel certainly possibly you could position the right valves to vent a bleed tank that way, too, though I am not certain that a check valve might have to be removed or something else, but I don't recall that we had a direct line connected for the purposes of venting the RC drain tanks at that time, no.

MR. BELLAMY: When were these lines first installed?

WITNESS ZEWE: I don't recall the actual time frame, but it was sometime, I believe, within four or five days of the accident. Like over the weekend or early part of the following week. I am not certain of the time frame involved.

MR. BELLAMY: Do you know when they were first used?

WITNESS ZEWE: Our records would show that in our logs and procedures for that venting, but I really lost track of exactly what occurred in that short time period because of the sequence of events. It was a very planned evolution and the route and everything was carefully constructed. I am not sure of the exact time, no.

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MR. BELLAMY: Could you suggest somebody to talk to who would be more familiar with the installation of these lines?

WITNESS FREDERICK: Harold Denton. He is the man that announced it through the media. He said the pump back is working now. He was watching it.

WITNESS ZEWE: Are you referring to who actually installed the lines of what times they were using and so forth?

MR. BELLAMY: I'm trying to get information on when it was first considered that you needed such lines. Who decided they should be installed? When were they installed? When were they used? I believe the control log will show the waste gas decay takns were piped back to containment on Friday afternoon.

WITNESS ZEWE: It was that soon? That could have been.

MR. BELLAMY: I'm trying for verification on that.

WITNESS ZEWE: All right, the source should be the procedure that was used, which was, I think, SOP2 and 33 respctively, and the time should be reflected in the log, but I'm not sure if anyone can say with certainty exactly, you know, when the decision was made unless it would be Mr. Miller or Mr. Seelinger or somebody like that. The actual installation was done by the I & C department so they probably can tie

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that to one day, too. The I & C foreman, Mr. Weaver, would probably say yes, we did that Saturday because he remembers that from his input, but I had so much involvement with that one portion of it I really don't remember.

MR. BELLAMY: That is all I have.

MR. FRAMPTON: Ron Haynes, do you want to go into the area of control room manning?

MR. HAYNES: Mr. Zewe, you're familiar with Table 6.2-1 of the technical specifications that addresses minimum shift crew composition?

WITNESS ZEWE: I'm familiar with what is required and how many are manned but not that 6.22 or something like that, no.

MR. HAYNES: Fine. What is required during normal plant power operation?

WITNESS ZEWE: We're required to have two control room operators and a shift foreman and shift supervisors and auxiliary operators.

MR. HAYNES: All right. Perhaps you can help me with this table here. I'm looking at specification 6.2.1 titled "Men and Shift Crew Composition."

WITNESS ZEWE: For the different modes.

MR. HAYNES: For modes 1 through 4, power operation through hot shutdown, there's a requirement for one senior operator licensed person in the control room; is that correct?

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WITNESS ZEWE: Yes.

MR. HAYNES: At the facility, not the control room. And two reactor operator licensed persons and auxiliary operators.

WITNESS ZEWE: Right.

MR. HAYNES: So according to the specification, the minimum shift crew composition is five persons of whom three must be licensed.

WITNESS ZEWE: Right. We had further made a commitment to always have a shift supervisor on site available.

MR. HAYNES: Where did you make that commitment? Is that in your procedures?

WITNESS ZEWE: The company did that. A shift supervisors is required at all times on site.

MR. HAYNES: Is that in the technical specs?

WITNESS ZEWE: It's not in there, no. That's a company commitment and I'm not sure how far-reaching it is. The table there for the add men under the technical specifications just required one senior operating license at the unit.

MR. HAYNES: But your company requires also a licensed shift sipervisor in addition to this?

WITNESS ZEWE: Exactly.

MR. HAYNES: Now, based on your experience during plant operation, Mr. Zewe, is this in your view an adequate number of persons for dealing with plant transients? The minimum

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shift group composition?

WITNESS ZEWE: Dealing with transients? I feel that, yes, the shift foreman who is the senior operating license of the unit and both of the control room operators who are the two licenses are capable of handling all transients in a control room. I feel the auxiliary operator compliment of two is insufficient. Here again, the company has stipulated that we will not have less than four auxiliary operators, which is more conservative than the technical specifications themselves.

MR. HAYNES: I also understand from the technical specifications that the requirement is that at least one licensed operator shall be in the control room when fuel is in the reactor. That means that you can go down to one man in the control room during power operation according to the technical spec; is that correct?

WITNESS ZEWE: Yes.

MR. HAYNES: Has that ever been the case at the facility here where you have been in power operation with one man in the control room?

WITNESS ZEWE: Not that I recall, no. There's always two. If a control room operator leaves, we always have the shift foreman or shift supervisor in the control room also. There are always two. I cannot recall a single instance where there was less than two operators in the control

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room at any one time during power operations.

MR. HAYNES: Are two men capable of handling transients during power operation?

WITNESS ZEWE: I would say for the initial action that is taken, yes, but he does need further help. All right? As the transient progresses or if it ensues in a reactor trip or turbine trip, that two in all cases wouldn't be sufficient. Another guy then would report right back to the control room for any transient that was announced so he is only a few minutes away. So considering in that light that he is available, even though he isn't directly in the control room, I think that's adequate, yes.

MR. HAYNES: I also see in this technical specification that the shift crew composition may be less than the minimum requirements for a period of time not to exceed two hours. Are you familiar with that?

WITNESS ZEWE: Yes. We have that option.

MR. HAYNES: You could in fact be down to a total of two licensed operators in the facility during power operation for a period of up to two hours and still be within the technical specifications?

WITNESS ZEWE: Yes.

MR. SICILIA: That is to cover a man calling in sick?

WITNESS ZEWE: Or somebody gets sick that's there

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and we call someone in and that should give sufficient time for that person to respond to the call to come in to relieve the other operator. Here is a case where the shift supervisor becomes very handy, so to speak. He is not counted in that manning here, where if he is in Unit 1 he could come to Unit 2 or if he is already in Unit 2 we could use his senior operator's license to either do a control operator function or SRO function. Either a CRO function or SRO function. Either manipulate controls or direct manipulation of the controls.

MR. HAYNES: This shift supervisor is a policy of your company as opposed to a requirement from the technical specifications, though? By that I mean according to the technical specifications, you could be as low as two licensed operators at the facility during power operations for periods up to two hours?

WITNESS ZEWE: Per the tech specs, yes, we could do that.

MR. HAYNES: And that number of people, if I understood you correctly awhile ago, is not a sufficient number to respond to a transient under certain circumstances with time? That is, it would be okay for the immediate action but shortly thereafter you would need additional help? They would need additional help?

WITNESS ZEWE: That is my assessment, yes.

MR. HAYNES: Your assesment?

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WITNESS ZEWE: Yes.

MR. HAYNES: Is that two hours too long or too short or is that the type of time period you think they would be needing the additional help?

WITNESS ZEWE: I think two hours would be too long if I had to rely on that as my only source of help, to wait two hours. But I'm relying on the shift supervisor and in always having two control room operators and one shift foreman and a shift supervisor there so if any one of those four should have a problem, you still have three and then you're waiting two hours for a fourth person to come in. All right? But if I only had two people and I had to wait two hours for a third person to help, that's much too long.

WITNESS SCHEIMANN: Let me bring up a point here, too. At this point, most of the crew coverage had had three operating licensed personnel on shift such that we never really came to the point where we came close to that situation.

MR. HAYNES: As I understand it, you also have a company policy where you have in addition to this a shift supervisor who is also licensed for both units 1 and 2.

WITNESS ZEWE: Exactly. Our shift at night was the only shift, like Fred here was just saying, our shift was the only shift that only had two control room operators assigned. The other five shifts have three assigned.

MR. HAYNES: Do you know why the company has a

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policy of a shift supervisor in addition to what is required in the technical specification?

WITNESS ZEWE: I'm not aware of all the commitments or all the reasons behind it, but they wanted one overall person in charge so that if you had a shift foreman on one unit and another shift foreman of equal authority, so to speak, if you had any conflict from one unit to the other unit for whatever reason that might be, auxiliary steam system or what have you, that you might have some discussion evolve of who has the priority, so the shift supervisor was there to assert that the decisionmaking on the inner plant regulate ability or priorities, also from the maintenance crews in each of the plants. I was to ensure that the maintenance and everything else on the shifts were conducted over the right priority. Once you have conformed to the things that may be we should work on this component in Unit 2 because we felt that was more important than a component in Unit 1, some of the interfacing between the units as opposed to an overall station view was more the responsibility of the shift supervisor. The unit was actually the unit of the foreman who was then responsbile to the shift supervisor on an overall basis.

MR. HAYNES: We were talking about transients. Based on your experience of what occurred during the accident on 3/28, how do you feel about the minimum shift crew composition with respect to accident situations?

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WITNESS ZEWE: I feel the manning we had that might of the accident was adequate, but I could have certainly used help, more thinking of the power to come up with more alternatives. Maybe that would have taken just one more body or just a different view of the accident. That's hard to say. But I think for what we had, we had adequate coverage for the accident.

MR, HAYNES: The manning you had that night, Mr. Zewe, as I understand it, was about twice what the technical specification requires; isn't that correct?

WITNESS ZEWE: In what respect are you saying twice?

MR. HAYNES: There were essentially two control room operators. Two senior operators including yourself. And you believe you had about four auxiliary operators.

WITNESS SCHEIMANN: Six.

MR HAYNES: If I look at the minimum shift crew composition at least we are up to the two-hour period. I could go down to two licensed operators and two non-licensed operators.

WITNESS ZEWE: All right. That would be true that we had twice what the absolute minimum would be for our technical specifications, but that was our normal shift. That was the normal complement we had on our shift. So I really can't say that that night we had twice what we formally have. We had exactly what we normally had.

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MR. HAYNES: What I'm looking at is the adequacies of the technical specification. That's what I'm probing as opposed to the adequacies of your normal shift complement. Your normal shift complement is about twice that of the technical specification.

WITNESS ZEWE: I would agree that that's true.. We're reflecting actualities versus a paper document? You're always more conservative, or more manning than what you absolutely need.

MR. HAYNES: As I understand it, you believe the additional people are need.

WITNESS ZEWE: If you only had the very minimum considering the two-hour period, I think they're adequate and in considering that you only have two non-licensed auxiliary operators required, that is inadequate, yes.

MR. HAYNES: Now, at the time of the turbine and reactor trip on 3/28, I will direct this question to Mr. Scheimann. As I understand, you were were out of the control room at that time working on the polishing system.

WITNESS SCHEIMANN: That's true.

MR. HAYNES: How often do you as shift foreman have to leave the control room and go out into the plant?

WITNESS SCHEIMANN: Normally a shift foreman should actually go out at least once during the course of his shift for a period of about an hour to two hours, which

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could be split throughout the shift, to make a tour of the plant conditions. I would say normally at least once a shift I should go out. Just if nothing else to observe plant conditions.

MR. HAYNES: At times when you were out in the plant, who is normally in the control room?

WITNESS SCHEIMANN: Under normal conditions prior to that night there might just be the two control room operators up there. When we were on rotation, where we had one shift supervisor between the two units, the shift supervisor could possibly be over in Unit 1 at the time.

MR. HAYNES: When you were out in the plant, with a situation like this, who is in charge of the control room at that time?

WITNESS SCHEIMANN: Just the two control room operators are there, the senior guy would be in charge.

MR. HAYNES: Who would that be? By position or duty that he is fulfilling that night or seniority or how is that determined?

WITNESS SCHEIMANN: That would be pretty much by seniority or whichever guy was on the panel. The guy on the console that night is the guy that would normally call the shots.

MR. HAYNES: So the control room operatos have a designated duty, as I understand, on shift; one would be a

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console operator and the other would be switching and tagging?

WITNESS SCHEIMANN: Switching and tagging, logs, whatever else had to be done at the time.

MR. HAYNES: So it's understood the man at the console was the man in charge when you're out of the control room?

WITNESS SCHEIMANN: Yes. At that time he has the best idea of what the actual plant parameters are.

MR. HAYNES: Mr. Frederick, do you agree with that?

WITNESS FREDERICK: Absolutely.

MR. HAYNES: Mr. Faust?

WITNESS FAUST: Yes.

MR. HAYNES: Since you're the operators that operate the control room.

WITNESS SCHEIMANN: I normally make it a point to address it to the person that is on the console, not necessarily to the other man, that I'm leaving the control room.

MR. HAYNES: Have there ever been occasions when you had to be out of the control room for extended periods, say, three to four hours as opposed to one or two?

WITNESS SCHEIMANN: I can't recall off the top of my head. On a normal tour, I might take an hour to two hours.

WITNESS FREDERICKS: Mr. Scheimann has a very good

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habit, if he is out of the control room for an extended period of time, which he has been for three, four hours at a time, he calls the control room and tells us where he is and what he is doing and asks if we have problems occasionally. Nothing that is required of him, but he does that.

WITNESS SCHEIMANN: It's very well knowledgeable where I will be when I'm out.

MR. HAYNES: Why do you call back like that?

WITNESS SCHEIMANN: So I can keep up on the plant status that I'm not observing up in the control room.

MR. HAYNES: You have a paging system in this plant; is that correct?

WITNESS SCHEIMANN: Yes.

MR. HAYNES: Are there spots in the facility where the paging system doesn't reach or --

WITNESS SCHEIMANN: There is a conceivability. That's why I normally carry a radio along with me also.

MR. HAYNES: A beeper?

WITNESS SCHEIMANN: No. Direct walkie-talkie type communication where I can be in contact with the control room. That I would use mostly if I'm on the outside of the plant, like over in the greenhouse or something like that or on my way back.

MR. HAYNES: Is there a place in the facility where neither the radio nor paging system would work?

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WITNESS SCHEIMANN: I can't recall having seen one as of yet. There might be somewhere, where there is a lot of steel where a radio wouldn't come through. I can't recall running into that problem.

MR. HAYNES: Mr. Zewe, do you carry a similar radio?

WITNESS ZEWE: Yes. I also carry the little page device also, plus a radio. But I only carry the radio now. The radion is ineffective if you're in the auxiliary building or in the reactor and fuel handling building. You have to rely on the paging there. Anywhere other than those buildings or the control tower itself, the walkie-talkie is an effective means of communications.

MR. HAYNES: Is there any place you know in the facility where neither system is available?

WITNESS ZEWE: Well, depending on the upkeep of the equipment, you may be in an area where one day the speaker system is adequate and the phone is adequate. The next day it could have a problem with the speaker or a problem with the page phones, which occurs from time to time. At any one time, considering how many stations we have with page phones and speakers, there is always a certain number of those that are being worked on or there is a problem with or they're abused in one form or another.

MR. HAYNES: Have you had occasions in your experience here where you have been out of contact with the

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control room and they tried to get hold of you and you were unaware of it?

WITNESS ZEWE: Yes.

MR. HAYNES: Very often?

WITNESS ZEWE: It depends on where you're at. If you're in the reactor building, we have a very definite communication problem with the reactor building becaise of the nature of it. The speaker system in the reactor building, depending on who pages you, is very unintelligible in the reactor building because of the effect of the dome and everything. So loudly and slowly. It's more often than not I'll say, did they call me or not? So I call back, did you call me? No, it was someone else but sounded like me. So by and large probably the worst communications is in the reactor building. Once you're on the phone, it's fine. But hearing the page and hearing the information passed is very difficult.

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MR. HAYNES: Knowing that you are going in the reactor building and communication is difficult, what precautions do you take to make sure that people know where you are and that you can be contacted?

WITNESS ZEWE: It depends on what the mode of the plant is. If we are cold shutdown, containment is broken, all right, I'm not concerned. If I'm going into the reactor building for just a normal inspection at power, this is more concern. If I'm going inside the secondary shield to inspect for leaks or other purpose, then I have communications and I have somebody there right by the phone.

An auxiliary operator typically goes with me. If I need any communications I have him do it directly. If he hears anything on the page, he comes up and asks was that for us. Those precautions are taken.

MR. HAYNES: Mr. Sheimann, how about you?

WITNESS SHEIMANN: I would have to pretty much agree with what Mr. Zewe said there.

MR. HAYNES: Is that how you do it?

WITNESS SHEIMANN: Yes, that would be how I do it. If I know i'm going in an area where I can't hear the page I normally would have a second body with me.

WITNESS FREDERICK: Are you trying to find out whether or not the page system as it exists is adequate

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communications in an emergency to recall the SROs to the control room?

MR. HAYNES: No. What I'm really probing is when the senior reactor operator is out of the building, as he is several times, how available is he to the control room?

WITNESS SHEIMANN: It might be noted the night of the accident I heard the word over the page for the turbine trip reactor trip and within three minutes I was up in the control room.

MR. HAYNES: I understand. That was this time. I wanted to see if there were other conditions where you may be out of contact and not know.

WITNESS SHEIMANN: That is not usually likely.

WITNESS ZEWE: He was in probably the highest noise level area of the entire plant, as far as being able to hear the page goes, because the condensate polisher area by the condensate booster pumps is without a doubt in my estimate the highest noise level area in the entire plant. That has general access.

WITNESS SHEIMANN: Of I hadn't heard the page, I would have heard the pipes going and would have been darn sure to check into it.

MR. HAYNES: Have you ever operated with one licensed operator in the control room?

WITNESS SHEIMANN: To my knowledge I can't

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recall coming into a case like that. I am normally always -- either the two control room operators there or myself and one of the control room operators. I can't recall going down to a single one.

MR. HAYNES: Do any of you know of any occasions during power operations when there was just one licensed operator in the control room? Any of you four?

WITNESS ZEWE: I don't know.

WITNESS FREDERICK: I think you will find if you look through the rest of the tech specs there is a section that defines the area in which the operators are allowed to stand and the area in which he is allowed to go. He is not allowed to go all over the control room. There is a map.

At any rate, when Fred or Mr. Scheimann or Mr. Zewe are out of the room and Craig and I are left there, just the two of us, there is an occasion where one of us may have to go to one or the rear panels. In that definition of the tech specs, there is only one operator at the controls.

MR. HAYNES: The other man is --

WITNESS FREDERICK: Checking a reading or an alarm and comes back.

MR. HAYNES: He is still in the room, within speaking distance?

WITNESS FREDERICK: Oh, yes.

MR. HAYNES: So to your knowledge there have

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always been at least two licensed operators in the control room?

WITNESS FREDERICK: That's right.

MR. HAYNES: Is that correct?

WITNESS FAUST: Yes.

MR. HAYNES: On the evening, midnight and weekend shifts how many station shift supervisors are on duty during each shift?

WITNESS ZEWE: One normally. Unless there is an evolution that requires more attention, where they will have two.

MR. HAYNES: That was the case on the night of the accident; is that correct?

WITNESS ZEWE: Yes. Unit one was in hot shutdown condition, getting ready to go critical, so we needed two shift supervisors that particular evening.

MR. HAYNES: Fine.

Mr. Zewe, where do you normally post yourself when you are on duty? In the plant or the unit one control room or unit two control room, or where?

WITNESS ZEWE: I typically, after I relieve the shift supervisor, I go out into the control room. I Xerox off my turnover notes and I go out there and turn over my notes to the shift foreman and the control room operators. And we discuss the plant conditions as they are, and

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any of the shift turn over that I got, to bring them up to where I am and for them to inject any changes that they see. All right? That's typically how the shift starts.

From there I might stay in the control room to do anything from reviewing procedures to giving oral walkarounds, to checking with maintanance, which I typically do in the first half hour. I check with our health physics department and see what they are working on. Check with maintanance, all three crafts, to see what they are working on -- to see what work they will be doing that shift and interface with the shift maintanance foreman. It's really the whole plant, the whole island is my bound.

Depending on what problems we have, what work related items we have, and what I feel I should be doing that shift is where I am at. All over. No one place, other than I typically start out my shifts all the same. I will turn over to the shift foreman and the control room operator, and then from there on in it's just whatever is on for that night.

MR. HAYNES: Fine. Thank you.

Mr. Scheimann, when you are not in the plant, where are you normally located?

WITNESS SHEIMANN: Normally up in the control room.

MR. HAYNES: I didn't ask you this question

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before: what is your view of the minimum shift crew position requirements in the technical specifications wherein you could be down to as many as two licensed operators for a period of two hours?

What is your feeling of the adequacy of that shift crew with respect to transients and accidents?

WITNESS SHEIMANN: I definitely feel the number of AOs, unlicensed personel, are too low. I have never been operating with less than four.

MR. HAYNES: How about the number of licensed personel?

WITNESS SHEIMANN: Number of licensed personel -- I would go along pretty much with what Mr. Zewe said. For a time period of up to two hours. Anything beyond that we would probably be pushing it.

MR. HAYNES: I believe Mr. Zewe felt that two hours was definitely too long if you get into a transient, if you have just two licensed personel in the control room: is that correct?

WITNESS ZEWE: I believe that I said that we always have three available at all times, even though the third one may not be there. He should become available within a few minutes into the accident.

If we had to rely on that two hour period to bring in the third license, I feel that's too long, yes.

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MR. HAYNES: Do you concur?

WITNESS FREDERICK: What I was trying to say was for normal conditions. I wasn't referring to an accident condition. During normal conditions, two would be sufficient.

Again, like Mr. Zewe said, in case of an emergency like that, the two thou period would definitely be too long.

MR. HAYNES: Thank you.

I didn't have anything further.

MR. FRAMPTON: Let me follow up with some related questions about control room manning and what kind of assistance and expertise it would be useful to have available to a shift in the case of a severe transient or accident.

The reason we have been asking about this is because obviously your company has a policy that probably reflects someones view, apparently reflects your view of the number of people its wise to have there. There is a policy to have more people than the minimum required by the tech specs. It may well be that other companies go down to the minimum and your policy perhaps reflects the minimum applied across the board to other plants is inadequate. Again, in situations that might occur elsewhere.

The first three or four hours of the accident on March 29th, I think you have all testified previously that you

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were facing something that your really didn't totally understand, that you had not really seen before in the training o. on the simulator.

Mr. Zewe, is that a fair characterization of the situation?

WITNESS ZEWE: Yes.

MR. FRAMPTON: What I would like to ask you is whether it would have been useful during that period of time in your view to have additional engineering or other expertise available to you to try to figure out what was happening and advise you as to what courses of action you might try to take, either in the person of someone in the control room or in the way of direct telephone lines out to B&W or to NRC engineers or other industry people?

Would that have been something that would have been useful to you at the time?

WITNESS ZEWE: Well, looking at it almost six months later with hindsight, all I needed was one good input from somebody and maybe that would have helped the situation greatly. But I feel at the time that I had capable people and that I had adequate help for what I had asked.

Within about nine minutes into the accident I had another shift supervisor there that was qualified. I had two nuclear engineers that were there that came over from unit one.

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MR. FRAMPTON: Who were those two people?

WITNESS ZEWE: One was Kevin Harkless, and I can't remember the other guy's name right now. I had those two that came over. I had them make phone calls.

MR. FRAMPTON: Who was the other shift supervisor?

WITNESS ZEWE: Ken Bryan, over in unit one. I asked him to come over at the onset not to help that much with the accident but -- I called him as soon as it happened. You could always gain from experiences like this. At that time, the first minute or two, I thought we just had a normal trip at that point. If I hadn't called him then, I would have certainly called a few minutes later for some help and some input. Initially I did it from -- come on over, you know, to gain from it and to help out both, because he hasn't been a shift supervisor that long and particularly he first qualified on unit one and then he qualified later on unit two, so it was good experience also. Within the first hour I had the unit superintendent technical support there on site in the control room who had been the supervisor of operations in unit one.

MR. FRAMPTON: Who was that

WITNESS ZEWE: George Kunder. George was there. I consider him a very capable engineer with considerable experience in operations, even though he didn't have a license yet on unit two, the philosophies and operations

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were exactly like unit one as far as the primary plant goes, so I considered his help very good.

I had at least three regular engineers. Another shift supervisor. A capable shift foreman and crew. I felt where we were at that point, not knowing we had a small break like a -- all right?

I felt we certainly had enough people to do what we needed to do looking at enough things at that point. But certainly if I had one more person, in light of, you know, to put it together and say hey, we got a small break and the relief valve is stuck open, maybe that would have taken 50 more people, beyond that, but we certainly had enough in numbers, enough in knowledge, and enough in that respect.

MR. FRAMPTON: Okay.

I understand that it's difficult to ask you to try to put yourself back in the position you were in then, but that is what I'm trying to ask you to do. Not in hindsight, but try to think about what people were thinking during those first few hours and on into the morning.

The reason I'm asking you to do that is to try to get some sense of whether it would have been useful to have telephone lines or additional people on site and to try to -- for situations like this; and whether it was possible to perceive at the time that that kind of input might have been useful.

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I think that what you said is certainly during the first half hour or so, the people who arrived in the control room represented what appeared to be plenty of expertise to cope with the situation that appeared to be developing; is that right?

WITNESS ZEWE: We really didn't know what was developing. I don't know how to describe it, but this transient was like many other transients that I have been involved in.

You have a trip, or you have something wrong that you are trying to correct and to understand and take the right course of action. That happens many, many times on various occasions. I have had several trips, several major plant problems in both units. They all start out, you know, where you have all this information and you are trying to sort out the information to try to make the best decision that you can.

We just kept on going through that process, trying to sort out the information for the right course of action. It wasn't a situation where we lacked things to do or things to look at. It was more of an interpretation type deal than what you were dealing with. Every problem of any scope that I ever had goes through that same process.

Where you have bad feedwater, for example, or end up shutting down a plant or if you have a LOCA -- some are

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more defined and it's obvious. Like when you shut down, other problems crop up.

It's a continuous type evaluating situation. It certainly wasn't one of panic that we totally didn't know where to turn.

MR. FRAMPTON: What I am getting at is whether there was a time during the first seven or 10 hours into the accident when you really perceived the need or a desire for more expertise than you had available to you in the control room?

WITNESS ZEWE: I think expertise was a phone call away. If I had asked the right questions or relayed the right information to the people that we had called, maybe that is true. I feel the resources were there all right. It's just how we used them was probably the fault.

I don't think that having three more guys on shift would be the answer in expertise. I know now we had taken the stand that we are going to have a degree engineer on shift, which will start as early as next month.

MR. FRAMPTON: Is that a new company policy?

WITNESS ZEWE: Yes. The people have already been selected and they will go on shift, as far as my understanding goes, next week, to go on shift to help out and learn, so to speak, and to help out with the shift routine to provide the expertise for the core cooling

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situations and anything that should be needed as far as protecting the plant goes.

WITNESS FREDERICK: Listening to your questions it seems like you are looking for what was going on in our heads as far as what we thought was standing in our way and arriving at the right answer.

MR. FRAMPTON: Precisely.

WITNESS FREDERICK: People? Mechanics? Training? What?

I'm volunteering an answer to that question now that I formulated it.

In my own mind, what I was groping for was more information from the instruments. It wasn't the fact that I needed another brain or a book to look into or anything like that. What I needed was an indication that was not subject to interpretation, that would tell me exactly what was going on either in the stem or in the cord itself, that was causing the problem.

I was constantly searching the panel for an indication that stood out as being so unusual that it would cause all these effects. I was looking for another symptom that didn't make itself obvious on the panel.

So my stumbling block was the information available from the panel and not the number of people that were standing there or the amount of knowledge that was in the room.

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MR. FRAMPTON: What you are saying is that what you felt was needed was not more expertise or additional expert people to help you evaluate or interpret what you had, but rather more information which you could use to make the evaluation yourself. It was inadequate information.

WITNESS FREDERICK: I guarantee if there was an obvious indication that said the relief valve was open we would have noticed the relief valve was open and we would have said it shouldn't be open at this time, and let's close it. That would have happened within the first few minutes of the accident.

MR. FRAMPTON: The purpose for this series of questions is to try to evaluate suggestions that have been made that what we really need most to prevent this kind of accident from happening is to have either a very experienced engineer on shift all the time, or some kind of direct tie-in between plants and some industrial locations where there is a lot of engineering expertise, and you can pick up the phone and get a lot of expertise very quickly if you don't understand what is happening because your instruments are giving you conflicting indications, or perhaps not enough indications of what is really going on.

One of the things I wanted to ask you about is: did anybody suggest, for example, calling B&W in Lynchburg? They were making attempts to get into the plant, but

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weren't able to establish direct telephone contact with the unit two control room until late in the afternoon.

What I'm trying to get at is whether that kind of thing is useful? Particularly from you, whether during the course of this accident there was a perceived need for that sort of input, that sort of expertise from the outside? Or whether that really wouldn't have helped you very much: whether you felt at the time that that wasn't the problem. That wasn't what you needed.

That is the kind of thing I'm trying to draw out.

WITNESS FREDERICK: The site representative from B&W was present.

MR. FRAMPTON: Lee Rogers?

WITNESS FREDERICK: Yes. I would call him if I wanted help from unit two. Him or Stan Mangi. I don't know if Stan was there or not. There was no shortage of people that you could ask questions of.

WITNESS ZEWE: We didn't have a communication problem in trying to get ahold of someone and being unable to get hold of them. We didn't experience that problem.

MR. FRAMPTON: You didn't at any time during Wednesday feel that you needed help from somebody you couldn't reach?

WITNESS FAUST: We couldn't reach the reactor. We kept trying to ask what was going on in there.

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WITNESS ZEWE: Up until the site emergency and everything else, I didn't thing of a problem reaching people at all with any information I requested of them or I gave them. I didn't have any problem in that respect.

MR. FRAMPTON: What about after the EMOV block valve was closed off? Did you then realize very shortly that that had been the main leak?

WITNESS ZEWE: Yes.

WITNESS SHEIMANN: Yes.

MR. FRAMPTON: Then you realized that in essense you had a small break LOCA; right?

WITNESS ZEWE: True.

MR. FRAMPTON: Thereafter, didn't you continue to face a situation in terms of the plant parameters that it was very difficult to understand why the plant was behaving that way?

WITNESS ZEWE: No. As soon as we closed the electromatic valve the pressure in the reactor building started to go down. The pressure in the coolant stem started to come up. So we knew then that we once again had a tight stem, which we didn't have before but didn't preceive we didn't have a tight stem. So from then on we knew that that was the leak and we were already on our maximum capability of high pressure injection and just coutinued on that path to pressurize up.

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MR. FRAMPTON: All right. You did pressurize up.

WITNESS ZEWE: Yes.

MR. FRAMPTON: But then throughout the day a number of decisions were made about the strategy for trying to establish forced core cooling; isn't that right?

WITNESS ZEWE: Right.

MR. FRAMPTON: Do you recall when the first diecision was made to try to depressurize the blowdown and go on decay heat removal?

WITNESS ZEWE: After we tried unsuccessfully to insure in our own mind the core was being cooled properly with the high pressure injection flow that we had, we had pressurized up and we were maintaining pressure by cycling the block balve or the electromatic relief valve -- all right -- cycling at a pressure around 2000 pounds.

MR. FRAMPTON: Both reactor coolant pumps were off at the time?

WITNESS ZEWE: Yes. This was in the neighborhood of midmorning now. We knew then that we had voids in the system. We were trying to collaps the voids.

We were cycled for about an hour or so the block valve on the electromatic to hold pressure up at about 2000 pounds, plus or minus a hundred pounds, and feeding our high pressure injection to increase the pressure. And we would relieve the pressure by venting, and come up again; and

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kept on cycling.

Well, we weren't sure in our own minds whether we were adequately cooling the core, and also how long we could continue to do this and cycle the block valve or the electromatic relief valve.

We elected then through some ideas that several of the operators had, including Fred Scheimann, to try to depressurize the plant and dump the core flood tanks in on the reactor vessel -- which we felt, at the time, would assure the reactor vessel was covered with water -- and then go on down and establish decay heat removal flow.

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MR. FRAMPTON: Let me stop you a moment and go back to this time period when you were trying to keep the pressure up and the high pressure injection was on at a substantial rate during that period when you were trying to keep the pressure up.

WITNESS ZEWE: As soon as we trip the last two reactor coolant pumps at about 5:40 we had high pressure injection flow on at that time. Once we shut the electromatic relief valve isolation valve at about 6:15 or so, from that point until 7:00 we had full high pressure injection on.

From the time of shutting the valve until about 7:00 or so, we increased pressure up. Then we started to reduce the high pressure injection flow because we had regained pressurizer level or the pressurizer level was still high but we had some indication, but now we had high level and high pressure both.

MR. FRAMPTON: So during the period of say approximately 7:00 am to around 11:00 a.m., the high pressure injection continued to be throttled back pretty far as necessary not to overpressurize the system, is that correct?

WITNESS ZEWE: Yes. I am not sure of the actual flow rate but it was the neightborhood of 3- to 400 gallons a minute at this time. Once we elected to depressurize and try to have the core flood tanks come into the reactor vessel, then we had our flow at just about 300 gallons a minute, not counting the seal injection because we had to try to throttle

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down to 100 on two pressure injection lines but that was inadequate so we ended up about 130 to 150 on two legs. That was about 300 gpm at that time.

MR. FRAMPTON: During this time period of about 7:00 a.m. to 11:00 a.m., did you believe that you had established any natural circulation at all?

WITNESS ZEWE: We didn't.

MR. FRAMPTON: What was the method -- what was the strategy for cooling the core then?

WITNESS ZEWE: High pressure injection.

MR. FRAMPTON: Feeding the high pressure injection and bleeding, venting off using the EMOV black valve?

WITNESS ZEWE: Plus we raised the steam generator levels or the A only because B had a confirmed primary and secondary leak so that was isolated but we had increased the water level in the A generator up to 90 percent, up 50 percent, to try to enhance cooling as afforded by that generator.

MR. FRAMPTON: What is 90 percent of usual operating level?

WITNESS ZEWE: Normal operating level at say 100 percent power or 98 percent, in our case it was about 60 percent on the operating --

MR. FRAMPTON: How many feet is that? Do you know?

WITNESS ZEWE: I don't recall the exact conversion. Fifty percent is 21 feet. So I would say that is about 35

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feet, 37 feet.

MR. FRAMPTON: Does the steam generator level have a dual set point? Automatic dual set point. So when the reactor coolant pumps trip, the set point shoots way up?

WITNESS ZEWE: Yes. All right, if you lose all reactor coolant pumps you initiate an emergency feed which institutes an automatic set point. At 50 percent.

WITNESS FAUST: Depending where you are at, the steam generator level actually seeks 50 percent. If we are sitting before that, we would actually go down for natural circulation.

MR. FRAMPTON: I will let Mark get into that in a minute but I want to ask you a few more questions about the strategy decisions during that day.

Basically from around 7:00 in the morning until around 11:00, you were trying to keep the pressure up and cool with the high pressure injection and collapse the voids you know are there, is that right?

WITNESS ZEWE: Yes.

MR. FRAMPTON: Around 11:00, a decision is made to try to depressurize blowdown and flood the core, is that fair to say?

WITNESS ZEWE: Right. Because we weren't certain that we weren't bypassing the core somehow with our high pressure injection water coming into the cold leg and going up

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throught the steam generators and then out the pressurizer and short-circuiting on the -- bleeding the electromatic and not really going through the core.

MR. FRAMPTON: How was the decision to try to depressurize made late in the morning? Was that basically a caucus decision?

WITNESS ZEWE: Yes. Based on how long that isolation valve would last and based on the concerns that Fred brought up and I had harbored the very same things, to try to depressurize and go on decay heat. Also Mike Ross, who was in charge of the control room at the time, we all talked together -- Fred and Mike and myself and the other operators -- about this and we went into the office where Mr. Merrill was with the other members of his command team there to discuss that with him, so that they discussed the options of doing what we were doing andy any other inputs from any other groups that were available to them.

We had decided to go ahead and try to depressurize and put the core flood tanks on, assuring us that without a doubt that we would have water in the core.

MR. FRAMPTON: I guess I should address the next question to you, Fred. What were your main concerns about the mode that you were in up until around 11:00? Was it that the high pressure injection wasn't going through the core at all but was going someplace else and wasn't effectively cooling

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the core?

WITNESS SCHEIMANN: My main concern was I figures we had to keep the core covered and cool. I figured if we could get down to decay heat removal we could be pushing somewhere in the neighborhood of 2500 to 3000 gallons a minute of cooling water around the system, twice what we were putting in by way of the high pressure injection. Maybe 300 gallons per minute a leg or whatever it was at the time.

That was one of the main reasons I voiced my opinion on coming down and going on to decay heat. We could assure we had more volume of cooling water being circulated around at the time.

MR. FRAMPTON: I think what I want to do is just go through to the end of the day on the decisions that were made and come back and ask one or two questions about instruments and then let Mark take over on some of the details.

WITNESS ZEWE: I will add one more thing here. Our instrumentation we had really didn't show any effective, really, core sealing. Our RTD in the reactor coolant loops showed high off scale. We didn't know where we were. The full range recorder goes up to 800 degrees. It showed we were in the neighborhood of the high 700's or 800 degrees.

Knowing we hadn't collapsed all the voids, these detectors were seeing a steam water atmosphere and may not be totally indicative of what the core was seeing.

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Our in-cores at that time on the computer were off-scale high so we couldn't use that. They did get some of those readings on the in-cores of the varying temperatures from zero to 200 as high as 2300 degrees all right, which I was unaware of that day.

MR. FRAMPTON: Was any of you aware of those high temperature readings on Wednesday the 26th?

WITNESS FAUST: Not me.

WITNESS ZEWE: I was really the contact for the operators between the emergency control director and them. I certainly didn't relate that to them because I didn't know about it.

MR. FRAMPTON: Would that have been significant information to you had you known it as to the evaluate any of what was happening in the primary system?

WITNESS ZEWE: I am not sure because the way the readings were put forth even the next day from the engineer that had them taken --

MR. FRAMPTON: Mr. Porter?

WITNESS ZEWE: Right. -- saying that here they are, I have really no faith in them. We just didn't perceive we had that high temperature at that time, anywhere near that high. We really didn't know if the thermocouples were qualified to read anywhere higher than what their normal range would be.

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I really didn't have a good handle on that. So I really couldn't say how I would have viewed them. I would probably have said they are unreliable and we will have to use our most reliable means. I am not sure it's only hindsight, if it would have affected my decisions or brought up any more questions in my mind other than those at that point in time.

That was my initial reaction when I first heard about it. Shortly thereafter on the 29th, when they said there were the high temperatures, the hydrogen and the high pressure spike we had seen, then we said, yes, we should have believed it because it was true, but not knowing of the high numbers before hand, it's pure conjecture on my part.

MR. FRAMPTON: Let's go on through the day.

WITNESS FREDERICK: The important thing on those readings, there is no more reason to believe the high number than there was the low number. It was a 0 and 10 and 15 and 200 and 300 and 2000. There was no more reason to believe the 2000 than the lower numbers, looking at raw data like that.

MR. HAYNES: Mr. Frederick, with respect to the numbers of thermocouples that were read, how many were showing high temperature and how many were showing --

WITNESS FREDERICK: I never saw them. I only heard it talked about in testimony, the fact they were such variance in the readings.

MR. HAYNES: If you would have seen that 15

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showed temperatures above 1300 degrees F and they were in a pattern and say 6 showed less than 500 degrees F, would that change your view of the credibility of the high temperatures?

WITNESS FREDERICK: I probably would not have believed the readings at any rate because they are not control instruments.

MR. HAYNES: You would not have believe the thermocouple readings because they are not control instruments?

WITNESS FREDERICK: That's right. If I were to take action on the readings taken on the core thermocouples and ignored the console temperatures, I would be violating the tech specs.

MR. HAYNES: The console temperatures are which?

MR. FREDERICK: Off-scale high. The only one we had was near 700 degrees.

MR. HAYNES: The hot leg temperatures?

WITNESS FREDERICK: Yes.

MR. HAYNES: They were close to off-scale?

WITNESS FREDERICK: They were off-scale.

WITNESS ZEWE: They only go up to 620 degrees Farenheit. We have recorders on the control room wall that go from 0 to 800. These were the highest readings we had plus we had connected a bridge network to the ARPS/RTD and interpreted that reading to a degree Farenheit, too.

MR. HAYNES: I am missing something. If the in-core

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thermocouples were reading high, a lot of them were reading high, say more than -- 15 reading more than 150°, and the console temperatures were reading off-scale, why does that make you not believe the in-core thermocouple temperatures? I didn't understand your response.

WITNESS FREDERICK: Well, like I said, number one, the in-core thermocouples are not calibrated, displayed, anywhere that one can use them for control numbers. The use of the in-core thermocuple temperature is not related to a technical specification or limit the precaution or any of the operating procedures or any of the emergency or abnormal procedures. There is no action outlined to take in the event of an abnormal in-core thermocouple temperature.

So if I stop considering the temperatures or indications or procedures we were trying to outline based on the console indications and say instead of doing that we will use these indications which are not confirmed but could be true, on what do I base the procedure that I take after that? What do I relate it to? How do I justify that any more than the fact I couldn't understand what is on the panel.

In hindsight, if I said those 15 readings were right, I should have done that, that is okay, but how can you control the --

MR. HAYNES: You wouldn't have looked on that as corroborating.

WITNESS FREDERICK: It was speculation as to whether or not those readings were correct.

MR. HAYNES: The in-core.

WITNESS FREDERICK: Absolute pure guesswork.

MR. HAYNES: How about the readings on the console with respect to hot leg temperature.

WITNESS FREDERICK: They were high.

MR. HAYNES: Did you believe them to be correct?

WITNESS FREDERICK: No, because there was not flow in the system. RTD's only work if you have the representative flow. It will read the temperature of the water next to the RTD but that doesn't tell you what the temperature it two inches away from there if there is no flow.

MR. HAYNES: You are saying the RTD reading is dependent upon flow through the system.

WITNESS FREDERICK: As being a representative number of what the temperature of the hot leg is, yes.

MR. FRAMPTON: Let's go on and cover the decisions made during the date or strategies that you tried to develop to deal with the situation as you saw it. When you decided to try to depressurize, how long did that basic strategy get implemented? Was that for the rest of the afternoon? Or did you find that that didn't work and tried something different? Do you recall that?

WITNESS ZEWE: We just tried to depressurize and we

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got as low as about 400-some pounds after several hours. At that point the decision was made by URP management off-site to stop continuing trying to depressurize and to go ahead and try to repressurize.

MR. FRAMPTON: That was 4:00 in the afternoon?

WITNESS ZEWE: In that neighborhood. The station manager and unit officer, technical support left to go to the Governor's office that day. When they returned, it wasn't long afterward that there was communication between URP management and Mr. Merrill and he was directed to repressurize the plant and try to get the reactor coolant pump started. That was about 4:30 or so that we headed in that direction.

MR. FRAMPTON: The basic strategy from about noon to 4:00 was to try to depressurize and get the decay system into operation but you were unsuccessful in getting the pressure down that low, is that right?

WITNESS ZEWE: Exactly.

MR. FRAMPTON: Were any theories developed as to why you couldn't depressurize the system low enough to get decay heat going?

WITNESS SCHEIMANN: In my mind, pressure was coming down fairly slow. We weren't getting pressure down to the point -- if we could have held the core flood tank levels and still managed to drop pressure until we got sufficiently below the core flood tank set point, I was of the opinion that the

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core flood tank would come down in a good surge and cool everything in that immediate area of the core.

However, what was happening was pressure was coming down very slow and as a result the core flood tank contents were actually just seeping instead of a good volume. That at the time appeared to be our main problem as far as depressurization. We couldn't come down fast enough.

MR. FRAMPTON: Was there any NRC input during the late morning and afternoon into this strategy? Were the inspectors there urging you to go one way or another or suggesting you go one way or another at any time?

WITNESS ZEWE: All those suggestions and interface took place with Mr. Merrill. They were involved in the decisionmaking process of the command team that was set up in our office but I am not sure to what extent because I didn't participate.

Whenever I did go into interface directly, I was there for what I needed to do and came out again. I didn't hear all the total discussions that happened.

MR. FRAMPTON: Okay. I know that Mark wants to go into a number of specifications during the day but I want to go back for a moment to talk about Mr. Frederick's comments with respect to instrumentation and the reactor not telling you enough. What kinds of things would you have liked to have been able to see on the control panel or be able to get

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out of the computer that would have helped you see what was happening here that you didn't have?

WITNESS FREDERICK: An absolute indication of valve position indication for the relief valve.

MR. FRAMPTON: What other kind of things during the day would have helped you identify uncertainties in your own mind about what was happening? I will address that first to you and then to the others.

WITNESS FREDERICK: Well --

MR. FRAMPTON: Are there other specific things you could think about?

WITNESS FREDERICK: Accurate flow indication.

MR. FRAMPTON: In various parts of the primary system?

WITNESS FREDERICK: In the flow system that would indicate natural circulation. We were questioned for many hours as to whether or not it was taking place. The only thing to base it on was Delta T. We weren't sure what that looked like or how fast the temperatures would separate on that circulation which depended on that flow rate.

MR. FRAMPTON: Delta T, you are primarily talking about the Delta T between the cold and hot legs or between any two points in the system?

WITNESS FREDERICK: Cold and hot legs. Then you would want to know whether you are transferring heat to the

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secondary side. Basic parameters like that. Core temperature; reactor coolant system flow. You want some indication on your coupling as a secondary sign. The same things now we have in our emergency procedures that says to look for. It says look for subcoolant. Your saturation mark. Whether or not you are effectively transferring heat to the secondary side of the plant.

Basic heat transfer stuff that you want to withdraw from the system without interruption. Every reading that is required to determine whether or not you are on that is an interpretation of temperature reading. List no flow or direction indication of whether or not you have natural circulation taking place.

I don't see why you couldn't have a very low range flow instrument to tell you whether or not you have movement of the water. Whether or not you have water in the core. Whether or not the temperatures are increasing in the core.

MR. FRAMPTON: Do you have anything to add to that?

WITNESS SCHEIMANN: Yes. We could have done without a lot of the superfluous alarms on the front panel and had some of the vital alarms on the back panel placed on the front panel. That would have helped, along with what he said about positive valve position of the electromatic relief valve. I would say those would be two main points I would bring into it.

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MR. FRAMPTON: Anything to add besides those in terms of things you would have liked to have known about what the reactor was doing? Instruments you would have liked to have had that would have given you more information?

WITNESS ZEWE: Some way to have assurance of a water level in the reactor vessel itself. Some direct means of water level to see if the core itself was actually covered. A more direct information on saturation conditions in the primary, other than a look-and-see type. Some alarm that says you are approaching saturation conditions or something of that nature would have certainly been helpful.

MR. FRAMPTON: Weren't you aware that you were in a superheat condition during a good part of the time during the day or was that not something really focused upon?

WITNESS ZEWE: After a period of time, yes. I am talking about within the first hour of the accident.

MR. FRAMPTON: Mr. Faust, any other additional things besides what was mentioned?

WITNESS FAUST: He did say core temperature. I would have some of those qualifiers.

MR. FRAMPTON: More reliable instrumentation on core temperature.

WITNESS FAUST: On the console. I would want even one indicator right on the console so I didn't have to punch it out of a computer.

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MR. FRAMPTON: One on which you could rely.

WITNESS FAUST: Yes. They lit the rest of them. Make them do that, fine. I got a question and it takes a lot of design probably. Since one of the big hang-ups is just being able to find the small leak, everybody is centralizing on that electromatic relief valve. This leak could have been anywhere in the pressurizer. Unisolable. What is to tell us where it is coming from so we don't take hours to have somebody out looking for this thing.

You are asking us to recognize it right away. It could be slow and hidden by other parameters where we thought we had a problem somewhere else which hid a lot of what we are talking now about from us. Got us thinking somewhere else. You have a system that you can come up with to tell me where it is leaking from right away, that would be great.

MR. FRAMPTON: Mr. Zewe, was there any time during the first day, Wednesday the 28th, when you thought that the core had been uncovered for a period of time?

WITNESS ZEWE: No.

MR. FRAMPTON: Off the record.

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(Discussion off the record.)

MR. FRAMPTON: Let's break.

(Whereupon, at 1:25 the hearing was recessed for luncheon to reconvene at 2:30 p.m.)

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AFTERNOON SESSION

(2:10 p.m.)

MR. CUNNINGHAM: On the record.

The first thing is to go back and claer up a couple of things you talked about with George awhile ago about what you were doing during the 18 hours in terms of repressurization and depressurization. I think what you said was after the reactor coolant pump tripped off, you turned on HPI full flow and started to repressurize; is that correct?

WITNESS ZEWE: No.

MR. CUNNINGHAM: That's later in time?

WITNESS ZEWE: We went to HPI injection but never started to repressurize. The electromatic was still open and we still had a lot of voids yet we just didn't recover from.

MR. CUNNINGHAM: So after the black valve was closed --

WITNESS ZEWE: That's when we begam to repressurize.

MR. CUNNINGHAM: You reached eventually about 2100 psi. Did you throttle back then on HPI and sat there and were running and opening and closing the block valve; is that correct?

WITNESS ZEWE: Yes.

MR. CUNNINGHAM: Okay. I heard, I guess it was Unit 1 had a emergency procedure for high pressure decay heat

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removal by running out the EMOV to the sump and recirculating through the sump. Were you aware of that? Did you consider it?

WITNESS ZEWE: I have never seen that procedure. It doesn't exist as far as I know. I had heard a comment by another operator that some years ago that had been discussed in a training class he was in, but I never saw that as a procedure.

MR. CUNNINGHAM Did you consider the possibility of leaving the block valve open and running to the sump as if it were an isolable small break under high pressure recirculation? Do you recall anything about that?

WITNESS ZEWE: Well, in effect, whenever we were cycling the electromatic relief valve for well over an hour, in effect that is what we were doing.

MR. CUNNINGHAM: You were back at lower flows, I guess.

WITNESS ZEWE: We were around 300 gallons a minute or so, yes.

MR. CUNNINGHAM: After that, you decided to depressurize. Do you have any idea for how long -- there was a quote made that you were floating the core fluid tanks on the TCS. Do you have an idea for how long you were doing that?

WITNESS ZEWE: The sequence of events and the

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graphs show exactly how long it was. I'm not sure in time frame but it was a couple hours anyway that we had seen a minimal reduction in the ater level in the core fluid tanks. We only had seen about 18 inches reduction the whole time. We had expected to see a larger volume transfer, but that's about all we had seen at that point mainly because we couldn't get low enough pressure to force the water out.

MR. CUNNINGHAM: If we can go back now to what you were doing with the secondary side of the OTSG's. You were -- after the reactor coolant pumps were tripped, you raised the level 70 percent. That was a manual action?

WITNESS ZEWE: Yes, it was.

MR. CUNNINGHAM: George got into briefly the dual level set point system that some plants have. Do you have something like that?

WITNESS ZEWE: Only in relationship to emergency feed water. If you lose reactor coolant pumps, all reactor coolant pumps you have an automatic set point of 21 feet or 50 percent on the operating range at which the emergency feed regulation valves control that steam generator level. If you have a loss of feed water, it will only control at 30 inches of level in the start-up range.

MR. CUNNINGHAM: Is this done by ICS?

WITNESS ZEWE: Yes.

WITNESS FAUST: ICS was in manual, though.

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WITNESS ZEWE: He was controlling it in manual at this time. That's why I responded to say he manually raised the level up to 50 percent.

MR. CUNNINGHAM: If ICS had been in automatic when the pumps were tripped, it would have automatically raised it to 21 feet?

WITNESS ZEWE: If everything was right, yes.

MR. CUNNINGHAM: Is there a related system in the steam generators -- in other plants it's called the SFRCS -- the steam and feed water rupture control system?

WITNESS ZEWE: We have such a system.

MR. CUNNINGHAM: Davis-Besse has interaction on steam generator levels following an accident. Nothing like that?

WITNESS ZEWE: Ours does not. We have two different systems. One for just a low main steam pressure we have isolation. Also there is one that is based on steam pressure versus feed flow. If you have greater than 200 pounds delta p that you have, the emergency feed pumps automatically start. But that's the only automatic signal that we have for that system that looks at steams generator pressure versus feed. It starts the three emergency driven feed pumps. That's all it does, It does not control levels or anything else.

MR. CUNNINGHAM: I would get into some of the small

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break procedures and some questions related to that. On the 28, do you recall going physically to the emergency procedures and pulling out the small break procedure and working with it or referring to it or anything like that?

WITNESS ZEWE: No. The small break procedure, as it is, I didn't refer to it. I did refer to another portion of the procedure that deals with high pressure injection being initiated and I only referred to that for a short period of time.

MR. CUNNINGHAM: This is in the overall LOCA procedure, emergency procedure, is that the correct procedure?

WITNESS ZEWE: Yes. Loss of reactor coolant, loss of pressure, right.

MR. CUNNINGHAM: Within the small break procedures, they have all the instructions for determining if you have a small break. You're losing coolant or experiencing loss of coolant. Can you briefly say what they are? What the procedures say you should see in the small loss of coolant?

WITNESS ZEWE: Well, our small break procedure addresses where you recognize that you have a small LOCA but it really doesn't define what is a small break and what is a large break. It gets you into where you have a loss of power along with a LOCA and it defines what action you have to take. We as operators deal with a small break being within

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a capability of the system where you're still able to maintain a pressurizer level and a make up tank level.

WITNESS FAUST: We had no problem maintaining that.

MR. CUNNINGHAM: Yes.

WITNESS ZEWE: The symptoms for any break are low pressure, low pressurizer level, decreasing make up tank, decreasing pressure, all right? Reactor building alrams of radiation. Sump level. High pressure. Depending on the severity of the break. And a small break and large break in terms of safety analysis is like anything that is greater than .5 square feet is large. Anything smaller is small. Ours is either you have the capability or you don't. Really a small break to us is something that you couldn't live with and you would need high pressure injection. I'm not sure I fully answered your question either.

MR. CUNNINGHAM: I think so. I'm not sure either. I guess what I was getting at is in the actual course of events in the early part of the transient, did things progress as a small break? You would expect a small -- back up -- as a loss of coolant or break in the -- rupture of the RCS boundary. Did they behave that way?

WITNESS ZEWE: No.

MR. CUNNINGHAM: So I guess you can get the question then of what just were the LOCA procedures to you in

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the early part of this accident?

WITNESS ZEWE: Not of much value.

MR. CUNNINGHAM: Was it the matter that the symptoms you were seeing just didn't fit?

WITNESS ZEWE: Right. If you have a primary loss of coolant accident, you should see more activity on your building monitors and should have a low level -- not a high level. There was conflicting signals we had. It really didn't fit our procedure at all. We had really initiated high pressure injection manually before we had to initiate automatically. That was the portion of the procedure I looked at briefly, was where you manually initiate the high pressure injection. We normally do that anyway on a normal reactor trip. Just to account for the shrink of the system caused by the cool down. At that point in the procedure, it had you throttle high pressure injection flows to maintain a pressurizer level of 200 inches where here we were following above that and we did try to throttle to accomplish that but were unsuccessful. Right there it ended for us.

MR. CUNNINGHAM: Okay. I guess I have a question. They have within the LOCA procedures what is defined as the small break with the loss of the make up pump or loss of the motor control center, I believe. They have in there -- could y briefly say what is contained in there? What the instructions are within that part of the LOCA procedures?

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WITNESS ZEWE: The instructions are to recognize that you have the condition and then you have a designated control room operator and a designated primary auxiliary operator which will proceed to the affected side to throttle the high pressure injection flows once he arrives at the vales, and as the control room operator will go to the affected side and establish communication with the control room within a certain time period, he will throttle the valves as necessary as told by the control room operator regulating the flows in the control room. The auxiliary operator proceeds to open up a discharge cross connect between the make up pumps because you're assuming like you said that you had a LOCA and for some reason you lost power or you lost the capability of running a make up or supplying high pressure injection water through two of the high pressure injection valves so you're required to take manual action which I just described in about a 10-minute period. So we practice this every month to make sure we can manipulate the proper sequence of events.

MR. CUNNINGHAM: All of you have been through a drill of trying to achieve this 10-minute --

WITNESS ZEWE: Several types.

MR. CUNNINGHAM: Do you think the criteria of 10 minutes or the various pieces within it are reasonable if you get into a small break accident?

WITNESS ZEWE: I think what is written is reasonable

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to accomplish what you need to accomplish in that time period, but it's just that that whole section of the procedures is all -- you have some form of loss of power or some capability that dropped your normal two independent strings down to one. It just addressed that aspect of it. Just for a small break LOCA, that's the only thing this addressed. It didn't address a, if you will, a formal small break LOCA condition where you didn't lose half your capability because you had a blackout or loss of a make up pump or power to the valves.

MR. CUNNINGHAM: Within the LOCA procedures, all of that which deals with the small break LOCA has the presumed failures of the make up pump or the power or something like that tied onto it; is that correct?

WITNESS ZEWE: Right. The whole small break LOCA part of that is just the response for those conditions and these were conditions that they had just analyzed for about 18 months ago, that they didn't realize we weren't protected so they formed just that section of the procedure to protect us against that small break with a loss of power until we installed some plant modifications which wouldn't require operator action.

MR. CUNNINGHAM: So your -- you would have been modifying the plant to take away the human action, the requirements for human actions and would have had systems

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automatic actions that would have taken care of this?

WITNESS ZEWE: That is true. They;re making that same modification now in Unit 1.

MR. CUNNINGHAM: Do the rest of you believe that being able to achieve these kinds of requirements within 10 minutes is reasonable?

WITNESS SCHEIMANN: I would say so. You might get down there but you might have a problem with the cross connect valve. Those are notoriously pretty hefty valves to try to get open.

MR. CUNNINGHAM: One part that concerned me was the small break would be identified within two minutes. Is that a problem?

WITNESS SCHEIMANN: That's the hardest.

WITNESS ZEWE: To me, as an operator, there are two conditions. I can live with it and I can do a normal shutdown, or I can't live with it. There is no in between. So small or large, to me it's just how long you have until you go on core fluid and decay heat removal pressure is how big the break is.

MR. CUNNINGHAM: If you were to be in a situation where you had a HPI actuation from an ES actuation, What system parameters or changes in system parameters would indicate a need to throttle back HPI? What kind of conditions would you have?

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WITNESS ZEWE: Greater than 550 gpm on any two legs under the same side. Because our make up pump capability is 550 maximum before you run out the pump, so even if you do have a very bad LOCA where you know that you need the high pressure injection, you should still throttle the 250 gallons a leg plus 25 or so but stay so that one make up pump, whether A or B or C, feeding two legs does not exceed 550 for that particular pump. Under any condition you always do that.

MR. CUNNINGHAM: You're trying to prevent pump run out.

WITNESS ZEWE: Exactly. For any LOCA, you would do that. If it's automatically initiated and you need it -- you would still throttle under those conditions in every case, and then you would throttle any other time if you recovered pressure and if you were filling up the pressurizer to prevent from going solid, you would throttle again.

MR. CUNNINGHAM: From what sources do you recognize these concerns on HPI? Did you learn this in the simulator or were you getting this from procedures or where?

WITNESS FAUST: A combination of all of them.

MR. CUNNINGHAM: No one specific one.

WITNESS FAUST: Procedures, you have them there, don't you? I guess you don't have them there. I thought you

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had a set of procedures there. They tell you about when you throttle back on high pressure injection. You look at restoring normal pressurizer level. The other would be stabilization mode on pressure.

MR. CUNNINGHAM: On the pump run out situation, is this something that has been emphasized that you do not want to under any circumstances have to get above 550 gpm?

WITNESS ZEWE: That's true.

WITNESS SCHEIMANN: That's covered in limits and precautions.

WITNESS ZEWE: Procedures, too.

WITNESS FAUST: 500 per leg -- per loop, rather, has always been the stressed value as far as that limit on it.

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MR. CUNNINGHAM: Okay. In the early part of the transient, you did throttle back HPI after the ES actuation. Am I correct that that was because of rising pressurizer level?

WITNESS FREDERICK: The excessive flow rates in the high pressure injection legs was the initial concern in throttling the high pressure injection.

Subsequently, we found that the pressurizer level was rising rapidly and additional throttling was necessary.

MR. WORAM: We were originally going to funnel all these questions through him, but this is getting awkward. The question I had is that after reading your procedures, the one criteria because the pressurizer level was going up, that makes you want to throttle HPI. With the pressurizer pressure going down, that would tend to make you want to be cautious about this.

I would be interested to know what your decisionmaking process was in terms of seeing both these seemingly conflicting parameters going on. It is a hard question to ask.

You probably know what I am getting at. You have probably been asked it a thousand times.

WITNESS FAUST: Not really.

MR. WORAM: The situation where if you just look at pressurizer level going up it is obvious from procedure that you should cut back on HPI so you don't get the plant solid.

If you then superimpose on that situation, the RCS pressure going down it is not a simple decision anymore.

WITNESS FAUST: Can I answer part of that? Part was I don't think -- maybe I should answer from where I was in the plant.

I didn't perceive pressure dropping. I perceived it stabilizing out. The next problem I remember hearing was that level was going up.

WITNESS SCHEIMANN: I myself was at the pressure control station. Pressurizer level was streaming up like a bandit. I had been looking at our recorder there. It was right in the vicinity of level for system pressure. At the time, to me, it appeared that pressure stabilized out which that in conjunction with the increased level is why I decided to go ahead and start backing off.

To my immediate impression, there was no continued decrease in pressure at that time. At which time I felt it was a good idea to come back on injection.

WITNESS FAUST: Part of our pressure drop -- well, that is getting off the subject. We thought it was -- a lot of the problem was initially repressurizing feed water to the generator.

It seemed like it held. That's all I can say now. It seemed like it held. I think I was saying that then, too.

MR. FRAMPTON: Off the record.

(Discussion off the record.)

MR. CUNNINGHAM: Mr. Zewe, I will refer to you, but if somebody else can answer it better, please do.

Have you been given any guidance or what kind of guidance have you been given with relationship to the need for steam generator levels in ruptures of the coolant boundary -- primary coolant boundary?

WITNESS ZEWE: In any rupture of the primary system, you would have pressure down sufficiently low to where you would trip the reactor coolant pumps.

You would be in a natural circulation mode anyway. Not considering the high pressure injection flow as the forced coolant system flow. The secondary side would automatically maintain steam generator levels at 50 percent.

MR. CUNNINGHAM: Because of the coolant pump trip?

WITNESS ZEWE: Right. It would boil down to 30, but as soon as you got pressure low enough to where you trip the reactor coolant pumps on a large break the pressure would come down rapidly. You would trip the coolant pumps and then go into that mode.

Where your steam generators would come up 50 percent regardless of a LOCA or not. It is looking at the coolant pump automatic set point. Anything else would have to be manually manipulated.

MR. CUNNINGHAM: I guess I am interested in the case

of a smaller break where you don't depressurize quickly and the pumps can stay on for a while. The reactor coolant pumps.

Have vendors or anybody given you insight on what you should do with steam generator levels in that instance?

WITNESS ZEWE: You would control at 30 inches. Just enough for the decay heat. Automatically either with the normal feed system or the emergency feed system. Either way.

MR. CUNNINGHAM: So you would want -- your background would tell you you would want 30 inches in the steam generators?

WITNESS ZEWE: Yes. Up until now, any of the new changes as a result of the accident, they are a little bit different now, but then it was either 30 inches or 50 percent on the operating range if you lost the coolant pumps.

You didn't want to overfill the steam generator and didn't want to boil it dry. Those were the only two control set points you had. They should have occurred automatically. If not, you would have to do it manually.

MR. CUNNINGHAM: Okay.

WITNESS FAUST: Can I say something? The level in the upper range even change. It used to be 75 percent. It changed down to 50 percent. As far as the operators went, as far as I know in fact, we didn't know why it changed to that level. I wasn't aware of it. I knew they dropped the level for natural circulation.

MR. CUNNINGHAM: They?

WITNESS FAUST: I don't know who they was. It turned up in the procedure one day. We get our information by what we get out of our procedure and training department. A lot of times we don't get the reason behind it.

MR. CUNNINGHAM: Can we turn to another subject? Some of the things that were going on on the 28th in terms of HPI flows. Once again, I have a feeling it has been asked many times. We are trying to get some gross feelings for how much flow was coming in the core and through what legs and what have you.

We talked about it earlier, you were having problems accounting for much of the water that came out of the BWST. If that much water came out and the core apparently wasn't cooled to a great degree, we would have to consider the possibility the water went someplace else.

WITNESS FAUST: That is what we were getting about, we had the feeling we were bypassing the core. We only had the A leg on at that time, for a large part of that time.

We actually backed down low enough -- I was the guy, by that time, I couldn't throttle the flow rate they wanted off both pumps, so I tried going down to one pump to get my flow rate higher and throttle at the value they wanted.

MR. CUNNINGHAM: You are talking about a flow path that would be into the cold legs back through the pump and

the steam generators and out the pressurizer?

WITNESS FAUST: Right.

MR. CUNNINGHAM: You were considering that?

WITNESS FAUST: That is when we later on staggered -- we ended up with A and C. C pump -- actually staggered flow across the core to be sure it was at least going through the core. This was later on.

MR. CUNNINGHAM: I am not sure what you are talking about.

WITNESS FAUST: We ended up putting the C pump back on and staggering like a diagonal path across the core which would have gotten us further away from a possible direct path through the makeup pump up through the steam generator and out the --

MR. CUNNINGHAM: Injecting into the A and B loop?

WITNESS FAUST: Right, trying to get the furtherest points from the path to the pressurizer.

MR. CUNNINGHAM: I see. Let me back up a bit. Start kind of at the beginning and work down through the day and try to figure out which valves you were using and what have you.

For the first four hours you were running makeup pump 1A. Which valves would you expect the flow from that pump would be coming through?

WITNESS ZEWE: It could only be two valves. 16A or B

in the A loop.

MR. CUNNINGHAM: Could it have been A and B or A and C?

WITNESS ZEWE: It varied.

WITNESS FAUST: The first four hours.

WITNESS FREDERICK: I actually don't recall what the flow rates were, and -- I tried to the best of my ability to recall that in one of the first interviews. I don't remember what I said.

WITNESS FAUST: I probably picked it up somewhere along the -- it had to be after the -- pinpoint where we had the RC pumps off. Already fed the generators up.

MR. CUNNINGHAM: This would have been -- 1A was running up until about 8:00 in the morning.

WITNESS FAUST: That is wrong. On you mean the makeup pump. I am talking about the RC pumps to find out when I was on the makeup system. You can't really determine that right off the bat. I just know I was on the feed involved with the RC pumps and feed and I ended up over on the makeup pumps later on.

MR. CUNNINGHAM: Okay.

WITNESS FREDERICK: The interviews we had with Darwin Hunter with the NRC I&E group that was here originally, we spent many hours trying to figure out those flow rates and which pumps were running.

If you can look that up in the testimony, you will get more numbers out of that.

MR. CUNNINGHAM: I am not looking so much for numbers as valve alignments.

WITNESS FREDERICK: We did that, too. Which leg we were shooting through and which pump, that sort of thing. Where the water was coming from.

WITNESS FAUST: There are pump combinations, just cycling of the pumps I can only base it on relating it to when we had building actuations and I don't even know -- I wouldn't have gotten a 1600 pound actuation -- well, I would have. I don't know for sure now. But we had several actuations. That is where you get into the pump shifts. Part of them.

One time was when I was actually shifting and I actually lost the A makeup pump and went back to the B and that is when you end up with the A makeup pump pull to lock.

MR. CUNNINGHAM: At that time, when A was pulled, B was in effect replacing A?

WITNESS ZEWE: The same two valves.

MR. CUNNINGHAM: You would have been injecting through 16A and B?

WITNESS ZEWE: Right. Any time on the sequence of events when C's are on, you have 16C or D as a possibility. Any time A or B and A and B is running, you only have 16A and

B. Those are your only possible combinations that you have. So if C isn't on, it is only A or B valve regardless of A or B running or if A and B both are running.

MR. CUNNINGHAM: There is a statement later on sometime that afternoon there was a quote in the I&E report of flow was heavily biased through 16C. Apparently you were, as I understand, attempting to regain natural circulation in the A steam generator.

WITNESS ZEWE: Right. Toward the afternoon, we did get temperature indications in the B loop, I believe, that came on scale, less than 620. It got down to 560 or whatever it was the way we were finally forcing some water through the loop on that side. The A side.

So then we thought if we would bias the flow on the B loop, we could force the same condition and have both loops on scale again as far as the temperature goes. So we tried to force more high pressure injection flow through the 16C which goes into the B loop. But after a short time of trying this, we ended up losing the A temperature again. It went off scale high again.

Slowly we went back to our normal configuration and regained temperature on the A side. Hours later we regained temperature on the B side just before we started the coolant pump.

MR. CUNNINGHAM: I guess I was under the impression you had done a similar thing biasing the HPSI flow through to

regain natural circulation on the A steam generator; is that correct?

WITNESS ZEWE: We had the A injection flow on and it may have been a few gallons a minute more on the A side than it was on the B side which was through the 16C and we thought that that was the difference that we recovered A first. So if we thought that if we accentuated that even more, that we would gain B faster but it just wasn't the case.

MR. CUNNINGHAM: So there was no deliberate attempt to heavily bias the flow into the A steam generator?

WITNESS ZEWE: Not really at first. It may have been, I don't know, 50 to 100 gallons more, but initially I don't remember us purposely doing that. We may have.

MR. CUNNINGHAM: Not like you tried to on B?

WITNESS ZEWE: Exactly.

MR. CUNNINGHAM: Was there any other time during the day where you attempted this kind of configuration where you were running flow through one of the 16 valves only aside from this one case? Any other time it would have been 16A and B or 16C and D?

WITNESS ZEWE: For the most part the rest of the day it was one injection path at least into each loop, one into A loop and one into B loop.

MR. CUNNINGHAM: At least. Could it have been -- was it typically, do you recall, two or all four legs?

WITNESS ZEWE: I would say two legs. A leg and C. We had been given a number in the afternoon saying that we needed at least 400 gallons a minute flow so that is what we eventually throttled to and the capability of those two paths were more than the 400 gallons we needed.

MR. FRAMPTON: May I break in a minute? You said you were given a number at some point in the afternoon. For minimum high pressure injection flow?

WITNESS ZEWE: Yes. We requested from B and W, and they had relayed that to Lynchburg, to come up with a minimum flow number for the condition that we were in. It came back 3,000 gallons a minute was the first number. When I -- we said go back and get a different number because we don't have that capability. So it was quite some time later that they came back and said no, it is really 400 GPM number. We said that is more believable. That is what we used.

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MR. FRAMPTON: When did you first seek to get a calculation, a number from B&W during the day? Do you remember that?

WITNESS ZEWE: Midmorning was the earliest I remember.

MR. FRAMPTON: Why did you want to get that information from them?

WITNESS ZEWE: Right after, around 7:00 I guess it was, the pressure was high, the level was high, we started to throttle again. I had asked for a number from the group there. How much high pressure injection do you want? How much can I throttle? So we didn't have a good solid number other than saying for all the accidents where you have redundancy, you have A and B string and one pump is only capable of about 500 gallons so let's feed about 500 gallons and we know we are safe because you have 100 percent redundancy; so we used that criteria saying 4- to 500 gallons because that is within the capability of one pump and for the accident you assume you have an A and B string but that one is totally 100 percent capacity or the other one.

So that is where we got the initial number there early on. Then it had been requested to come up with some number. Hopefully it would be a lot lower.

MR. FRAMPTON: Did you specifically want --

WITNESS FAUST: They gave us a 300 gpm number.

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WITNESS ZEWE: That was just an arbitrary number whenever we started to depressurize trying to get down to core flooding in the decay heat system.

MR. FRAMPTON: Go back to 7:00 in the morning on the 28th. When you wanted to get a number, was that a number for a minimum flow? A number you wouldn't go below. Is that right?

WITNESS ZEWE: Exactly.

MR. FRAMPTON: You wanted to get that number from B&W specifically? Did you think they could provide that number for some reason?

WITNESS ZEWE: I didn't ask B&W -- I asked that of Gary Merrill and the team that was there.

MR. FRAMPTON: Of upper management.

WITNESS ZEWE: Among them was Lee Rogers from B&W. I am not sure when he arrived. I think he was there somewhere around 8:00. It's that time frame we are talking about, between 7:00 and 8:00.

MR. FRAMPTON: Did he try to find out from Lynchburg an appropriate number?

WITNESS ZEWE: I assume he did. The number came back later in the afternoon. I am not sure exactly when they relayed that or asked or it. At that time I had just asked to see if anyone had a good number idea. Later on I requested again we need something more.

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MR. FRAMPTON: Did you request that of Lee Rogers among other things later on? Did you say to him, do you have any idea of what your people are saying for a number?

WITNESS ZEWE: I addressed everything through Mike Ross and Gary Merrill only. He interfaced there. I directed it to him.

MR. FRAMPTON: But you know that later in the afternoon or sometime during the afternoon you got a number from B&W relayed to you.

WITNESS ZEWE: Right. The first number was -- must have been right around noon or before noon. That was that 3000 number we considered was ridiculous at this point.

MR. FRAMPTON: Why would B&W people who knew this plant communicate a number like that? Was this simply a miscommunication, do you think?

WITNESS ZEWE: I don't know at this time. I don't know exactly the person that gave that number but it was given to me in that light. The minimum flow you would have to have now they said, and I assumed that that was B&W, and that may be a wrong assumption, but that is where we would seek from their analysis people on how much flow to have, was 3000. We said, oh, that is ridiculous and let it drop at that time.

MR. FRAMPTON: Why were you looking for a minimum number? Why did you need a -- why did you want to get a minimum number?

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WITNESS ZEWE: Because I have a range from zero to 1000 gpm and we weren't sure of our cooling status of the core and we were cycling the valve and if I put in less water it would require less cycling of the valve that I was concerned about failing, so if I add 500 gallons a minute, the pressure change in the system is a lot faster. Even though we weren't solid we had voids. Pressure would change more by the more volume I changed.

If I got adequate cooling with 200 gallons I would have to cycle the valve less frequently.

MR. FRAMPTON: I understand that during the morning period. What about after a decision was made by the group to try to depressurize? Did that minimum then go by the board? Wasn't high pressure injection throttled way back in the process of trying to get the pressure down?

WITNESS ZEWE: We discussed on what flow we were going to go to and we figured to try to get around 225 to 250 total flow.

MR. FRAMPTON: During the depressurization?

WITNESS FAUST: That is tough.

WITNESS ZEWE: Then we found out it was very hard to throttle. We found that the best throttle point for throttling and maintaining flow was about 150 gpm in two legs, so we eneded up at 300 gallons a minute high pressure injection flow and still had about 40 gpm of seal water; so

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at that time we had 340 gpm. That is about what we remained at while in that depressurization period.

MR. FRAMPTON: That was until you got the feedback from B&W to maintain 4- to 500 at least late in the afternoon?

WITNESS ZEWE: I am not sure if we didn't receive that number after we began to repressurize again or not. It wouldn't have been a very long time period between us receiving that number and when we elected to try to repressurize up and start the coolant pump. I am not sure of the time frame.

MR. FRAMPTON: Thank you.

MR. CUNNINGHAM: Late in that afternoon, the early part of the evening, reactor coolant pump 1-A was restarted. After it was restarted how were you using the make-up pumps? Normal make-up or what valves? Do you have any idea?

WITNESS ZEWE: None of us were there at that time. I had left. I was the last one to leave of this group. I assume they just used the make-up pump in normal seal injection mode and normal pressure control mode. I would assume. I hadn't heard anything otherwise. Purely an assumption on my part.

MR. CUNNINGHAM: Who would have been the person who would have been doing that manipulation?

WITNESS ZEWE: Shift supervisor, Joe Chwastyk. The supervisor of operations was Mike Ross at that time. Gary Merrill was there, too. I would ask them for any details of

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that procedure. At that point they had pressure and they had level and had a pump running so I wouldn't think they would have to deviate from the norm there.

MR. CUNNINGHAM: You would presume they are running through the 17 valve rather than the 16?

WITNESS ZEWE: I would assume that, yes, though I don't know that to be the case.

MR. CUNNINGHAM: A couple of questions on the pressurizer heaters. When the heaters are turned off by increasing RCS pressure, do they report on the alarm printer as being tripped?

WITNESS ZEWE: Yes.

MR. CUNNINGHAM: So if you were to see that on the alarm printer you would assume that.

WITNESS ZEWE: As far as I am concerned all the status of the pressurizer heaters on the computer are just useless to us. It just ties up the computer for no reason.

MR. CUNNINGHAM: Just ties it up.

WITNESS ZEWE: It really don't serve any useful function to us in the control room.

MR. WORAM: I have a question on that. It seems the pressurizer heaters have electrically two things going on. One is the supply breaker can be either closed or tripped. The other is that the control system, you either have the heaters on or off depending on RCS pressure or level or

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whatever. When the heaters turn on and off, do you get a computer alarm due to the normal cycling of the heaters or do you only get that alarm when the actual supply breaker trips due to, say, thermal overload or something like that.

WITNESS ZEWE: Normal cycling, it's on and off, too.

MR. WORAM: Off the record.

(Discussion off the record.)

MR. FRAMPTON: Back on the record.

Mark, you have to speak louder and more clearly, okay? You have to talk at the reporter.

MR. CUNNINGHAM: Okay.

Like I said, we have had the problem of trying to resolve the mass balances and part of this is just we have to consider the possibilities of somehow bypassing the flow away from the core. The one you were talking about of backing through the steam generators and out the pressurizer, we have a few other possibilities we would like to bounce off of you.

Somebody raised the possibility of a break in one of the ECC injection lines. More specifically, the A line. Is there any indication during the time that anything like that was going on from the flow indication or anything like that?

WITNESS FAUST: Not that I recall. I don't remember anything that would have told me I had an indication of a break in one of the feed lines.

MR. CUNNINGHAM: Another possibility. Apparently

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the borated water recirculation pump was on prior to the transient and remained on for a while and was tripped at some time. I presume that is the normal operation, just to keep water in the BWST mixed. Is that correct?

MR. FREDERICK: Yes.

MR. CUNNINGHAM: Are you aware of any valve manipulations or work with that system during the 28th that would have affected anything?

WITNESS SCHEIMANN: No.

WITNESS FREDERICK: Are you considering that as a way we might have lost water?

MR. CUNNINGHAM: Yes.

WITNESS FREDERICK: What is the pump designation of the pump you are talking about?

MR. CUNNINGHAM: I am not sure. Borated water recycling pump. I am not sure of the number.

WITNESS ZEWE: There are two right by the tank we can recirculate the tank with. Also a spent fuel pump we can put on recirc through filters with. Depending on which pump you are referring to, SFP-2 or the other one is, it makes a difference.

WITNESS FREDERICK: One is borated water tank recirc pump --

WITNESS ZEWE: Two of them.

WITNESS FREDERICK: The other is the borated water

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recirculation pump or something like that. The names are almost identical. But they are completely different system.

WITNESS ZEWE: One is locally only.

WITNESS FREDERICK: One pumps from the bottom to the top of the tank. The other you can pump it anywhere in the world.

MR. CUNNINGHAM: The one I was thinking of was the latter.

MR. FRAMPTON: Off the record.

(Discussion off the record.)

MR. CUNNINGHAM: The pump I was referring to was the borated water recirculation pump that was pumping out through the filters and around. Does that clarify it?

MR. FRAMPTON: What is the question?

MR. CUNNINGHAM: Were you aware of any manipulations with that pump and the associated valves?

WITNESS ZEWE: No.

MR. CUNNINGHAM: Thank you.

WITNESS ZEWE: If there was, how could you get from the high pressure injection leg back in through that pump?

MR. CUNNINGHAM: I am not sure what you mean.

WITNESS ZEWE: You are just referring that we get a level reduction and can't account for it, right?

MR. CUNNINGHAM: Right.

WITNESS ZEWE: Okay.

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MR. CUNNINGHAM: That's right. During that day, were you putting water from the make-up tank out to the RC bleed tanks? Were you doing any alignments between those two tanks that you can remember?

WITNESS ZEWE: You can't do that to begin with. You can redirect letdown to go to a bleed tank but you can't directly go from the make-up tank to the bleed tank except through that relief valve we referred to earlier.

MR. WORAM: I have a question on that.

MR. CUNNINGHAM: The more appropriate question is were you taking letdown flow to the bleed tanks rather than the make-up tanks?

WITNESS ZEWE: I believe we did at various times to keep from taking the make-up tank solid.

WITNESS FAUST: Part of what we were doing, I don't remember it all, we were actually trying, we had problems with letdown even that early, where I was seeing quite large surges in the letdown flow rate itself as well as DPs across the letdown filters -- not filters but seal injection filters, return filters, and the system was just showing us that something was occurring in there, like blockage.

One of the things we were trying to do was improve, to see where our problem was. One way we were doing it was eliminating part of the flow path by just going back to the RC bleed tanks to see if that section of the line might have been part

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of the problem. There wasn't too much time spent on that.

MR. CUNNINGHAM: On putting water to the bleed tank or testing out that section?

WITNESS FAUST: Testing it by directing the water into the bleed tank to see if there was a restriction somehow downstream of that point.

MR. WORAM: The question I had was do you have any feel for how much water you actually put into the bleed tank by going through the -- or a reasonable guess, order of magnitude guess as to how much water you might have put through the valve in the make-up tank?

WITNESS FAUST: I don't think it would have been anything like you are talking about. You are looking in the wrong place for the loss of water there.

MR. CUNNINGHAM: One other possibility of losing water was sometime prior, in the prior history of the TMI units, there was a time where the BWST was inadvertently drained to the reactor building sump through the sump recirculation valves.

WITNESS FAUST: Unit 1, I believe.

MR. CUNNINGHAM: Yes. Do you think there was something like that --

WITNESS ZEWE: I can't remember the draining of the BWST to the sump but I remember draining the pressurizer directly to the sump.

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MR. CUNNINGHAM: Someplace --

WITNESS ZEWE: In Unit 1.

MR. CUNNINGHAM: Someplace that was discussed, that they had drained some of the BWST water to the sump. I guess the question is: do you think --

WITNESS FAUST: They didn't operate the DHV-6-A and -B. They weren't operated that day. We didn't open them up.

MR. CUNNINGHAM: That is the places I am looking for the water. Do you have any ideas of any places where the water could have gone?

WITNESS FAUST: The aqua filter.

MR. CUNNINGHAM: How?

WITNESS FAUST: Through the path we are saying. Put it in the system apparently and vent it off through the relief.

MR. CUNNINGHAM: The path back thorugh the steam generators.

WITNESS FAUST: Definite decrease in the pressurizer temperature. This is later on in the day. It definitely seemed to be dropping.

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MR. HAYNES: I am looking at P&ID drawing 2024, ref 25, a flow diagram of the reactor coolant makeup purification system. Do you know that if this drawing is essentially correct with respect to the designation of the steam generators, the A and B side, the location of the pressurizer, namely, that shows that it is on the hot leg of the A loop?

WITNESS ZEWE: That's correct.

MR. HAYNES: You don't know of any errors on this with respect to the designation of the loop piping?

WITNESS ZEWE: Now that I am aware of, no.

MR. HAYNES: Fine. When I look at this drawing, I see the makeup pump C injects on the high pressure injection system through the 16 C and D valves which go into the cold legs downstream of the 2-A pump and 1-A pump respectively. Okay?

Now, I also see on this drawing that the pressurizer spray line comes off of the cold leg of the loop immediately downstream of the reactor coolant pump 2-A: is that your recollection?

WITNESS ZEWE: Yes. Apray from 2-A, yes.

MR. HAYNES: That also heads through injection valve 16-C coming into the same line. It appears on this drawing -- do you know if that is a common penetration on the piping?

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WITNESS ZEWE: Common? Wait, I am not sure I understand that. You are saying 16-C comes in, if that is common to --

MR. HAYNES: To the pressurizer spray line.

WITNESS ZEWE: No, it is not. It is a separate connection to the piping system itself. It is not --

MR. HAYNES: They are both two-and-a-half-inch pipes.

WITNESS ZEWE: Right. It is not a common tap. They are separate lines.

MR. HAYNES: Are they somewhat in the same relative location?

WITNESS ZEWE: I am not sure how many feet they are apart. I don't recall how many feet. But they are not a couple of inches from each other. They are several feet from each other.

MR. HAYNES: With the C pump on injecting through the 16-C valve, if the pressurizer spray line were open at that time, then you would have a direct path into the pressuriser contract C line.

Do you know if the pressurizer spray line valves were open at any time on the day of the 28th when you were trying to inject in the loop? The high pressure injection system.

WITNESS ZEWE: I don't recall using the pressurizer spray valve at all after we shut off the reactor

coolant pumps other than the automatic mode. We did use the pressure vent, but not the pressurizer spray.

Do you remember using it?

WITNESS SCHEIMANN: No. Pressurizer spray wouldn't have done much good without the reactor coolant -- it wouldn't have done any good without flow in the system for ADP across the spray valve. I don't recall using it, either.

WITNESS ZEWE: Prior to tripping the pumps, we would have no need to use spray with low pressure already. Only to reduce pressure further. I don't remember using the spray valve at all that day.

MR. HAYNES: Is the position of the spray valve indicated on any permanent record?

WITNESS ZEWE: No recorder or anything like that.

MR. WORAM: I believe the position of the spray valve is on the reactimeter.

WITNESS ZEWE: Right.

WITNESS FAUST: Doesn't do us any good.

WITNESS ZEWE: I don't know, for one, all the parameters we had on the reactimeter. There is no permanently installed indication on that reactimeter data -- if it has, I didn't know it did.

MR. HAYNES: I finished my questions.

MR. CUNNINGHAM: This is just a conversation.

This confuses me a bit. We were just saying that the 16-C valve goes to the A steam generator, whereas I thought before, you were saing it was going to the B steam generator.

When they were biasing flow through to the 16-C valve, that was trying to establish natural circulation in B rather than A.

WITNESS ZEWE: I believe when we talked, I had reversed my -- which it was A we had on scale, B we were trying to get, or if it was B, we had an A we were trying to get.

I remember that I said it one way; you said, no, it is the other. So, I changed my mind. At this time, I really don't remember which leg came on scale first. All right? I really didn't -- I know we had increased the flow to the leg that hadn't come on scale yet and I really, if it was the A side or the B side using the 16-A or C, I really don't remember, but it wouldn't have made any difference.

We had increased the flow to the side that we had not received the on-scale instrument yet.

MR. CUNNINGHAM: So, whichever it was, the level biasing the flow was after you had -- it was a deliberate act after you had established apparently some sort of natural circulation in whatever the other steam generator was; is that correct?

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WITNESS ZEWE: Well, I don't believe we actually thought we had positive signs of natural circulation. It was just that we had filled the loops enough to flow over the candy cane and past the RTD to get on-scale indication of what the temperature was of the water and not the steam that was in the area of the candy cane for the RTD. If you can follow that.

MR. CUNNINGHAM: I am not sure.

WITNESS ZEWE: See, we perceived then that the area of the RTDs a the hot legs -- that comes out of the reactor, makes like a candy cane effect. After it turns an comes down before the steam generator is where you have your RTD.

The high temperatures we felt that that was just the steam that was in the loops and, once later on in the day we finally got some down-scale indication, we felt we were then forcing water over the candy cane or over the hot leg past the RTD cooling it off and showing that were once at some minimal flow, if you will, or some water movement past that RTD, which was more indications that we had less voids than what we had before, at least in that loop.

So, I am not sure we said, hey, that is a sign of natural circulation. That is just a sign we had some filling effect in that side. We had some temperatures on scale.

MR. CUNNINGHAM: So, at that point, you believe

that was, at least in some respect, or may have been attributable to the fact that the HPI flow was more biased to that steam generator?

WITNESS ZEWE: I really didn't know, nor do I know now, that we knew the ratio, that A had more than the B or B had more than A or how they blew down unequally or what, but it was just in the course of the conditions that we had for the high pressure injection flows that we started to see the temperator first in one loop and then thought, well, if we increase the flow to the other loop and force more water there, we will fill it up more to meet where the other one was because now, to us, it seemed like we had more water in one loop than the other loop because we were having some flow or some indication of me water in that side.

MR. CUNNINGHAM: So, I think you are saying that the more deliberate attempt to bias flow to one loop was as a result of getting some sort of flow in the alternate generator?

WITNESS ZEWE: Exactly.

MR. CUNNINGHAM: Thank you.

MR. HAYNES: On the three makeup pumps, we have the A, B and C pumps. The A pump is normally lined up when the high pressure injection mode to go through the 16-OA and 16-B valves; is that correct?

WITNESS ZEWE: That's correct.

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MR. HAYNES: The C pump is lined up to go through the 16-C and D valves.

WITNESS ZEWE: Correct.

MR. HAYNES: The B pump can go either route. The same as the A or C pump, depending on how you do your cross-valving.

WITNESS ZEWE: Exactly.

MR. HAYNES: The cross-valving was set up on the 28 such that it goes through the 16-A and B valves.

WITNESS ZEWE: That is correct.

MR. HAYNES: It was not changed during that day at all?

WITNESS ZEWE: It was not.

MR. CUNNINGHAM: Try and talk about a couple of other things now not related to anything else.

In the turbine trip procedures that you have, is there any discussion or precautionary notes or anything dealing with an ES actuation after a turbine trip?

WITNESS ZEWE: I don't recall any at all, no.

MR. CUNNINGHAM: So, during the beginning of the transient, you had the turbine trip, reactor trip, and the ES actuation. The feeling I get thirdhand from this was that it was not considered to be highly significant that you had the ES actuation; is that correct? Or am I missing something?

WITNESS FAUST: That is correct.

MR. CUNNINGHAM: Can I ask why it wasn't considered significant?

WITNESS FAUST: Because if you, which I think you have, review our other trips we had in the past, we had ES actuations on them. Turbine reactor trip where the pressure goes down and picks up 1600 pounds ES and we cut back on high pressure injection then.

MR. CUNNINGHAM: So it is not unusual to get an ES actuation after a turbine trip.

WITNESS FAUST: No.

WITNESS ZEWE: You don't automatically expect it to happen, but just knowing that it has happened before, it is not totally surprising. But it unusual. You wouldn't expect it to happen everytime you had a turbine trip that you have a reactor trip.

MR. CUNNINGHAM: So it is not unusual but not frightening. Whas has been the causes of the other ES actuations? Is there a typical cause?

WITNESS FAUST: Overfeeding of the steam generator.

MR. CUNNINGHAM: It is a matter of too much RCS shrinkage?

WITNESS FAUST: Relief valves not seating. Not the one we are talking about here. I am talking about the

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main generator safety steam side.

WITNESS ZEWE: Normally it wa attributed to other problems.

MR. CUNNINGHAM: I am not sure what you mean by other.

WITNESS ZEWE: Other events that caused you to cool down either more rapidly because of it. Like one case where we overfed and cooled down too much so we had ES actuation after turbine trip.

Another time the main steam valves failed to reseat which further cooled us down to ES. We had a turbine trip and reactor trip and, yes, we had ES, but there was something else that really gave us the ES. If you just have turbine trip, normally you shoulnot get it.

MR. CUNNINGHAM: When do you become aware of the fact that the reactor coolant drain tank rupture disc had broken?

WITNESS FAUST: I didn't even know it during that day, I don't believe, myself.

MR. CUNNINGHAM: Anybody else? Do you recall?

WITNESS ZEWE: I suspected it, or at least knew there was something wrong with the RC draining tank, and I am not sure of the time-frame. Probably somewhere after a half hour and prior to the first hour and a half, that there was a definite problem with the RC drain tank, but I am not

sure that I knew that the rupture disc went.

It could have been a stuck relief valve or some other breakage or problem with the RC drain tank. But it was not before the first half hour.

MR. CUNNINGHAM: Did you attribute any significance to this?

WITNESS ZEWE: Only that we knew that the electromagnet had lifted on high pressure and it should have on high pressure and the initial discharge of water into the tank could have ruptured something in the tank, yes.

Not that it was a continuing thing, because the first time I went back to look at the RC drain tank, I believe Ed was with me then, and we looked at the pressure was zero and the temperature was around 210 degrees and it was off-scale low on the level.

MR. CUNNINGHAM: This would have been in this half hour to 90-minute time period?

WITNESS ZEWE: That is as close as I can come to it.

MR. CUNNINGHAM: Seeing the lack of level and lack of pressure, is that something that is fairly typical? Is that what you would expect?

WITNESS ZEWE: You should see level. You should see a certain amount of pressure in it, too. So I thought in my own mind that you did have something wrong with the

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drain tank, but that it happened due to the reliefs opening but it was not a continuing thing.

WITNESS FAUST: I don't know about the pressure necessary because we have gone back there and not had any pressure indication on the tank as far as the pressure.

MR. CUNNINGHAM: During normal operation?

WITNESS FAUST: During normal operation. We have gone back there with the tank level quite low at times where you didn't get down to 70, but down around I guess 80.

MR. CUNNINGHAM: 80 what?

WITNESS FAUST: 80 inches.

WITNESS ZEWE: But knowing that we had a relief valve open on us and still now not having any pressure, we should have had some pressure under these conditions still in the tank from the relief because we knew it had relief, but now there was no pressure in the tank, so that was an issue.

MR. FRAMPTON: Does the reactor coolant drain tank have a high temperature alarm?

WITNESS ZEWE: Yes.

MR. FRAMPTON: Where does it alarm visually, if at all?

WITNESS ZEWE: On the computer.

MR. FRAMPTON: Is there a visual alarm that appears anywhere on the back panel?

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WITNESS FAUST: On the back panel itself. 8-A.

MR. FRAMPTON: That is a —

WITNESS FAUST: I am trying to remember specifically. I believe an alarm —

MR. FRAMPTON: Is this a visual alarm?

WITNESS FAUST: Yes.

MR. FRAMPTON: High temperature alarm?

WITNESS FAUST: I believe so.

MR. FRAMPTON: That is your recollection. What about a high pressure alarm? Does that in the reactor coolant drain tank appear on the back panel, too?

WITNESS FAUST: Listed as high-low pressure.

MR. FRAMPTON: Would they be visual from the main console?

WITNESS FAUST: No.

MR. FRAMPTON: They are facing the other direction?

WITNESS FAUST: Yes.

MR. FRAMPTON: On the back of the back panel?

WITNESS FAUST: Right. Two panels back there.

MR. FRAMPTON: Do those alarms sound audibly in the control room?

WITNESS FAUST: If it is an alarm im, you will know it.

MR. FRAMPTON: If there are other audible alarms

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going off, you wouldn't know either of them went off.

WITNESS FAUST: You wouldn't know if anything went off the back panel at that time.

MR. FRAMPTON: What about reactor coolant and drain tank rupture disc? When the disc blows out, does that cause an alarm?

WITNESS FAUST: No, except low pressure maybe.

MR. FRAMPTON: Is the reactor coolant drain tank disc in the bottom of the tank?

WITNESS FAUST: No. The top.

MR. FRAMPTON: It is on the top of the tank.

WITNESS FAUST: Yes.

MR. FRAMPTON: What would have caused the level indication to go to zero when you went to look at it?

WITNESS FAUST: I am not sure. It might be a dry reference.

WITNESS FREDERICK: The level indication doesn't go to zero. The lowest level you read is 70 inches.

MR. FRAMPTON: That is an off-scale low, in other words?

WITNESS FREDERICK: Yes.

MR. FRAMPTON: When was the first time that you, either of you, Mr. Frederick or Mr. Zewe, went to find out what the back panel readings were with respect to the reactor coolant tank? Was that at the time you described?

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Sometime about a half hour to an hour and a half into the accident?

WITNESS FREDERICK: Yes.

MR. FRAMPTON: Your discovered that the level was bottom low and there was no pressure; is that right?

WITNESS FREDERICK: Yes.

MR. FRAMPTON: What would that tell you about the state of the tank? What conclusion did you draw about what the situation was there?

WITNESS FREDERICK: The only conclusion you could draw directly is that the level was a little bit low. About six inches low.

MR. FRAMPTON: Would that tell you the rupture disc had probably blown?

WITNESS FREDERICK: No.

MR. FRAMPTON: It would not?

WITNESS FREDERICK: No.

MR. FRAMPTON: Then --

WITNESS FAUST: Uou would have to have a trend or be standing there watching pressure actually go up to be sure the rupture disc blew and see it decrease or else the trend report printing this out so you come back and say we just exceeded the capacity of the relief and picked up that of a rupture of 200 pounds.

MR. FRAMPTON: Was the fairly high temperature reading and level low indications, were they consistent with the possibility that the EMOV had opened and then shut at its low set point?

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WITNESS FREDERICK: To me they were. I would have expected the tank to heat up.

MR. FRAMPTON: Which it has.

WITNESS FREDERICK: Yes. I would have expected the level to change one way or the other. If you had steam generation and lifted the relief valve, you might have lost some water level through heating up the whole tank and I would have expected either a normal or higher than normal pressure. When we went back, it was zero or about normal. Just a bit above zero.

MR. FRAMPTON: What is normal pressure?

WITNESS FREDERICK: Zero.

MR. HAYNES: May I continue a moment? The reactor coolant drain tank cooler intermediate cooling tmeperature was alarmed at 11 and a half minutes, supposedly, to some of the sequences and that alarm set point was set 25 degreesF. Does that strike a bell with any of you?

WITNESS FREDERICK: What cooling alarm temperature is that?

MR. HAYNES: Intermediate cooling temperature for the reactor building drain cooling system.

WITNESS FREDERICK: There is no intermediate cooling closed water to the reactor coolant drain tank. The system which cools that is the linkage closed cooling system which is cooled by decay heat in the closed cooling water

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system.

WITNESS FAUST: Referred to as leakage closed cooling.

MR. HAYNES: You have a cooling system in the reactor coolant tank; is that correct?

WITNESS FREDERICK: Yes.

MR. HAYNES: Does that have an alarm if the temperature gets too high in the cooling loop?

WITNESS FREDERICK: Not that I'm aware of. The one we have is high temperature in the tank, not in the cooling water that cools the tank.

MR. HAYNES: Okay.

WITNESS FREDERICK: If there is a computer alarm for the leakage in the cooling water system, that's probably where you found that. Does it give the course of that?

MR. HAYNES: Alarm printer and reactimeter. It says that it's set 225 degrees F. The point I'm trying to get at is if the cooling loop is 225 degrees F, then the water in the tank that is trying to cool has to be at least 225 degrees F; is that true? Now, if the rupture disc breaks under this condition, then would not the contents of the tank flash into steam and empty the tank?

WITNESS FREDERICK: Empty the tank? Not necessarily.

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MR. HAYNES: Would it flash and tend to decrease the level?

WITNESS FREDERICK: You would have some steam generation and appropriate reduction in level. The evaporation of the water would cause the water to cool.

MR. HAYNES: But there would be a decrease in level?

WITNESS FREDERICK: Yes. It would be difficult to estimate what the decrease would be unless you had a continuous heat source. Then you could say it would blow dry.

MR. HAYNES: Say the continuous heat source is open relief valve from the pressurizer.

WITNESS FREDERICK: Certainly. I imagine it would blow dry, yes.

MR. HAYNES: If I may pursue on this panel 8A, at the time when the transient started, several alarms came in the control room, as I understand it; is that right?

WITNESS ZEWE: Yes.

MR. HAYNES: When was the alarms -- enunciator alarm system acknowledged first to your recollection?

WINTESS ZEWE: Several minutes after the start of the event.

MR. HAYNES: More than 15 and less than 30?

WITNESS ZEWE: Less than 15.

MR. HAYNES: Was it subsequently acknowledged again?

WITNESS ZEWE: Several times after that, yes.

MR. HAYNES: If I understand the panel 8A enunciator system correctly, if you acknowledge out on the front board that the horn will not go off, the audible alarm will not go off if there is also an alarm on the back panel; is that correct?

WITNESS FREDERICK: That depends on which alarm is in on the back panel.

MR. HAYNES: Say the alarm is the high temperature in the reactor coolant drain tank, for example, or low level in the reactor coolant tank.

WITNESS FREDERICK: The alams on panel 8A are silenced in the control area.

MR. HAYNES: They're silenced there?

WITNESS FREDERICK: Yes. They would go out. If that was the one causing the horn, it would stop. The alarms that are not acknowledged from the front are ventilation alarms on panel 25A.

MR. HAYNES: So what you're saying is that you could have alarms on panel 8A that came on, acknowledged on the front, which would acknowledge them on the back panel 8A and they woul go, if they're still in an alarm state, on under the light on status and you really would not know that those

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alarms came in until you got up and walked around to take a look at panel 8A; is that correct?

WITNESS FREDERICK: That's correct.

MR. HAYNES: Do you recollect, when you first set the alarms and the horn cleared, did any of you go and take a look at the --

WITNESS FAUST: It didn't clear very long. Push the button and it went back on.

MR. HAYNES: Was there ever a period when the alarm was cleared for a few minutes? The horns cleared for a few minutes?

WITNESS ZEWE: I'm sure there was, but it didn't seem to like it.

WITNESS FAUST: It seemed like it was going all the time.

MR. HAYNES: I believe you went back and checked the back panel sometime after 15 minutes of so; is that correct, the panel 8A?

WITNESS ZEWE: Half hour or so.

MR. HAYNES: Did you notice any alarms on panel 8A at that time?

WITNESS ZEWE: I really didn't concentrate on the alarms that I had. I was concentrating on the panel indications that I had.

MR. HAYNES: What were the panel indications that

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you saw?

WITNESS ZEWE: Zero pressure off scale low level and elevated temperatures. Those are the only parameters we have there for the RC drain tank itself.

MR. HAYNES: And I believe you said that your evaluation of that at that time was that possibly the rupture disc failed or a relief valve was opened; is that correct?

WITNESS ZEWE: Something was wrong with the tank because of the relief valve but I didn't perceive it was still continuing. That's all.

WITNESS FAUST: At the time I think one of the things we came up with later, one of the things we were thinking about at the time was we might have lifted the code relief valves. It was just a consideration.

MR. FRAMPTON: Let's take a short break.

MR. CUNNINGHAM: Can I ask one more question and I'll be done?

MR. FRAMPTON: All right.

MR. CUNNINGHAM: This is a general question. I guess for all of you. In a general sense, how do you rate the B & W design of a reactor, of an NSSS and the power plant in ease or difficulty of operability and operation?

WITNESS FREDERICK: I'm not sure the construction of the NSSS is directly relatable to the layout of the control room.

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MR. CUNNINGHAM: I wasn't talking in terms of control room layout. I was talking in terms of as you're trying to produce kilowatts from a plant. Is it a plant that you have to constantly fiddle with and make small adjustments to it or is it a plant you can sit back and it will purr along by itself?

WITNESS FREDERICK: I thought it was rather a smooth running plant myself.

WITNESS ZEWE: I can just interject an experience I had on Unit 1 in the last five years in operation. My evaluation, it's a very good plant to control, but then you must recognize this is all we have. We have nothing to compare it to. I compare Unit 1 with Unit 2, but that's as far as I can go. From operating Unit 1 for the last five years, it was a very stable plant that you haven't had to adjust except periodically and we went through a whole fuel sequel without an unplanned reactor trip for a whole year. That in itself proves it's a pretty reliable system and a pretty controllable system. But it did take sometime in start up phase and then some work time to work out some of the little design bugs, if you will, that you will have to work out. But I don't think it's hard to control. I think it's a good system.

WITNESS FAUST: Essentially, I was thinking along the lines Ed Fredericks just said. I wouldn't mind having a little more indication here and there.

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MR. FRAMPTON: Let me ask a follow-up question. I will start with you, Mr. Faust. Did Unit 2 have any kind of reputation relative to Unit 1 of being troublesome or a difficult plant during the start up preoperational testing?

WITNESS FAUST: I was getting the impression we were having -- being harassed, being off more that we were, but that was still early in operation.

MR. FRAMPTON: Do you mean the machine was giving you a lot of trouble or somebody else was giving you a lot of trouble?

WITNESS FAUST: I guess you would call it, when you pick up the phone and talk to Unit 1, why: "Oh, are you on line yet?" We experienced -- everybody is aware of quite a few difficult shutdowns on Unit 2. I don't know if I could point a finger at it and say we were worse than anybody else.

MR. FRAMPTON: Do you think their attitude came from the period of down time, the specific trips and problems that we are aware about in the history of the plant or was it a lot of other little things, too?

WITNESS FAUST: Just more competitive between the units, I guess. Who is up more than the other one. You had more operating time than we did. I don't think there was anything really meant by it.

MR. FRAMPTON: Does anybody else have any thoughts

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about that?

WITNESS ZEWE: I think that practically everyone you talk to would prefer Unit 1 to Unit 2.

MR. FRAMPTON: Why?

WITNESS ZEWE: A number of reasons. One, they're more familiar with Unit 1. The people you may talk to, they first trained in Unit 1. We all first trained in Unit 1. The plant has a fine record. Very, very few problems in relationship to Unit 2. Different types of problems but not as many. We're futher along in Unit 1. I think at that time design aspect of a plant, I like Unit 1's secondary side and control room layout much better to Unit 2. I think just a general feeling of attitude was, you wanted to know for these various reasons, was it a preferable unit to the operator.

WITNESS FAUST: I want to comment on what he said in the sense that depending on which unit was up or down at the time, whether they preferred one or the other. I heard other guys state that boy, it's nice to be over at an operating unit. That Unit 1 is a pain in the ass when it's down.

WITNESS ZEWE: If the operator was hired into Unit 2 and he had very little to do with Unit 1, you would find a reverse effect. Something they were familiar with first, that's all you know. so you say this is better than over there. Those that worked both units, like myself, for a number of years, I don't believe that I know any of the

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shift supervisors that worked both units that wouldn't prefer Unit 1 over Unit 2. But personally, you work more with one unit and it just, you know, it's preferred from that standpoint.

MR. FRAMPTON: Can you put your finger on what was preferable about the secondary side in Unit 1? Was it for reliability? Was it simpler?

WITNESS ZEWE: From my own standpoint, I think that the secondary side was better designed, laid out better, more accessible, had a lot of better reliable features than Unit 2 secondary side.

MR. FRAMPTON: Can you expand on what reliable features means?

WITNESS ZEWE: I believe that the hot well level control system was inadequate for the system. We could never quality control out hot well level. We had repeated problems with the condensate booster pump recirc lines which have high vibration and high noise levels. We cannot have any bypass valves for either the condensate polishers or on high D p, and the valve we have is not open with an excessive amount of D p on the system. You have to get down and manually open it up locally. The design of where the vacuum pumps suck out of the main condensor lead to problems with feeding the main vacuum pumps. The turbine bypass valves going into the condensor has led to an awful lot of problems

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with the hot well level. We don't have particularly bypass valves or warm-up lines around the major valves of the plant. We don't have position indication of the major valves in the plant, manual valve locally. We don't have bypasses around the condensate pumps or the main feed water pumps so if we want to clean up feed water and run the condensate pump, you have to windmill the booster pumps and feed pumps. All these things in Unit 1, they do have an automatic byoass around the polishers that opens on high D p. There is no problem with recircs for the booster pumps or condensate pumps. They have bypasses running to the booster and feed pumos. All these things Unit 1 has. I can only compare that plant with this plant. The good features. Plus I consider that the condensate polishing system as a whole still had a lot of problems. We spent many, many years, I would think, in time spent on the polishers and it was still an inadequate system. We were always running near the total design capacity of the system. We had problems with transferring resin and whatnot. Unit 1 had a resin type coating bed. It was much easier to use. Maybe it couldn't handle a large capacity feed water problem or a leak in the condensor, but I considered that system a lot more reliable in that facet. I think that just the design of the feed water pump turbines, if you walk to a 281 elevation of the tubine building, good luck. It's really bad now because of the

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accident because we added a . w more things. But even before then, if you look at the Unit 1 main feed pumps and the Unit 2, they're exactly the same pumps. Different turbines. And the turbine designs are good. It's just crammed into too small a space. Hard to work on. Very hard.

WITNESS FAUST: Crazy.

WITNESS ZEWE: Unit 2 like Unit 1 had a lot of problems with heater drain pumps, but Unit 2 had more problems with them. The design philosophy changed quite a bit. All of those sort of things, plus the water make up system, we have not been able to use it yet effectively where all the de-mineralized water used for the island comes from Unit 1. The Los Angeles water treament in Unit 2 has never been used effectively. Either the pretreament system or the de-mineralizer system. We have not been able to make it work. Here again, may man-hours were spent, months and years. We have not been able to make that system work.

MR. FRAMPTON: Would it be fair to say that the vast majority of the significant events, trips, and problems that occurred in Unit 2 during the preoperational testing, the start up year and the period of '79 up to the accident originated in one way or another on the secondary side rather than the reactor primary system itself?

WITNESS ZEWE: I would say so, yes. Typically, you always have more problems on the secondary side. That's

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where you devote most of your attention to, the primary side or -- the secondary side problems. Primary side is a lot more controllable from my aspect.

MR. FRAMPTON: You say from your aspect. What do you mean by that? From the point of view of the operators in the control room running the plant?

WITNESS ZEWE: Exactly. The primary side is very controllable from the control room. The seconday side is not necessarily as controllable from the control room as what the primary is for the control room.

MR. FRAMPTON: So you have to have people out there physically spinning the valve wheels and whatnot, monitoring conditions; is that what you're saying?

WITNESS ZEWE: Yes.

MR. FRAMPTON: Is the primary side the NSSS, is that relatively more reliable as well? More reliable than the secondary side?

WITNESS ZEWE: Yes.

MR. FRAMPTON: And much more problem-free?

WITNESS ZEWE: It's much simpler. You have two pieces of pipe with a pot in the middle and four pumps. From the time you begin the start up until the time you're 100 percent power, there is not much change in the system except for the rod portion or the boron in the water. In the secondary side you're changing the speed of the pumps, flow

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rate through the systems, temperature of all components. You have many, many more variables in the secondary side whereas the primary side the temperature is constant, flow is constant, pressure is constant. What is going to go wrong? As soon as you're producing a little bit of power, you're hardly going to change anything in the primary system all the way up to full power.

MR. FRAMPTON: Yet isn't it the case for you in the control room, anything that happens in the secondary side can have a very subtle and immediate impact on the primary side in many cases, causing a trip or a run back or some other potential problem? Would you say that is a fair statement?

WITNESS ZEWE: Yes. For, the whole reason for the primary system is the secondary side, which is to make -- to turn the water into steam and spin the turbine. We wouldn't need the primary side if we didn't have to have the secondary side.

MR. FRAMPTON: Thank you. Let's take our break now.

(Recess.)

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MR. FRAMPTON: Back on the record. Mark this 8, please.

(Exhibit 8 identified.)

MR. FRAMPTON: Mr. Frederick, I would like to ask you a couple of questions about what we have marked as Exhibit 8, a handwritten note from you to "Jim," dated May 3, 1978, which I believe is a memorandum you sent to Mr. Seelinger making some comments on his report on the April 23, 1978 transient: is that right?

WITNESS FREDERICK: Yes.

MR. FRAMPTON: You have been questioned about that memorandum rather extensively in a previous deposition, and I won't go through it completely, but there are one or two questions I want to ask you about it.

Did you ever receive any feedback from Mr. Seelinger on your suggestions made in this memorandum?

WITNESS FREDERICK: Yes. The deposition that is an exhibit in the Presidential thing, the other half of the letter is attached t it.

MR. FRAMPTON: He returned a two-page handwritten memo to you commenting on your suggestions?

WITNESS FREDERICK: Right.

MR. FRAMPTON: After that, do you recall whether there was any feedback to you as to whether any of Mr. Seelinger's superiors acted on any of these suggestions?

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WITNESS FREDERICK: I can't remember any specific feedback from Mr. Seelinger, but I saw some modifications in the plan.

MR. FRAMPTON: Made as a result of your suggestions?

WITNESS FREDERICK: Probably not made as a result of my suggestions, no, but they were similar concerns that other people shared, I suppose. In other words, I never received a memorandum that said, "In reply to your suggestion 3 of such and such, there is a new light on the control panel."

MR. FRAMPTON: Okay. Paragraph 3 in your memo noted the alarm system was poorly designed and contributes little in the analysis of a casualty.

Prior to this time, had you and other operators suggested that the number of alarms that indicated in the control room be reduced?

WITNESS FREDERICK: Had we requested it of Mr. Seelinger?

MR. FRAMPTON: Of anyone.

WITNESS FREDERICK: Yes.

MR. FRAMPTON: Was there any program in effect to try to look at the alarms and see whether some of them weren't necessary?

WITNESS FREDERICK: At what time?

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MR. FRAMPTON: At the time of the April 23 transient.

WITNESS FREDERICK: I don't recall. I know there was one in progress earlier this year before the accident.

MR. FRAMPTON: There was?

WITNESS FREDERICK: Yes.

MR. FRAMPTON: Can you describe what that was?

WITNESS FREDERICK: Met Ed had two full-time engineers analyzing each alarm and its applicability to normal and emergency operations, and they were deciding one by one which alarms would be retained and which would be eliminated or modified.

MR. FRAMPTON: Was their program in response to a perception that the number of alarms in the control room was just overwhelming?

WITNESS FREDERICK: Yes.

MR. FRAMPTON: Do you know whether much progress was actually made in reducing the number of alarms before the accident on March 28, 1979?

WITNESS FREDERICK: As far as I know, it was still in the stage where they had identified which alarms they wanted to change. They may have changed a few, but they had not really gotten into the hardware changes full tilt.

MR. FRAMPTON: Mr. Zewe, do you happen to know whether a large number of alarms had been identified to be

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eliminated, if possible?

WITNESS ZEWE: We really had two different facets of the alarm, rectifying the alarm problem. We had reduced the number of alarms from over 100 down to about 50 that were in when you would normally operate, and these ones that were in when you were normally operating were the ones that they were trying to evaluate to see if we shouldn't change the condition of the alarm to reflect an abnormal condition, rather than a normal condition, but we did have considerable work from the maintenance force in fixing alarms or reasons why alarms within that were valid.

There was just something wrong with the alarm circuit itself, but it measured the right parameter, but there was some problem with it. An awful lot of these were fixed. We used to identify the existing alarms and reasons for them on the surveillance which was done every Wednesday morning.

We would tabulate all the alarms we had. This would go to maintenance. They would try to work on all these alarm problems and try to rectify them. This engineering twosome that Ed talked about was working on the same things, but on rectifying existing problems with the alarm as it existed, not fixing any discrepancies that the alarms had at that time.

I thought we had made considerable progress with the number of alarms we had that were valid or they were

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nuisance alarms or they were alarms that were broken, so to speak.

MR. FRAMPTON: Would you say that the number — the gross number of alarms that are displayed in the control room, that factor in itself contributed adversely to your handing of the accident in this case?

WITNESS ZEWE: I think it had an effect, yes, because the number of alarms is somewhat overwhelming on trying to go through and methodically account for each of the alarms and what to do about the individual alarms. The volume was just too great.

MR. FRAMPTON: What you are saying is the number of alarms made it difficult to prioritize, pay attention to the more important ones and leave the least important ones for later?

WITNESS ZEWE: Exactly, yes.

MR. FRAMPTON: What about the noises? The fact that there was constant or recurring horns? Was that a factor? Would that make it somewhat difficult to respond in a measured way to what was going on? Was it annoying?

WITNESS ZEWE: Annoying, yes.

MR. FRAMPTON: Do you have any suggestions about anything that could be done to rectify that, to have some kind of a system that brings the alarm to your attention during an accident situation but doesn't overwhelm you with

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a constant buzzing?

WITNESS FAUST: You could use a silencer for one thing. When you are clearing it, you are acknowledging the alarm. Okay, acknowledge it and have that alarm locked in until you then can get a chance to clear that individual alarm to look at it. Not to where you push a button and that one goes off and another comes in. Or the same one comes in and out again and again.

MR. FRAMPTON: What you are saying is there should be an acknowledgement system which permits you to turn off the noise but freeze the alarm until you actually go to a second action of clearing it?

WITNESS FAUST: If we had a system that froze the alarms that came in and kept them in, it would get to a point where the alarm would no longer -- you freeze enough alarms you have a lot of alarms in. We freeze them in state. They would be in. We knew we had to look at them. We would then indvidually eliminate an alarm, if we had the time to go up and look at it to get rid of it. But to have it coming in and out, and you don't know which state you are catching it in necessarily, that is when it gets annoying and gets useless when you are trying -- yhou don't have the time to look a that one, and you have several other ones you are trying to work on at the same time coming on.

What is the sense in having it that way? You might as

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well have it come in, freeze, and when you have the time, of it takes 14 hours to get to that alarm, at least it's still in, not continually alarming in our area.

WITNESS FREDERICK: The comment I made in that memo was partially in request to have the alarm system worked on that had problems with that system, but also the system as a whole, to have it considered as far as how effective it was in performing its function. The overhead enunciator blinking-light type alarm I think is kind of an ancient idea by now, in that the type of information the operator needs to respond to could better be displayed in a different way. Probably a more expensive way but certainly a more — in a manner that gives the operator more information than simply, for instance, a level alarm that says level high or low. Then it just leaves you with a limited amount of information.

You know of the problem but have no idea what is causing it.

MR. FRAMPTON: The view you expressed was the system as it existed at the time was not very effective in giving you the most important information you need under abnormal circumstances; is that correct?

WITNESS FREDERICK: Yes.

MR. FRAMPTON: Had you and other operators been making such inputs since the beginning of the installation

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control room in Unit 2? Is this something you observed prior to this time?

WITNESS FREDERICK: Comment that the number of alarms was excessive and the enunciator acknowledgement was undesirable, that comment was made prior to the time the panels were energized, while they were still installing the panels. While the room still has no electricity in it.

We were touring the plant looking it over casually. We could see there was one enunciator acknowledgement button in the center console in the middle of all of these, whatever, 13 panels. There is only one button to acknowledge 1200 alarms.

MR. FRAMPTON: That was changed, was it not?

WITNESS FAUST: Got more buttons.

MR. FRAMPTON: But didn't change the fundamental system of single state acknowledgement of enunciators.

WITNESS FREDERICK: Right. Just gave you more buttons that perform the same function.

MR. FRAMPTON: How realistic do you think it was to suggest that the whole system be reconsidered after it was designed and in the process of being installed?

WITNESS FREDERICK: The statement I made was probably unrealistic in that I asked them to change the system, but at least they could have installed the same acknowledgement system Unit 1 had. A three-button

acknowledgement system. Where you can test, acknowledge and clear alarms all from the same station. With several on the panel.

MR. FRAMPTON: Do you think there were other aspects of the control room design or display system that made it difficult to respond effectively to this accident or might well make it difficult to respond effectively to other accidents?

WITNESS FREDERICK: The location of the instrumentation on the panels, we have discussed many times. Most of the operators that I have talked with agree that the parameters are not displayed in the area in which you institute the controlling function. In other words, you are manipulating the feedwater station, it will have a definite effect on reactor coolant system pressure. The two are not anywhere near each other on the panel. They are probably 12 feet apart. Going into ES actuation you would expect the operator to throttle high pressure invection or control high pressure injection flow.

The control valves are on the forward desk section and the flow indicators on the rear upper-right panels. They are another 10 feet apart. They are standard 6-inch gauges or 8-inch gauges. So that the indicators for the parameters which you are controlling should be located near the control station, so you can see what you are doing. In many cases

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for critical operations your controling station and parameter are quite a distance apart. That makes it very difficult to operate.

MR. FRAMPTON: I believe someone told me that an operator, perhaps it was you, installed a mirror at one point to be able to see the necessary instruments. Do you know about that?

WITNESS FREDERICK: That was after the accident. We had made the suggestion repeatedly that a separate alarm system or some type of viewing system be established that we could see the alarms on the rear panels, so we could read them from the operating station, to separate them from the rest of the alarm system completely. We suggested putting up a long mirror so we could look up and see where there was a light flashing back there or up in front. That was never done. But after the accident, we came across a small mirror, and I hung it up there. It didn't work very well, but it was better than nothing.

MR. FRAMPTON: Are there other things about the control room design itself that made it difficult to respond to this accident?

WITNESS FAUST: You have here the one about the console being too long without any access to the back panel. Talking about the control room console itself. Without going around the end of the panel — it end up the

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whole length and you have to jump over the panel, so it ends up in a nice little walk around the corner of the panel and back around to where you are at.

WITNESS FREDERICK: You might be able to see in this diagram. There is only one split panel for access to the upright panels between 2 and 3. It would have been advantageous to have one on the other side of the room between 5 and 6 or 4 and 5, so one could reach the rear upright panels without having to exit the control area and come all the way around the side of the panels.

WITNESS FAUST: Just the way out of controls alone on the panel, as far as what is pertinent to the operation, switches you rarely use or in an emergency situation you don't need to use, being up on the front panel compared to what is on the back.

MR. FRAMPTON: Mr. Zewe, do you happen to know whether there was any system for operators, foremen and shift supervisors to have an input into what the TMI 2 control room would look like at the time it was being designed? Was there any way the company came to people who would have to run this thing and said, "Looking at the Unit 1 control room, what changes, additions, improvements can we make?" Do you happen to know whether there was any systemized way of doing that?

WITNESS ZEWE: The design was pretty well set when

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I was first a shift foreman at Unit 2 in 1973, the design was pretty well set even though none of the panels were in place. I can only recall one instance where I had inquired about a separation in the panels also, and they said it had already been considered, but that the engineering was too far along for it to be changed, and we really couldn't prove in their minds, being upper management, that we really needed it. I think we took more the stand we would learn to operate what we had, more so than to try to change it, because it was very difficult from our standpoint to institute changes without really operating it and really knowing if it was difficult, unless it's totally obvious from the beginning. Then it was hard to support, well it's more of a convenience item, more so than a real hindrance that could lead to safety aspects.

But we did have the mechanism available through problem reports that we could bring it up to upper-level management, so they could make the final determination whether it was valid or warranted a change or not.

MR. FRAMPTON: What are the major improvements that you think are necessary or major directions you would like to see control room design move in to handle the kind of thing you had to go through on the 28th? What are the big things that are important that this control room perhaps didn't do well?

WITNESS ZEWE: Better all around indication. More reliable indication from a recording standpoint. I think a lot more things that are just displayed should be recorded in a more effective manner by way of a brush recorder rather than a slow pen and ink type recorder that we have. It is a very slow speed, very inaccurate, hard to trend because it is low speed. Most of the recorders that we have external to the main console that are on the upright panels by and large are pretty well useless to us.

The multipoint recorder aspect, I think we are way past that stage to where we need to rely on a multipoint recorder for any important parameter at all.

MR. FRAMPTON: Can you really read those things in the middle of a fast moving event?

WITNESS ZEWE: No. That is what I am getting at. You have to have something you can relate to in a timely fashion at a sufficient speed so that you could see trends and see the parameters as they are happening.

Of course, a higher speed, more capacity computer would be a lot better, too. So they could have the information

readily available if and when we asked for it.

MR. FRAMPTON: Would it be important that the computer call up if it were on a console be able to show you a trend rather than a number and give you a display that would give the last five minutes or hour of five hours?

WITNESS ZEWE: I think the CRT display aspects of a computerized input for primary and secondary system parameters is very useful.

WITNESS SCHEIMANN: I go along with what Bill said. I would try and get some of those possibilities and information we got in the back out towards the front more. Some of the more critical information. RPS cabinets, I am not too pleased with where they are sitting. They are back behind the main console section where you have to go all the way around to get to them.

If you have a trip or something, you have to check and reset papers, you have to actually go out behind the control area itself in order to get to them. I would move them in. Pressurizer heater controls, I would move them.

The motor control center and the breakers for them. It is in an area where in the past we normally had steam problems in there. You mess up your heater controls. Things along that nature would be what I would change as well as some of the others.

WITNESS FAUST: Just having -- this goes along with what we are talking about on panel location of meters. What I

have in mind is just more of the principal data, pressures, primary temperature and pressures related not only in one corner, but in other areas of the plant, the console -- in other words, operators usually take up station during a transient. It helps more if he is looking at it when he is trying to concentrate on something, if he is looking at it in front of him than hearing somebody else talk in the background what he is watching and what you are trying to watch and relay it between you that way.

WITNESS FREDERICK: Last week the Essex Corporation interviews, I suggested they consider having a central location in a prominent place along the central console, a display of reactor coolant system temperature, pressure, steam pressure, feed water flow, pressurizer level, all where you can see them in a group so that as one changes, you can see the effect on the others, instead of having to walk through all different panels to gather all the information.

MR. FRAMPTON: Put the major,most important parameters from different systems in one central location where you can look at the way they are reacted?

WITNESS FAUST: Multiply it once or twice. In other words, I can look at it here while Ed looks at it in his corner and saying what are you doing that is causing that? If he knows he is not doing something, I might be creating the problem over at the station where I am at.

MR. FRAMPTON: I want to turn to a slightly different topic that also arises out of your memo, Exhibit 8. In paragraphs 7 and 9 of that memo, you noted that the April 23 transient was something that presented you with a situation that you really weren't trained for. And where you have multiple failures in a situation that you are not really trained or prepared for, it is very difficult to be effective.

Is that a fair characterization of what you felt about that particular transient?

WITNESS FREDERICK: I think that is fair, yes.

MR. FRAMPTON: One of the things that you said in your memo was: "You might do well to remember that this is only the tip of the iceberg. Incidents like this are easy to get into."

Could you explain what you meant by that?

WITNESS FREDERICK: I believe I was trying to illustrate that the incident which we had survived without suffering any core damage or any significant equipment damage other than the fact we may have to replace the main steam relief valve, which we eventually did do, I said that incidents like this, meaning incidents which involve multiple casualties or multiple failures of equipment, seem to me to be easily postulated.

The failure of any two components simultaneously or as a result of the other seem to me to be fairly simple.

MR. FRAMPTON: But you hadn't been trained for such

an event?

WITNESS FREDERICK: Yes.

MR. FRAMPTON: The same is true of the accident on March 28, '79, right?

That was something that you hadn't seen before and you hadn't been trained to see or respond to; is that right?

WITNESS FREDERICK: Yes.

MR. FRAMPTON: I guess what I am getting at is this: I think it was Mr. Zewe who said before that on a number of occasions when there were trips or transients, the operators were seeing something in the sequence of events that was not anticipated. It wasn't a by-the-book element of that particular trip or transient. Let me ask you, Mr. Frederick, to start with, events that you have had familiarity with where you have been in the control room, is it true with respect to TMI 2 that almost every trip or transient had some element that is unexpected in it?

Have most of the trips and transients that you experienced have gone the way they were supposed to go according to your training or simulator sessions?

WITNESS FREDERICK: Most of the transients we went through did have some conflicting factor in it that was not accounted for in a single emergency procedure, yes.

MR. FRAMPTON: Can you respond to that?

WITNESS SCHEIMANN: I would go along with what he

said on that, too. Almost any time you get in a situation with a trip there will be something that just ain't covered by that procedure. You can never get a procedure that will cover every possible conception of what can happen.

MR. FRAMPTON: Would it be fair to say in many or most of the trips or transients you have had experience with you get something that is not only not covered by a procedure but which is really not covered by your training or simulator training?

WITNESS SCHEIMANN: I would say it is conceivable.

MR. FRAMPTON: What has your experience with that been?

WITNESS SCHEIMANN: A lot of times they don't go in in simulator training or other types of training into a lot of different things that could happen on the secondary side in the course of a trip. Like you might have a heater drain pump that trips on you when you need it or a feed pump go out in conjunction with the trip.

There are so many different things that can happen and there are different ways of seeing trips. There are some things that are not covered on the procedure. They couldn't very well all be.

MR. FRAMPTON: Mr. Faust? What has your experience been with that? Do most trips, scrams, transients, more or less go by the book or usually have some factor that you really

haven't been trained to expect?

WITNESS FAUST: I think they go by the book for the most part myself. I think our training has been -- it has proven itself, I think, just from the fact that the idea of our training is to prevent core damage by recognizing symptoms and going by that procedure for it. That sort of got us into somewhat of a problem because we ended up not being able to cipher out all the symptoms we suddenly ended up with and apply them to a specific procedure. That is a little short fall in the training area if you want to look at it that way.

We were looking awful hard to get a procedure to fit. There wasn't one that fit, that actually came out and said we had this, this, this, and that and now this is the one you use.

MR. FRAMPTON: Mr. Zewe, do you have any thoughts about that?

WITNESS ZEWE: As far as the trip experience goes, you mean? I think that each transient that I have has had some uniqueness to it. It had some related problems or some unrelated problems from one another that made it unique so that they weren't mere images.

MR. FRAMPTON: Does the training that you have gotten really prepare you to handle abnormal situations or most abnormal situations,had an element that just wasn't covered by the training?

WITNESS ZEWE: Training is a very broad scope. It encompasses all of the postulated possibilities that could arise and tries to put it forth in a cookbook fashion. A, B, C, D. This is what you will see and that is what will happen.

I think we are all trained that you really won't see the eight out of eight symptoms or maybe only see three out of eight and you can't follow it A, B, C, D, as far as the procedure goes. Use it as a very good guideline because you always have some varying circumstances that makes that particular transient unique.

I think at least I have felt that is how the procedure should be used. You always can't cover it in every case. I think the training we have received on the simulator always dealt with single case failures.

The current training trend is multiple system failures. At the last simulator class I was at, that I have been at about ten of them so far, but this last one was far above the other ones in that there was multiple casualties. You look more toward an overall objective more so than getting bogged down in specifics and doing this, this, this, and that. Looking at what you are trying to accomplish and then working toward that end.

MR. FRAMPTON: Was this most recent session also a session that involved team response?

WITNESS ZEWE: Yes.

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MR. FRAMPTON: And also played out the casualty over a longer period of time?

WITNESS ZEWE: Yes. That was a very large portion of it. They would give you a casualty and then just perpetuate it longer periods of time until you reached a stable condition. It had other failures along the way.

MR. FRAMPTON: Let me ask you a specific question about the training with respect to going solid. I think I have been told or read in prior testimony that in the simulator training given at B&W, there has previously been no simulation of what happens after you go solid. The simulation ends when you go solid. Is that correct?

WITNESS ZEWE: Yes. Prior to the Unit 2 accident, the B&W simulator was not programmed to go beyond a solid plant.

MR. FRAMPTON: What were the things in your training and simulation that made you want to avoid or be wary of going solid, running solid?

WITNESS ZEWE: It is inherently unstable. A solid system changing with large flow rates is inherently a very large pressure transient, either up or down.

If you are putting in a lot of water or removing a lot. It is inherently very difficult to control. From my previous experience in the Navy also, we used to take the primary plant solid every year to do instrument calibrations and

pressure was very hard to control.

MR. FRAMPTON: When you say pressure is hard to control, is that because small changes in liquid inventory result in large changes of pressure?

WITNESS ZEWE: Yes.

MR. FRAMPTON: That is dangerous to the system for stress reasons among others?

WITNESS ZEWE: The controllability aspect which relates to -- from going solid, you are worried about over-pressurizing.

MR. FRAMPTON: What was your experience in the Navy with these tests of going solid? Can you describe a little more about that?

WITNESS ZEWE: Well, we used to go solid just to calibrate the primary instrumentation, but while we were solid, we took every precaution that we could to avert any pressure change because of charging in water or adding heat to the system or draining any water or removing any heat from the system, so that you didn't have this pressure excursion because of the change in inventory system affecting the pressure.

WITNESS FREDERICK: Are you done with that, about going solid?

MR. FRAMPTON: I was going to go on to another subject. Would you like to respond to that?

WITNESS FREDERICK: Can I go back to the one you asked about --

MR. FRAMPTON: Absolutely.

WITNESS FREDERICK: Somehow we got from looking at reactions to reactor trips or other casualties, talking about how sometimes the EP may not apply or more than one emergency procedure may apply and whether or not the training was deficient. Whether or not the operators felt confident they could handle some kind of hot reaction in the plant on any given transient.

I think the training is based on staying away from the emergency procedures as being the bible and what you have to do during a transient. There is much more emphasis on an in-depth knowledge of the characteristics of each of the independent systems than there is on the rote response to emergency.

The backup that you have to some abnormality during emergency is the fact that you understand the systems intimately. That some slight perturbation during an emergency, you would be able to figure out what caused it because you understand the system as a whole.

That backup is what allows the operator to have some confidence that something going wrong during an emergency isn't going to panic because they can probably figure out what caused it. It is when you get more than one emergency

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procedure going at the same time and several unexplained recurrences, and then you don't have time to figure out each one, that the training somehow got us steered in the wrong direction during this accident. We kept looking for more and more symptoms, more indications of what was causing the problem instead of zeroing in on the safety aspects of losing control of the plant.

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MR. FRAMPTON: Had you ever had a training exercise or simulation where you were given conflicting systems and then required to find more and more symptoms to determine which of the conflicting symptoms was the correct indication of what was happening?

Do you remember any training that tested you along that line or challenged you along those lines?

WITNESS FREDERICK: Not specifically. I don't think that is a valid method of training either. If the idea is to go on the fault tree type method of analyzing the problem and if the fault tree fails you in analyzing the problem, then you should revert back to your basic safety concepts. Do we have heat removal? Is there flow? And what is the temperature in the core as best we know it?

WITNESS FAUST: Given those indications at hand.

WITNESS FREDERICK: Given the fact that is available in the control room. Once you lose track of the emergency procedure, once it no longer applies, you should revert back to, since we don't really know what will happen next, are we protected at this moment? Are we moving in a safe direction? Should we change what we are doing? Once we had throttle back high pressure injection and it didn't give us the indication we wanted, decrease in pressurizer level, and the pressure, ACS pressure didn't increase when we wanted it to, there should have been those three criteria

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in our mind that says do you have subcoolant? We would look for our saturation module. Have you been stable on high pressure injection and low pressure injection for twenty minutes?

Do you have the secondary loop coupling? If we had those three criteria at that time, we would have started high pressure injection and would have been able to survive the casualty. Those generic concepts were not in the training program. I don't believe they were --

MR. FRAMPTON: They are now?

WITNESS FREDERICK: They are now.

MR. FRAMPTON: Are those concepts that have been part of the remedial training coming out of this?

WITNESS FREDERICK: That is the big difference Bill is talking about in that the casualty is more complex and carried out to a much more restrictive and positive end. You have to get each casualty to a normal cool-down situation before you can terminate, which was unheard of before, spending two to three hours on a single casualty. That change comes from this concept.

MR. FRAMPTON: The concept is when you have a very complex situation or situation which is conflicting or where more than one procedure applies or no procedure applies that you try to fall back to certain fundamental principles or fundamental precepts and apply your overall knowledge of

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how the systems work and interact to those principles. In effect, make up from first principles what you think is the best emergency procedure to deal with this unforeseen situation; is that right?

WITNESS FREDERICK: Not exactly. What it is is unless you have a prescribed set of circumstances, that is positively represented on the panel, you are not allowed to take any manual actions. You must fall back on the automatic protection steps and assure that they are functional. You must have high pressure injection in the automatic mode and low pressure injection and isolation. Everything must be left automatic unless you prove you have those three criteria outlined before.

When you do, you can begin to take manual action to restore the normal cooldown. If you can never achieve those basic criteria then stay in basically pressure injection until something happens where you can gain control. That is what saves you.

MR. FRAMPTON: If you had to abandon the control room at 6 o'clock on account of high radiation levels, what state would the high pressure injection and other systems be left in when you all left there? Would that have been the basic position that things would have been left in? All the safety systems actuated and on automatic and you just walk out? Is there a procedure for that?

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WITNESS ZEWE: Not under these conditions, no. First, I can't conceive of any reason that I would have to totally evacuate the control room for any period of time. If the radiation level got such that I would limit the stay time, that would be a different story. I could still occupy the control room and take control. But I can't conceive myself of any case where I would have to totally evacuate the control room for a long period of time.

If I would have to evacuate for certain periods of time for one reason or another, I would certainly have to institute the engineering safety feature system.

MR. FRAMPTON: Are there any provisions whatsoever in your emergency procedures for having to abandon the control room for an indefinite period of time?

WITNESS FREDERICK: Yes.

WITNESS ZEWE: The only thing is we do have a procedure for cooling down the plant outside the control room which only deals with some problem in the control room like a fire that limits the -- which causes the operator to leave the control room to where you can control a plant in a remote cooldown station, but in this case if you are dealing with high radiation the plant that -- the portion of the plant that we would go to would have the exact same effects as the control room because it is directly below the control room and some of the local control stations which we would

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have the auxiliary operating to would be inaccessible because of further high radiation.

The control room is designed for a certain postulated accident with enough shielding to allow you to occupy the control room. So that would be the one place which should be the last place where we should have to abandon.

Just to reemphasize the training now, is that we have one objective, to protect the core and the devil with everything else. Before we used to worry about the coolant pump. You have a three or four million dollar pump here. You have a turbine. And then in real world you are dealing with dollars and dollars is how the whole world survives, I guess. And you are worried about that. But somehow you can lose sight of the overall objective of the core which has to supercede everything.

So the training objectives Ed was talking about, if you don't meet the basics to protect the core, you don't go any further. You have to have that before you can go any further to protect anything else.

MR. FRAMPTON: You think that's really different than the emphasis in the training you received before the accident?

WITNESS ZEWE: Yes, because we were dealing with specific procedures for specific symptoms which -- reactor coolant pump procedure, you are worried about the reactor

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coolant pump there. The turbine trip: you are worried about that the turbine is isolated and the valves shut and you got oil pumps on and zero speed, you put it on the jack and all those sorts of things.

Now casualty training is really a lot easier. Now you know exactly what your objectives are for any category. You go to the main thing. Is the core cool? Subcooled? Could you have control? Then you can branch out knowing that the most important thing is all right and you just keep rechecking that every 15 or 20 minutes to make sure that whatever you do in between your initial conditions, that you go back to check to make sure you still meet that core cooling criteria. It is really easy from a large accident type status because you throw everything else out the window and it is all secondary.

You always protect that so you are always safe, even though you may ruin everything else in the plant, you do protect that.

That is the philosophy we needed that day. It is rather easy now because you know exactly anything that happens, all right, it is multiple plant. You focus that one thing and make sure of that. It makes the rest if it easy to do.

MR. FRAMPTON: Let me move on to another subject.

MR. WORAM: Before you do, may I ask a question? It may be appropriate here.

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I am interested to know what your opinion is on the licensing examination process. Does it address what is really important for an operator to really know? Are the decisions made for the right or the wrong reasons?

WITNESS FREDERICK: The NRC examination technique, is that what you are asking about?

MR. WORAM: Yes. The technique and general format of the exam. I am sure the technique varies from examiner to examiner, of course.

WITNESS FREDERICK: There is a written and oral exam. The oral examination format has been usually acceptable to me. It gives under stress conditions to the operator to think quickly and remember important facts. I think that is a good fundamental way of testing a person for this type of job.

The written examination, on the other hand, leaves a great deal to be desired. The emphasis historically made in each section of the examination. Emergency procedures are memorization quizzes. How well can you memorize this sheet of paper? Not how well do you understand the objectives of this procedure and the results of not performing these steps. Or what can go wrong in this procedure that is not outlined? In-depth questions about casualties that never come up on examinations and never have.

MR. FRAMPTON: Do they come up on oral

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examinations?

WITNESS FREDERICK: I couldn't specifically outline any questions that have been asked to everyone but I have never been faced with multiple casualty type questions on an oral examination. Still the emphasis is on how well do you remember this emergency procedure but then on an oral examination you always have the option to say I will follow the procedure now and remember what I forget or look up what I forget.

That is acceptable to the examiner in most cases. The written exam has a section on reactor theory. A section on operational characteristics. And several other sections. But the questions are nearly predictable in each section. So that a review session before the examination could get you ready for an examination if you already had the basics and had been studying for several months. I think most operators will agree the exams are in most parts predictable.

I don't think that is bad as far as an operator goes. As far as the range of questions, the topic matter, things that will be covered, the depth of the questions hardly ever changes as far as if you look at a brand new operator who was an operator for a year and an operator who has been there for eight years, they will be tested on the same level. They are not expected to have learned any more or

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forgotten any less.

And I don't believe that is the way it should be. There should be an initial operator exam that says, okay, now you know the basics. Now progress and learn more and go into more depth and become a better operator. The exam does not require that. It requires you to stay at the same level of knowledge with the same amount of expertise. It is like learning algebra over and over every year and memorizing the same axioms and same laws over and over again.

You don't learn any more about algebra, but you are ready for the exam each year.

MR. WORAM: I gather you are getting into both the initial exam and requal program.

WITNESS FREDERICK: They are identical.

MR. WORAM: That was going to be my follow-up question. What do you think of the requal program? I think you have answered that.

WITNESS FREDERICK: Okay.

MR. WORAM: Anybody else have any comments you would like to make?

WITNESS FAUST: Sounds like an exam where you are going to get tough.

MR. FRAMPTON: Are you cross-licensed, Mr. Zewe?

WITNESS ZEWE: Yes.

MR. FRAMPTON: You were licensed first on Unit 1?

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WITNESS ZEWE: Yes.

MR. FRAMPTON: When you got your cross-license for Unit 2 did you have to take that second oral examination?

WITNESS ZEWE: Written test administered by the company.

MR. FRAMPTON: That only.

WITNESS ZEWE: Yes.

MR. FRAMPTON: Do you think the cross-licensing process absolutely required you to become as familiar with the Unit 2 as you had been when you got your original license on Unit 1, to be familiar with Unit 1?

Do you think someone could gain a cross-license without really becoming familiar with the second unit?

WITNESS ZEWE: I think that somebody could gain a license of any type and really not be that proficient. I don't think an NRC examination would necessarily make you a better operator. I just feel that now can you have an organization come in and examine you specifically on your unit if they don't know the unit themselves?

They can certainly examine you on how safe you would react to key questions and overall operation from a basic standpoint to tell when they feel that you will operate in a safe manner, when you can manipulate the controls, you know, but not specifically. They really can examine you.

Like if I gave an oral examination to a control room

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operator, If I felt he was really acceptable, or if an NRC guy went out and examined him not knowing the plant, I think that an exam by a person who knows the facility is a lot more worthwhile than the NRC examin because of the outside not knowing the plant.

He knows theory and the basics. You have to know that too, but I don't think that you could only examine on generalities and not deal with very specific terms which I don't believe the examiners are really that qualified to do. I don't think there is any examiner at NRC that knows more about that plant than I do.

I better know more than he does if he is here for a week or three weeks every year.

MR. FRAMPTON: Do you think a person can pass an NRC license exam for a particular plant and still not be competent to operate that plant safely?

WITNESS ZEWE: I think how well -- not to evade your question with a vague answer, but I think it depends more on the training program afforded the operator from the company more so than the exam of the NRC.

If you have a guy that is a very good talker, so to speak, and really has a way with words, I think it's possible, yes. I think that the examiners I have dealt with can look past this to a certain degree. I think they do just examine you on generalities and pull out a procedure

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and see if you could follow it and find all the components. That is something, too, which needs to be done. I just think the exams should be by more qualified people on the particular plant and I am not sure what the best method of that would be.

MR. FRAMPTON: So you think the main weakness, if there is one, in NRC licensing exams, is the fact that the examinations are done by people who don't have sufficient knowledge of the particular plant.

WITNESS ZEWE: I think so because I think our record shows that the operators were qualified more than sufficiently to pass the NRC exams. Not meaning that the NRC if they were to qualify on the plant could shoot them down either.

If they are qualified, they are qualified. It is just a veiw that I have, having somebody come in for a few hours to tell you when you can operate or not when you know the plant and they don't. That has always been a negative aspect from my aspect and it has always been, now you got your license, now you can learn the plant by operating. And that is true.

MR. FRAMPTON: From your personal training experience, was there any evidence that the NRC was really monitoring the substance of the training you were getting? Did you see any evidence of that yourself while you were being trained?

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WITNESS ZEWE: They were here for periodic review of the training records and the documentation that we do for our initial training and for the subsequent training and even for the initial license.

We mark down what training the person has gone through and how many weeks of this and at this simulator and how many hours of formal training and so forth.

I know these have all been reviewed to see if there was sufficient training done for the knowledge level the man should have and then they come in to examine you to make sure you are where they consider you should be.

MR. FRAMPTON: Do you think from that kind of review by NRC inspectors. they can really form a conclusion as to whether the training program that a given utility has in place is a real crackerjack program or below-average program?

WITNESS ZEWE: I think the final analysis is in talking to the people themselves to form their own opinion rather than solely on paper.

MR. FRAMPTON: Mr. Scheimann, do you have any thoughts about that from your own training experience? Did you have a sense that the NRC was really monitoring the substance of the training you were getting?

WITNESS SCHEIMANN: I would say substance, no. I would say the requirements or the amount of material that was covered, yes.

By means of their periodic inspections. However, I have yet to see one that came and sat down in the damn class to see what material was being presented.

MR. FRAMPTON: Mr. Faust, any thoughts about that?

WITNESS FAUST: You covered everything.

MR. FRAMPTON: Mr. Frederick?

WITNESS FREDERICK: You missed my speech. The NRC as I see it, even now they don't examine the content of the lessons or the lectures that are given down there.

There is a huge retraining program going on now for Unit

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I and they don't -- they review the written material produced for electric plants and for tests and things like that.

MR. FRAMPTON: Outlines and study guides?

WITNESS FREDERICK: Yes, and study guides that are used. As Fred said, I never saw one in the classroom evaluating teaching techniques or asking operators what they think of the training program.

MR. FRAMPTON: Do you think NRC inspectors ought to do that?

WITNESS FREDERICK: It would give them a better idea what they should have on their exam. The training department reacts to previous exams as to what they should teach, the way it is now.

The NRC is reacting to the exams that they give as to what they should emphasize. It's kind of a closed cycle.

There is no new input into the system. The training department will teach what they have to to get operators to pass the exam or be ready for an oral exam and the NRC, in turn, examines people on what the format exam is already based on.

You never really expand beyond the boundaries of what has been taught for the last many years. The new lessons and things learned from accidents are included in training programs and occasionally show up in a question on an exam

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but it's never really expounded upon as far as increasing the operator's study of a particular area.

You study reactor theory in general and cover the basic questions but you never dig down and go beyond what you need to pass the exam.

WITNESS FAUST: Something I seemed to know when he was talking about material coming up tht you are examined on, on recall exam or something like that, it seems like the NRC picked up on something, it was a casualty or some sort that happened.

You might end up getting questions along those lines. Something had to occur before you got questioned on it.

It just seems like a wait until it happens and then we will talk to you attitude.

MR. CUNNINGHAM: Could I ask a question? We have pretty much concluded here, I guess, that you peole know these plants better than anybody coming in from NRC. The question comes to mind: What do you think -- where do you thin. the vulnerabilities of these plants are? To what type of accident is a plant like this going to succumb in your mind?

Will it be a large break? A transiet-induced accident? Whatever? As an operator. And is that being covered at all by what NRC put forward in training requirements?

WITNESS FAUST: We are not covered for the

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long-term accident, or hadn't been anyway.

I wouldn't say that now. I haven't had the training down at Lynchburg that Ed and Bill have seen, but it sounds pretty good.

WITNESS ZEWE: I think the vulnerability lies on what we haven'tcall it major accident that nuclear power will have, no matter whether it is or if it ever happens, it ain't going to be the same.

All right, I don't think we will ever have another stuck-open relief valve that will end up like this one did.

That's not saying we won't have some other problem that won't lead to a more serus problem or not so serious when it's something there that you are unprepared for, either trainingwise or whatever it might be. I think that is where the problem lies.

It's just a continual thing that you never know at all and it's always the unexpected that gets you. The things you aren't prepared for. I am not sure I know what that is. Some of the things now that have been identified 15 years ago that we thought were incredible could be very credible.

Like this one. It was brought up and for some reason put on the re[illegible]rner or rear shelf, well, saying it isn't too credible so we won't explore it further and it will crop up

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because it's a growing industry yet and there is a lot of other problems out there that we don't see.

WITNESS FREDERICK: One thing, my experience with the two units, one thing Bill pointed out, he may have forgotten, is that the industry doesn't seem to learn from itself during construction.

Unit 1 turned out to be a fairly good plant. Unit 2 had a lot more problems as far as I can see. And Unit 2 was built after Unit 1. There was no attempt made to change Unit 2 to conform with all the good things they learned about Unit 1.

I am not sure how other multiple units or even how the units of the same manufacturer feed each other to improve each model.

I don't see it happening. If you don't learn from your mistakes, you will make them over and over again.

MR. FRAMPTON: Do any of you disagree with that assessment?

WITNESS FAUST: Me? I was just talking. I know another man in another plant, Millstone, that I was talking to recently and he was pointing out some of the instrumentation of what they have and how they handle their training as far as who gets it.

They have three units up there. He is talking about separation between units and different things we haven't

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done here. I was saying it sounds like their operators designed their remaining two control room units, the panels.

They had a lot of input into the panels. We just --

MR. FRAMPTON: Didn't.

WITNESS FAUST: Didn't. Somebody is learning in the industry, I am saying. It sounds to me like there is information out there that isn't getting spread around.

That is what it's amounting to. We haven't been talking nationwide as well as -- as much as it sounds like they have been talking between companies, their own companies possibly?

WITNESS ZEWE: Also, to point out one example, I had gone to the B&W similarity for a couple of years before we had a similarity primary- to secondary-tube leak. They had an actual one at the Oconee plant for Duke Power.

They had a procedure for preliminary-to-secondary leak and we didn't even have one. We went to the similarity. I am not sure if it was 1975

They gave us a preliminary-to-secondary leak. We pretty much handled it fairly well, but we didn't have a procedure for it. There was no formal procedure for it. Yet, Duke Power Oconee had one, an approved procedure, and there are two B&W plants, like sister-type plants, yet they had procedures we didn't have. Generic-type procedures. That

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is true for natural circulation. Like we didn't have a natural circulation procedure prior to their accident as such were Toledo Edison had one.

I am not sure how long they had it prior to the accident but they had one and we didn't.

Maybe it would have helped. It certainly wouldn't have hindered. I think one manufacturer that only has seven or eight units like B&W does, they have B&W user meetings where the superintendents and so forth from the various companies get together.

I am not sure that they trade all the information that they necessarily should. At least they should all have the same generic procedures.

MR. FRAMPTON: In a similar vein, am I correct in understanding that you had never had knowledge of the transient at the Davis-Besse plant that occurred in September of 1977 which involved stuck-open EMOV prior to the TMI accident, is that correct?

WITNESS ZEWE: That is true. I heard about it for the first time two days after the accident.

MR. FRAMPTON: Is that true for the other three of you gentlemen?

WITNESS FAUST: Yes.

MR. FRAMPTON: All of you are nodding your assent.

WITNESS ZEWE: Normally, the shift trains

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together.

In training, we get all the information we get, we get -- either I get it or Fred gets it and I get it both or everyone gets it.

If I get it, I always pass it on. If it isn't covered in the training week, we don't have the information.

MR. FRAMPTON: You had never seen in training or simulation a failed open EMOV on the pressurizer, I take it.

WITNESS ZEWE: I have had transients at the similarity where we have had the valve fail to recede. I have had that. But it was just level and pressure went down and plus you had the indication of it.

MR. FRAMPTON: Did the similarity have a position indication showing that the valve was open when the simulation was supposed to have failed to recede?

WITNESS ZEWE: I don't recall exactly how they simulated it. There was no question in your mind the PORV was teh culprit, so to speak, for the accident.

MR. FRAMPTON: Were you supposed to figure that out or told in advance that that is what you were going to be seeing?

WITNESS ZEWE: You had to figure it out.

MR. FRAMPTON: But it was either shown on the similarity console or it was easy to figure out? One or the other?

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WITNESS ZEWE: It was easier to figure out. We had the quench alarm right overhead on the trip. You had the pressurizer also never increased in the level.

You always had a loss of coolant which resulted in a low-pressurizer level. They could only simulate at that time a loss of coolant of a certain magnitude and they can vary that magnitude but it would be from the system and not from a certain portion of the system. Not from the pressurizer or not from the hotleg or -- just a leak from the coolant system which would result in reduced pressurizer level even though it was from the electromatic valve so you knew you were still losing water and then you put the quench tank -- you looked and I can't remember if they had the red indication on it or not for that simulation, but you isolate it and terminate the transient.

MR. WORAM: May I ask a question here? You indicated that -- particularly Mr. Frederick -- that training is improving in terms of getting back to basic things that you have to protect against.

Do you feel that's true across the board for all categories of responses or is it just being dwelled upon in this specific small break analysis and everything else is the same?

WITNESS FREDERICK: No, I don't consider it getting back to basics. I conside it an advanced form of

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training in that you progress beyond memorization of basic emergencies. You progress on to multiple casualties and how you -- they are very complex casualties. That is not restricted to LOCAs.

They do it for loss of feedwater and steam generator leak and loss of within-reactor coolant pump and a failed pressurizer level instrument.

They will do two or three things at the same time. It's seem to me like a random selection of failures. They say this, this, and this fails. What do you do?

It gets very complicated.

MR. WORAM: If I understand it, you said this is really reflecting a general change of philosophy rather than a small response to a specific problem.

WITNESS FREDERICK: Right. Every casualty we attack now in the similarity takes in this basic concept-type approach, whereas if the symptoms are simply and cleanly represented as there is a reactor trip caused by one thing, then you follow the procedure.

You follow right into that and keep in mind there is basic generic constants at the same time. But if something happens that doesn't exactly fit an emergency procedure, then you still have this new concept with which you can work and still protect the core.

It makes the operator feel much more comfortable and less

emphasis on transient behavior of the plant.

Now, they eliminated that with chaning of the EMOV set point. Every transient results in a trip just about. Before there were several minutes or a long time for the transient to progress before the trip just because of the capacity of the system to absorb pressure changes, which it no longer has, so the casualties are, in one respect, more complicated but in the operator's eyes, it becomes more of a controlled situation.

MR. FRAMPTON: Let's take about a two- or three-minute break.

(Recess.)

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MR. FRAMPTON: On the record. I have already asked about the role of NRC inspectors in the control room on the first couple of days after the accident began. Did the nature of the NRC presence or the amount of responsibility that the NRC people on-site had for operations change after the first several days? Was there any different arrangement between the people in the control room and the NRC people on-site on Saturday or Sunday or Monday?

WITNESS ZEWE: I am not sure of the time frame there from what day their role changed but it definitely did change. They were more involved and wanted to see more and wanted to be explained more. It was a tremendous influx of various inspectors where you dealt with X number of inspectors for a one- or two-week period and then you would have five or six new ones come in and start all over again.

Bring them up to speed, so to speak, on the problems we were having.

MR. FRAMPTON: On Friday afternoon, the 30th, Harold Denton and a large group of people from Washington arrived with communications gear and so forth. Was there any change then or within a day or two after the arrival of all those NRC people in terms of when NRC would be informed more of what was going on or have more veto power over plant operations?

WITNESS ZEWE: Not that I was aware of. The only time I ever seen Mr. Denton was on TV. That is the only interface

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I ever had with him other than he was walking around with the President on Sunday in the control room. That is the only time I had any interface at all, which wasn't any personal thing at all. Just that I seen him.

MR. FRAMPTON: From your point of view there wasn't any increased NRC involvement in or veto power over operations come Saturday or Sunday directly in the control room.

WITNESS ZEWE: No. As far as I knew, all the decisions and all the responsibility was entirely the utility's.

WITNESS FAUST: We felt the pressure of the NRC presence, if you want.

MR. FRAMPTON: What kind of pressure was that?

WITNESS FAUST: IT seemed like we didn't do something unless we were forced to do it. Every step of the way just about, if you look at it. When we went to another mode or something, we were forced into it. In other words, if we wanted to do something, we didn't do it until it came about that something forced us to the next step, so to speak.

MR. FRAMPTON: Talking about beginning Saturday and Sunday after the accident?

WITNESS FAUST: Even Saturday and Sunday -- even on the vent, we were forced into that. I consider that forced.

MR. FRAMPTON: You are talking about Friday morning. How did that relate to NRC presence or non-presence?

WITNESS FAUST: I am saying, and this is on my level

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of it, from what I know. What I don't know is tremendous. But it just seems that we were told to minimize releases, which is understandable, when plant conditions started warranting we should maybe release a little more to get into a better situation, it took a relief valve lifting to get moving where we were actually able to do something by trying to bottle it up and not getting rid of it sooner -- I am just talking, it seemed like generally I don't know if it was stated or what, it seemed like it was keep that in there. Don't leave it out no matter what.

MR. FRAMPTON: Did you want to comment?

WITNESS FREDERICK: In the beginning, when the NRC first arrived, they wanted to observe everything. As far as I could see they didn't take much part in the analysis or the directing. They just wanted to watch. In the days after the arrival of Mr. Denton they became more active in watching. They required that we give them hourly readings in writing.

MR. FRAMPTON: Of major plant parameters?

WITNESS FREDERICK: Of many plant parameters. Hundreds of plant parameters. And the readings became very cumbersome. Almost impossible to deal with in the fact that several NRC organizations all wanted copies and they wanted them over the observation center and in the supervisor's office and here and there. Every hour.

They shifted from watching what was going on to taking

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an active role in confusing things by making it mandatory that we produce readings that they could look at.

MR. FRAMPTON: When did this begin? Saturday? Sunday? After that? Before?

WITNESS FREDERICK: It began to mount Saturday and Sunday as far as what parameters were supposed to be monitored. In the weeks following, the readings they were taking continued to grow.

MR. FRAMPTON: Would you say as early as Saturday and Sunday the NRC demands for information and the fact that it had to go to more than one NRC source was detrimental to the efficient operation of the plant?

WITNESS FREDERICK: I can't blame it all on NRC. There were other organizations that began to see that as a nice way to go. They all wanted readings. B&W wanted readings. GPU wanted readings. Everybody wanted their own set of readings so they could monitor this. But there was never any feedback from this, at least on the operator level. Okay, we have been analyzing all this. This is what you should do now.

Still it was left with the shift supervisors and Met Ed people to decide what to do next. They would decide and tell NRC about it and it would be held up until somebody decided either you can do that or just wait until something changes. Normally the answer as don't change anything. Wait.

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Which frustrated a lot of us in the fact we wanted to move on to natural circulation or something that was more permanent. And the pump back operation was delayed I feel by the NRC until they were absolutely sure of what would happen.

Getting the waste gas decay tanks -- it was hooked up within a few days after the accident but not used for many days. That may be just the way I remember it. You can look it up I guess. Primarily my interface with the NRC was giving them readings which took up a great deal of the operator's time.

As a matter of fact, there were three operators working on it almost full-time during the first few weeks. Three licensed operators.

MR. FRAMPTON: Did you feel the burden of these requests for information, Mr. Zewe, or was this something a matter of being laid on the operators' shoulders?

WITNESS ZEWE: Well, it became troublesome in the control room in that it tied up the operators and caused an awful lot of people to be transient through the control room looking at parameters, looking over your shoulder, trying to get data. I personally felt it more in the ensuing period in trying to write special procedures for the evolutions we wanted to conduct to go through the review chain.

It took days and days for NRR and NRC to review the changes and bring back their comments and do this. It seemed like by

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and large an awful lot of it really wasn't tremendously constructive. It seemed like we couldn't do anything from that point on. All procedures we had were void and anything you wanted to do you had to rewrite a new procedure for.

We ended up writing all these procedures and recovery and special procedures, some of which we really didn't need, nor did we ever use.

It seemed like for a large part we did operate from one crisis to another where we ran something as long as we could and we had some alternatives but no initiative was taken until a pump quit or something else happened where we were forced into another area.

It seemed like we just fell from one pit into the next one and not a great deal of forethought and planning. The answers were there but it took so long to make sure that everybody approved of it and to get that approval. But the burden was clearly on the utility, on us, meaning Met Ed and GPU to come up with the answers and come up with the procedures and they were there by and large to audit, to make sure we followed what we said and somewhere down the line they had more and more and better input as they got more and more familiar with the steps.

Their details and things they asked, there were a lot of good inputs then. But I think that developed over some period of time.

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MR. FRAMPTON: I would like to move to another subject. I would like to ask you a couple of questions about the emergency feedwater block valves. The twelve valves. Had these valves been found closed on previous occasions during normal operation when they were supposed to be opened, to your knowledge?

WITNESS ZEWE: No.

6:p.m

MR. FRAMPTON: Do you know of any indication they were previously closed when they were not supposed to be, Mr. Faust? That you can recall.

WITNESS FAUST: I feel like they have been. Not both of them. But I don't even know if it was those valves in particular as to just the emergency feed system having something out of alignment in it. I can't place it now. It was just like we would be starting out with maybe a start-up procedure, since we didn't always start from zero and go up to where the plant stopped at, it might have been overlooked that way.

That is my problem with trying to remember. Yes, I think I came across them like that. It was just noted.

MR. FRAMPTON: Would that have been noted in a log?

WITNESS FAUST: I don't know. I think it would have been just informing the foreman at that time.

6:p.m.

MR. FRAMPTON: Mr. Scheimann, do you recall any occasions on which the valves had been closed or found closed?

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WITNESS SCHEIMANN: I physically haven't seen them closed when they weren't supposed to be. As far as knowing about it, if there had been, I can't recall any incident.

MR. FRAMPTON: You don't have a present recollection as you sit here now of any occasion on which those valves were closed or found closed when they were not supposed to be?

WITNESS SCHEIMANN: Not to my recollection at the moment.

MR. FRAMPTON: Mr. Frederick?

WITNESS FREDERICK: I don't recall a time when the valves were shut when they weren't supposed to be.

MR. FRAMPTON: Could those valves have been used -- I guess I should ask Mr. Scheimann -- could those valves have been used to delay emergency feed in a turbine trip reactor trip?

WITNESS SCHEIMANN: In what way? Intentionally? Somebody saying, hey, I will sabotage you by doing this?

MR. FRAMPTON: Not sabotage but for the purpose of trying to prevent the primary system shrinkage and ES actuation?

WITNESS SCHEIMANN: To that I would have to say no. The valve line up for the system calls for those valves to be open. I don't recall any place in our procedures that tells you that you are permitted to close those valves for

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that reason.

MR. FRAMPTON: Do you know of any occasion on which that had been done prior to the accident?

WITNESS SCHEIMANN: No.

MR. FRAMPTON: Mr. Frederick, do you?

WITNESS FREDERICK: No.

WITNESS FAUST: I don't either.

MR. FRAMPTON: Mr. Zewe, do you have any knowledge of how those valves got closed or came to be closed in the case of this accident?

WITNESS ZEWE: I have no idea at this point, no. From hearing previous testimony, I don't have any idea.

MR. FRAMPTON: Mr. Scheimann?

WITNESS SCHEIMANN: Likewise no.

WITNESS FREDERICK: No, sir, I don't know how they were shut.

WITNESS FAUST: No.

MR. FRAMPTON: I know you have been asked these questions before but we are on the record and you are under oath and I thought it's important to ask them again.

Ron Haynes, I think you have two topics that you want to take up. Why don't you go ahead.

MR. HAYNES: Mr. Zewe, I would like to talk a bit about the discontinued use of the atmospheric relief valves on the afternoon of March 28. I believe the previous testimony

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has shown that these valves were closed about 1:15 in the afternoon. Why were the valves closed at that time?

WITNESS ZEWE: I was instructed by senior management to shut the valve. I didn't agree with it but I shut the valve.

MR. HAYNES: Who was that who instructed you?

WITNESS ZEWE: Gary Merrill did. He was instructed by his upper managment to shut it.

MR. HAYNES: Who would that be?

WITNESS ZEWE: Jack Herbein is as far as I can go, the vice president, instructed Mr. Merrill, who instructed me to shut it.

MR. HAYNES: Do you know where Mr. Herbein was at that time?

WITNESS ZEWE: At that particular time I believe he was at the observation center.

MR. HAYNES: Did you receive directions from Mr. Herbein or other personnel at the observation center to perform particular operations at the facility other than this one event?

WITNESS ZEWE: That day all the direction came from Mr. Merrill or through Mr. Ross to me or from Mr. Merrill to me directly. I received no direct communications from off-site. Other days, I had. The ensuing several weeks, I had taken direct communications and orders directly from the observation center. Mainly Mr. Herbein.

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MR. HAYNES: In these ensuing days, was this the Thursday, Friday or Saturday immediately after the accident or when? When was it?

WITNESS ZEWE: More like the following Monday, Tuesday, Wednesday, sort of deal.

MR. HAYNES: What kind of instructions were they Mr. Herbein gave you?

WITNESS ZEWE: It depended on the situation. He would call in by radio or by phone and give some direction that he had for that particular situation that we were in at that time. Whether it was part of the natural circulation or what have you, venting off the hydrogen bubble or what have you. It varied as time went on.

MR. HAYNES: I believe you stated earlier that there was a command organization in place during the days immediately after the accident that included, I believe, Mr. Miller and Seelinger trading off, 12 on 12 off, this type of thing and Mr. Floyd and Mr. Ross; is that right?

Was that the sort of chain of command?

WITNESS ZEWE: Yes.

MR. HAYNES: Were these orders from the observation center coming directly to you going around those people?

WITNESS ZEWE: Directly to them at that time.

MR. HAYNES: And what did they do? They passed it on down to you?

WITNESS ZEWE: Yes.

MR. HAYNES: So Mr. Harbin was not directing you specifically? It was through the chain of command?

WITNESS ZEWE: There were days after the accident where he addressed me personally with a direction. I don't believe that he bypassed the other group. In some cases Mr. Miller handed me the phone to talk to directly to Jack. He had already related to Gary that he wanted Mr. Harbin to relate it to me directly. Just to save representing it back.

MR. HAYNES: Has that been a normal practice during plant operation, for you to receive directions directly from the vice president of generation?

WITNESS ZEWE: I have on many occasions, yes.

MR. HAYNES: Is that one method of the way Mr. Harbin operates?

WITNESS ZEWE: Well, Mr. Harbin was assistant superintendent and superintendent and station manager and operations nuclear and he is very familiar with us and very familiar with the plant. And we have often taken directions directly from him at his varying capacities.

MR. HAYNES: All right. Back to the atmospheric relief valves. When they were closed at that time, I understand that was your heat sink; is that correct?

WITNESS ZEWE: That was our only heat sink. The B steam generator was completely bottled up, isolated both steam and feed. We were steaming the A generator out to the atmospheric dumps because we didn't have vacuum in the main condenser.

MR. HAYNES: How long before you reestablished vacuum in the main condenser?

WITNESS ZEWE: I am not sure, but it was 3:00 or 4:00 in the afternoon I believe.

MR. HAYNES: You were without a heat sink for up to three hours, something like that?

WITNESS ZEWE: I would say so. I really don't remember the exact time, but I am certain it was a couple hours.

MR. HAYNES: What were your instructions, if any, for

reestablishing flow through the atmospheric relief valves in the event you needed it? Say that suddenly you got natural circulation reestablished in the A loop. But the condenser vacuum wasn't available.

WITNESS ZEWE: My instructions were not to use it at all, with no other leeway at that point. It was my interpretation from asking Mr. Miller that the state government had instructed us to shut the valve. It was really their decision in ordering us to have it shut. We were merely complying with them. Not that it was in our best interest to do that.

I mean from a plant standpoint. I felt it was totally acceptable to do that.

MR. HAYNES: Why do you feel it was totally acceptable to use atmospheric relief valves?

WITNESS ZEWE: The State was worried about any release of radioactivity in the steam that would be released to the atmosphere. We had no reason to believe we were releasing anything and we had also had an operator at the valve itself where it was discharging dew into the atmosphere with a hand-held instrument checking for any sign of radiation.

We had none on our installed instruments for that generator. We didn't have any at the final discharging point of the operator on the roof holding it right by the steam

being passed to the atmosphere. We had no indications at all that that steam in any way was contaminated.

MR. HAYNES: Did you do any chemistry tests on the water in the steam generator?

WITNESS ZEWE: We sampled on water in the A and B steam generator and the generator A didn't show signs of contamination. B did. The first samples that we had all showed the A was contaminated and B was not.

We found there was an error. They confused the samples. We subsequently rectified that and drew another sample and confirmed there was no activity there. We had the sample of the water.

The other monitors showed that initially we only had a primary-secondary leak in one generator and we were monitoring the steam locally at the final exit point. That proved to me without a doubt we didn't have a problem.

MR. HAYNES: At this time you still had high pressure injection going into the reactor coolant system. I believe the data shows you possibly got a bubble shift out of the A loop somewhere during this time. There was some heat transfer to the A steam generator.

Do you recall that?

WITNESS ZEWE: In vague terms, yes. I don't recall if that coincided when I shut the atmospheric relief valves or not.

MR. HAYNES: Subsequent to that?

WITNESS ZEWE: I didn't correlate that with that indication. I didn't have the time frame there to correlate it. It very well may be.

MR. HAYNES: I am not saying it was related to shutting the atmospheric dump valve.

I am saying it occurred about two hours after the atmospheric dump valves were closed, but about an hour before the condenser vacuum was reestablished, which would give you the --

WITNESS ZEWE: Okay, well that is a fact from the time frame and that is how it was, I guess.

MR. HAYNES: Let's say that the natural circulation through the A loop would have stayed or would have taken, would have kept the natural circulation, that would start transferring heat from the core to the water and steam generator which in turn would heat up and be able to remove heat from the core; is that correct?

WITNESS ZEWE: It should have, yes.

MR. HAYNES: What would you have done if that would have occurred and you needed to get the heat -- get a heat sink reestablished?

WITNESS ZEWE: I would have shut the valve like I was directed to do, but I would have certainly, if it had changed the parameters any, gotten right back through Mr.

Miller and back to Mr. Harbin. It would have been imperative we would have reestablishing steaming on that generator and it would have been his decision at that point.

I got the impression at that point, because I did try to argue with Mr. Miller on a -- not really arguing but discuss my concerns that it is ridiculous to do that and we were advised to shut it in no uncertain terms.

MR. HAYNES: During this time Mr. Harbin and Mr. Miller were in transit and also at the governor's office or lieutenant governor's office; is that correct? To your recollection?

WITNESS ZEWE: I was instructed to shut the valve before Mr. Miller left.

MR. HAYNES: But then he left to go to the state house; is that correct?

WITNESS ZEWE: He did leave, yes.

MR. HAYNES: Did you have a way to contact him?

WITNESS ZEWE: They took a beeper with them and also a walkie-talkie, but as soon as they arrived in Harrisburg, they established phone communications from the lieutenant governor's office to the control room.

MR. HAYNES: So in fact the natural circulation had taken in the A loop, you had to wait to notify Mr. Miller and Mr. Harbin of that to get the decision changed to get the atmospheric relief valves back in operation if you needed them;

is that correct?

WITNESS ZEWE: I could have, yes.

MR. HAYNES: That is speculation, of course. It didn't happen. I wanted to see what the decision would have been or what your approach would have been to that problem.

WITNESS ZEWE: I would have certainly related to them, but it would have still been their final decision because I was still taking their directions.

MR. HAYNES: What do you feel about that type of direction since you have the license and you were the one that had the license for the safe operation of the facility?

WITNESS ZEWE: If I felt it would really do a tremendous amount of harm, I would not hesitate to go against any other direction, whether it be from NRC or my own corporate management.

I felt that closing it would not affect it a great deal. I didn't think it was necessary, nor would I have chosen to do it if I had my own decisions. Whether the governor wanted it or not or whoever it was that ultimately told us to shut it. But if it would have placed the plant in real danger, I would have certainly gone against it if I felt in my own estimation that that was the best thing to do. I wouldn't have hesitated in that.

MR. HAYNES: Now let's flip over to a new subject. This has to do with the diesel generator automatic start system

and the core flood tanks during the course of the accident.

You had a chance to -- I believe you testified earlier to the I&E investigation report. In that report it states that early in the event that the automatic start system on the diesel generator was placed out of service and also that the core flood tank valves were isolated early in the course of the accident. Are you aware?

WITNESS ZEWE: I read that, yes.

MR. HAYNES: Do you agree with that? With the systems placed out of service on your shift?

WITNESS ZEWE: The diesel generators, as far as I can remember, ran for at least 30 minutes just sitting there running unloaded before we had an auxiliary operator go down to shut them down locally. At that point I assumed they were in auto-standby. Only from interviews that I had later on with the operators involved, did I know that they weren't available.

MR. HAYNES: So your intent was not to place the auto-start feature of the diesel generator out of service; is that correct?

WITNESS ZEWE: My intent was not to do that specifically, no. My intent was to shut down the diesels to save them from just sitting there at 900 RPM unloaded,but I really didn't concern myself with the diesels after that because I didn't need them. But I felt they were available

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for use if I didn't need them.

MR. HAYNES: And that they would have automatically started and loaded on the bus if needed?

WITNESS ZEWE: I made that assumption, yes.

MR. HAYNES: You say later you found out that the automatic start feature was placed out of service in your interview with the operator; is that right?

WITNESS ZEWE: This was on the order of two months later or so when I was approached repeatedly by two of the I&E inspectors saying that did you know the diesels were inoperable? I said no, they were operable. They said they had testimony from the sequence of the events from the computer and so forth dealing with the air compressors, if the diesel had started, the air compressors should have come on to restore the pressures and so forth. And then they had an interview of one of the auxiliary operators that went down there to secure the diesels and from that interview and from my interviews with a few of the operators, which is months later, that they very well could have been disabled from the automatic start feature.

MR. HAYNES: Did you ever get a chance to talk to the operator yourself?

WITNESS ZEWE: I did ask who the operator was that did it and his mind was somewhat vague on who he talked to and why he placed the diesels in a certain condition. But

one thing that I have tried to do is I have not really tried to talk to a lot of people in their involvement. I have tried to keep my own mind as clear and uncluttered as I can for the whole evolution. I let the investigative part up to other people.

MR. HAYNES: Mr. Zewe, I understand that the automatic start feature was placed back in service a little bit later on on the 28th. I believe that morning or so. Is that your understanding?

WITNESS ZEWE: From what I recall, it was placed back on automatic somewhere mid-morning, yes.

MR. HAYNES: You didn't know at that time that it had been placed back in service?

WITNESS ZEWE: I didn't know that.

MR. HAYNES: Were you aware of this evolution?

WITNESS SCHEIMANN: No, I wasn't.

MR. HAYNES: Mr. Faust?

WITNESS FAUST: I am aware vaguely that morning we had the diesel coming on. Vaguely. I will tell you what I remember is that the diesel did come on initially and ran. We sent an operator down to shut it down. We had another ES actuation where the diesel came back up on line again. It was going to be a problem with the diesel coming on every time we had an ES actuation and I don't know who said it, but somebody said put that thing so it won't come back on right now.

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If we need it we will turn it on. That is not the exact words. I am just saying it was along that line. It was becoming an annoyance or something else we had to take care of on top of what we were doing.

It was along those lines that it was probably taken and put out so it wouldn't automatically respond to an ES actuation. I don't know who directed the operator to do that or who did it.

WITNESS FREDERICK: May I ask by what method the diesel was rendered inoperable?

MR. HAYNES: My reading of the report -- you have not had a chance to read the report?

WITNESS FREDERICK: No.

MR. HAYNES: My understanding of the report is the fuel rack was blocked out.

WITNESS FAUST: Not reset.

MR. HAYNES: Therefore, it couldn't rack in for a fast start. Is that your understanding of it?

WITNESS FAUST: No. I thought it was from the control room that somebody went through the exercise position and switch. All the operator would have to do to put it back in ES position or start it manually himself.

MR. HAYNES: That is -- that is your understanding?

WITNESS FREDERICK: That is my understanding.

MR. HAYNES: Okay.

WITNESS FREDERICK: That the diesel was lined up for ES actuation but placed in maintenance exercise so it would not start unless you put the switch on ES which is a control room function.

MR. HAYNES: That is your recollection or what you heard?

WITNESS FREDERICK: What I heard, yes. I was not aware of the status during the day, but that was related to me by the operators.

WITNESS FAUST: Part of what I am saying is probably pieced in but I remember the diesel giving us a problem. Something was set to keep it from coming on automatically. So I guess partially I might have assumed it was done from within the control room.

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MR. HAYNES: It is my understanding, and it is in the report, that it was later in the morning that the fuel rack was put back in position and the switch was placed in the exercise position in the control room so in the event there was a loss of off-site power the operator could take action in the control room and get the unit back on line. That was a second step.

MR. FRAMPTON: Let me ask one or two questions about that.

When the diesel is running, do you have to send an auxiliary operator down to turn it off?

WITNESS FAUST: Yes. In ES. If it starts on ES single we have to go locally to shut it off. The problem with it running like that for no reason unloaded is it does carbon up. We don't know at what point we might end up with a fire in the stack on that because of the carbon buildup in it.

It is stupid to let it run. It is there for your function. It is foolish to let it run. Put it that way.

MR. FRAMPTON: When the auxiliary operator goes to turn it off at the site of the diesel, does he have to do something additional affirmative to disable it from being reactivated by another ES actuation?

WITNESS ZEWE: In order for him to stop the diesel after this, he has to trip the fuel rack. Then he must set the fuel racks after that to put it back.

MR. FRAMPTON: If he does nothing more than trip the fuel racks, then the diesel is in a condition that it will not automatically restart on another ES actuation; is that right?

WITNESS ZEWE: It won't start anyway. Not manually or from the control room.

MR. FRAMPTON: In order to reset it he has to not only turn it off but reset the fuel rack into it; is that correct?

WITNESS ZEWE: Right.

MR. FRAMPTON: So if you wanted to, from the control room, to set it up so that it was ready, available for another ES actuation down in the plant but it would not actually respond, you would have to instruct the operator to completely reset it and then in the control room you would have to put the switch on to test, on to exercise; is that right?

WITNESS ZEWE: Yes.

WITNESS FREDERICK: That is not a common practice, but it was through the in-depth knowledge the operators had they could reason that out and say they could prevent unneeded wear on the machine by using that position of the switch. It was not the intent of the switch.

MR. FRAMPTON: Do you know when the diesel came on the second time and it appeared it would keep coming on that instructions were affirmatively given to an auxiliary operator

to reset it in the plant or whether that operator was told to turn it off so it wouldn't come on, Mr. Faust?

WITNESS FAUST: That I can't answer.

MR. FRAMPTON: Do you know who gave that instruction?

WITNESS FAUST: I am saying that was one over those just hearing -- I was over near that side during that period and I remember hearing that.

MR. FRAMPTON: Mr. Frederick, do you know who passed that on down the line?

WITNESS FREDERICK: No, sir.

MR. HAYNES: Mr. Scheimann, do you?

WITNESS SCHEIMANN: No.

MR. CUNNINGHAM: One more related question. If the diesels had been racked, and the fuel racks had been tripped electrically, and you found that you had a need for the diesels to start, how long would you estimate it would take to send somebody to the diesels and reset it and start it?

WITNESS ZEWE: Five minutes.

MR. HAYNES: I assume if that occurred, the whole building would have been dark; is that correct? Or would there have been lighted passageways from DC lighting system to show the way to the diesel generator?

WITNESS FAUST: There was a flashlight. The operator carries a flashlight with him anyway. But there is a certain amount of lighting, I believe.

WITNESS ZEWE: Diesel generators are approached from outside anyway. From outside into the diesel generator building themselves.

MR. HAYNES: With respect to the core flood tanks, the statement is made the core flood tanks were isolated early on in the course of the accident. Do you have any recollection of that, Mr. Zewe?

WITNESS ZEWE: I don't. It is only in talking again with another person who was there that night a couple of months afterwards that I learned that that may have happened, but I was totally uanware of it at the time.

MR. HAYNES: Do you believe that these valves were closed at a time that I guess they were supposed to be open according to the tech specs?

WITNESS ZEWE: I can't think of any reason why we would shut them or attempt to shut them at this point in time, but I believe if the man says he deliberately went and shut them, that he shut them.

MR. HAYNES: These tanks were later floated on to the system early or in the middle of the afternoon on the 28th. If that is the case, if those valves had been blocked out, wouldn't someone have to go down to the breakers and reestablish the power to them?

WITNESS ZEWE: Yes. Plus someone would have to go and reopen the valves from the control room too, using the

Operators.

I have not yet heard testimony or otherwise that anyone ever did that.

MR. HAYNES: How many people were operating controls in the control room on the 28th?

WITNESS ZEWE: The only ones that I know of that should have or could have operated anything were the four of us or Ken Bryan. The other shift supervisor.

WITNESS FREDERICK: During the entire day?

WITNESS ZEWE: That's early on.

MR. HAYNES: I am talking about the time the core flood tanks were floated on to the system which I recall was about mid-afternoon.

WITNESS ZEWE: Then there were several other people that would operate it. There was at leas. two full crews that were there or more people available who could have been directed to operate the valves.

MR. HAYNES: Who was in charge of the control room at that time when the decision was made to depressurize and float the core flood tanks?

WITNESS ZEWE: Mike Ross was there.

MR. HAYNES: Was he issuing orders directly to operators?

WITNESS ZEWE: The chain of command that day was Mr. Miller to Mr. Ross to me to the operators.

MR. HAYNES: Do you recollect telling any operator to open up the valves on the core flood decks?

WITNESS ZEWE: I don't. The valves were open, as I recall. We didn't have to reopen the valves. We had discussed closing the valves during that same period because I had suggested, which Mr. Scheimann had said before, that I thought it might be better to try to depressurize below 600 pounds and keep the core flood valves shut and let a PD develop between core flood and reactor coolant system and surge the core flood tanks.

That is when I had the first idea of closing the breaker, is we could operate from the control room. The only time that day I addressed that, other than actually not doing that, just letting them come in gradually as we tried to reduce pressure.

MR. HAYNES: These core flood tank valves may be closed to isolate these tanks according to a certain pressure on the reactor; is that correct?

WITNESS ZEWE: That is true. At approximately 700 pounds you would isolate it on a normal plant. Cool down pressure reduction so you didn't empty the contents into the reactor coolant system.

MR. HAYNES: You were in the control room that day on the 28th, Mr. Scheimann. Do you recall the valves being closed or having to be reopened to float the --

WITNESS SCHEIMANN: No, I don't. To my knowledge,

those valves were open during the whole course of the time. The only thing I knew of concerning those valves was at the time Mr. Zewe was walking about, we did have the breakers closed.

The normal condition of the breakers was to be open. In that case the valves themselves would be open, but the breakers closed. There would be no way of closing the valves. However, in anticipation of coming down and attempting to close the valves just prior to a sudden surge into the vessel, I had had the breakers closed.

But to my knowledge, the valves were never closed.

MR. HAYNES: So the breakers were closed in preparation of closing the valves from the control room switch if you wanted to?

WITNESS SCHEIMANN: Yes. As to valves, to my knowledge, they were never closed.

MR. HAYNES: The fact that the breakers were closed in preparation for closing the valves, did you view that as a problem, Mr. Scheimann?

WITNESS SCHEIMANN: No.

WITNESS ZEWE: No. The first time that I had heard the core flood valves were shut and reopened and so forth, I thought that there was confusion relating to the time that that occurred.

I am referring here to when we made the depressurization attempt, which was early afternoon. But the time the I&E

inspector rela' d to me was when the core flood valves were shut early into the accident, before 7:00 o'clock, somewhere between 5:00 and 6:00 o'clock is when he said he had found out that they had been shut.

For that time period there I said no, it should not have happened at all. It was later on in the day. But I have talked with the operator who closed the valves the first time and he went to the valves for the control center to close the power supplies and he was not wearing a respirator. He was not in special clothing, meaning it was done before the site emergency was decleared. It had to be done before 7:00 o'clock.

MR. HAYNES: At that time breakers were closed or what?

WITNESS ZEWE: That the breakers were closed by the auxiliary operator to provide power to it. He was not the one that said the valves were closed from the control room.

WITNESS FAUST: That is where I am saying I remember something, once again, and it as in anticipation -- it was early into the accident when we were actually anticipating future event of cooling down. This was before we started getting longer.

I think that is when they said why not close the breakers now just so we close the valves as we need to as we cool them later on.

MR. HAYNES: The normal shutdown procedure, if you are planning on going down to the delay heat removal system, would be to close the breakers first. As reactor pressures comes below 700 psi, close out the tank valves; is that correct?

WITNESS ZEWE: That's right. But the fact is that just closing the power supply to the breaker wouldn't have altered anything but it is physically closing the valves is the real question.

MR. HAYNES: Are you satisfied in your mind that the valves were closed that morning or not from what you have learned since?

WITNESS ZEWE: Talking to the man who says he thinks he closed them, and he is pretty sure he closed them in those words, I think I did. I am pretty sure I did. But I couldn't say positively. But I would have to say he did.

MR. HAYNES: Who is the man?

WITNESS ZEWE: Ken Bryan.

MR. HAYNES: Okay.

WITNESS ZEWE: This was also a conversation that I had that was at least 60 days after the accident. Once I learned from the INC guy that that happened, he said that he had testimony to support that, but he wouldn't tell me who, so I went asking around to try to find out who it was.

MR. HAYNES: When you heard this from the I&E man, inspection and enforcement inspector, this was about two

months after the accident he learned about it?

WITNESS ZEWE: I would say the time frame of month and a half to two months that he related it to me that I can remember as far as a time period goes, yes.

It wasn't, you know, hours or even days or just one or two weeks later. It was in the order of a month and a half to two months that he first related it to me.

The first time he questioned me, I believe he questioned me and Fred together in the control room. I said, you know, something is just screwed up. There is no way I did that. I don't know where you are getting your information from. I never did that. There is no reason for me to do that. So he said, well, he would check further and then he brought it up two or three other times and I said well, where did you get that information. He wouldn't say that other than that he had verbal testimony to that effect.

MR. HAYNES: So you issued no order to close the valves early in the accident.

WITNESS ZEWE: No, I didn't.

MR. HAYNES: You issued no such order.

WITNESS SCHEIMANN: No. I had directed somebody to close the breakers, but being unaware that -- quotes unquote -- they were supposedly shut already.

MR. HAYNES: All right.

MR. FRAMPTON: One more question that I omitted to

ask you. Mr. Zewe, were you aware on March 28 of the pressure spike in the containment building?

WITNESS ZEWE: Yes.

MR. FRAMPTON: What did you learn or what were you told about the magnitude of it?

WITNESS ZEWE: Waht I was told about the magnitude of it? I seen the magnitude of it. I probably seen it first because I was directly in front of the RB pressure indicator and I was directing the evolution we were doing for depressurizing and Mr. Scheimann was operating the electromagnetic lock valve, opening it up to reduce pressure, and I was trying to have him open it up at a point where we would not have another four point engineering safety feature actuation, so I was picking the point where the RB pressure was rather low so he could vent and we wouldn't have another actuation on four pound pressure.

As soon as I said all right, open it, Fred and I was right in front of the recorder. As soon as he hit it, I was watching it the whole time. Up and down. I stepped back. Everybody there did because it was -- you know, I said did you see that. Yes. Wonder what that was.

We looked at Lynn Wright, one of the control room operators said the building spray pumps were on which were about six feet to my left. So we -- and then we waited a few minutes and then we looked at everything and everything looked normal.

The pressure returned immediately to zero as fast as it appeared. And we secured the building spray pumps since the pressure was down and they were no longer needed. We didn't see any other effect of it. We didn't know what it was. We had a limited discussion on what sort of electrical transient or instrument malfunction could give us that pressure spike. No one had any really good ideas or answers. And we went on with the evolution at hand at that point.

MR. FRAMPTON: When yousay "we" discussed this, how many people were in the control room at that time in total?

WITNESS ZEWE: I don't know, but I would think in the neighborhood of 25 people. There were three shift supervisors there. Myself, Joe Chwastyk and Bryan were there. There were operators there. Two different sets of operators. NRC inspectors there. Mr. Miller and Mr. Ross were there.

MR. FRAMPTON: Was there -- this was after Mr. Miller came back from the Lt. Governor's office?

WITNESS ZEWE: Prior to him leaving.

MR. FRAMPTON: Before he left?

WITNESS ZEWE: Yes.

MR. FRAMPTON: Do you recall discussing the spike with Mr. Miller specifically?

WITNESS ZEWE: I don't. I heard his comments later saying he heard a thud. He hadn't witnessed the spike, but heard the thud and had reported that to Mr. Ross, and he had

attributed that to maybe a ventilation change in the control tower.

MR. FRAMPTON: Do you recall discussing the pressure spike with Mr. Ross?

WITNESS ZEWE: Yes.

MR. FRAMPTON: How about Mr. Kunder? Was he there?

WITNESS ZEWE: I didn't discuss it with Mr. Kunder directly. The discussions mainly were between myself and Mr. Chwastyk and Mr. Ross. What was it sort of thing. We sort of concluded it was some sort of electrical transient. It was just unexplainable to us.

MR. FRAMPTON: You reached a tentative conclusion, if any conclusion, that it was an instrument malfunction in effect?

WITNESS ZEWE: Or some electrical spike that caused a malfunction. Not really --

MR. FRAMPTON: Not a true indication of increased pressure, in other words?

WITNESS ZEWE: Yes. We hadn't perceived we had hydrogen at all in the building. We didn't perceive we had temperatures to create any hydrogen. All our training as far as hydrogen in the reactor building goes is that sometime after the event, in the order of days and weeks, you build up hydrogen in the reactor building from the reaction with the aluminum in the building. It is a long-term type effect, not

an immediate type.

MR. FRAMPTON: Do you recall whether Mr. Ross said anything about whether he was going to relate this to Mr. Miller or anyone else in the chain of command?

WITNESS ZEWE: I wouldnot see why not, but he didn't relate to me I am going to go and call Mr. Herbein about this right away or something of that nature.

I don't see how anyone in the control room at that time would be aware of it. I find that very hard to believe. I remember just backing up right after it happened and literally stepping on two or three other people's shoes because I was in a hurry to back up to look at it. Actually stepped on one of the NRR guy's shoes, as I remember, too.

MR. FRAMPTON: Do you recall whether any NRC people were in on any discussions about what it was?

WITNESS ZEWE: I don't, no. They were there observing the same sort of thing that I observed that was available. I didn't specifically sit down and talk to them about it. Like I stated before, my interface with them there was very limited. I didn't ask anything of them and they certainly didn't come forth with anything.

I just went on with what I had to do and what I was directed to do and the observations were there to be observed.

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MR. FRAMPTON: Was there any discussion of whether the fact that there was a thud in the building was inconsistent with the possibility this was just a stray electrical pulse of some kind?

WITNESS ZEWE: I had personally not heard any this nor did Mr. Miller relate to me or anyone else he had heard anything. I learned this from testimony at the Udall Commission in Washington for the first time that he heard anything and had questioned that he heard something. I hadn't heard it before.

MR. FRAMPTON: Your jumping back was not from anything other than seeing the spinning on the instrument?

WITNESS ZEWE: Yes. I was probably 10 inches from the record looking at it very closely. This spiked up, I stepped back, a natural reaction. Nor from any noise or anything else. I found it so hard to believe that anyone who was in the control room observing anything would have missed that or turning off the pumps or any of the discussions at all.

MR. FRAMPTON: When you say missed it, you mean missed the discussion that ensued.

WITNESS ZEWE: Or missed what was -- that the spike had happened or that we secured two building spray pumps because of it. We actually had ES actuation because of that, too. On high pressure you had isolation again so the

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spray pumps were on and everything else went to ES position.

MR. FRAMPTON: When you say missed that, you mean missed the flurry of activity caused by that?

WITNESS ZEWE: Yes. I'm observing something. Even if I didn't see the spike, I see a flurry of activity and say what was that? I don't see that --

MR. HAYNES: On the pressure spike, I believe 4 psi you get containment isolation?

WITNESS ZEWE: That's correct.

MR. HAYNES: 28 psi is the trip point for the building spray system?

WITNESS ZEWE: 30 or less is the set point.

MR. HAYNES: I believe the pressure peak was 28 psi as indicated on the chart and the building spray system came on?

WITNESS ZEWE: True.

MR. HAYNES: Are you aware in the control room logs, I believe you have the chief foreman's log and also the operator's log, the pressure peak is not recorded in those logs?

WITNESS SCHEIMANN: May I comment as far as that is concerned? You have four people in that control room. You have a piece of mess going on in front of you. There is no way in hell you got time to take and worry about inking an entry in your log.

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WITNESS ZEWE: We had log takers at that point. Like you mentioned before, Mr. Berry was taking logs, so to speak, on timed events and writing down the sequence of events. We relied on him and the other people that were taking time sequence type data. It wouldn't surprise me at all we didn't write it down in the book.

MR. HAYNES: That's correct about Mr. Berry's notes showing that he was taking data in the afternoon of the 28th and that also he made the late entry in the control room perator's log, I believe it is. You have a foreman's log and you also have an operator's log. And there is a late entry in that where he notes the four psi and then the securing of the spray system. So I would say from that, what would you deduce from that? That Mr. Berry was not aware of the spike also?

WITNESS ZEWE: Either that or like the rest of us, he failed to grasp the significance of it. Greater than four pounds was greater than four pounds. I don't know if he was -- since it was there and gone, not thinking that it was significant, maybe it didn't make any difference. Maybe the most important thing to him was we had an actuation of an ES system. Mr. Berry has a very long experience in the nuclear power field and I think that he, too, also just thought the ES at that time was the most important thing and the spike was inconsequential to the event, so he elected not to write

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about it. I guess. I can only surmise. He was behind the panel looking at all the operations and everything that was done and said and watching the clock. I'm sure he was aware of it.

MR. HAYNES: The control room operator's log entry for that day is four to four and a half psi spike. The shift foreman's entry for that afternoon also said there is about four and a half to five psi pressure in the containment. Do you know why the two apparently independent logs would have the same value recorded and ignore the 28 psi spike? You're shkaing your head, Mr. Frederick. Do you know why?

WITNESS FREDERICK: First it's two questions. The narrow range instrument showed a spike as well as the wide range instrument.

MR. HAYNES: I understand it did. It goes up to 10 psi. I understand that was at full scale?

WITNESS FREDERICK: Why did they write down four instead of 10?

MR. HAYNES: Four instead of 28.

WITNESS FREDERICK: Just the same logic as the thermocouple readings. If you have 150 readings that say four pounds and one that says 29, which do you consider is correct?

MR. HAYNES: I understand one reading was on a

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10 psi scale that went full scale. Another went up to 26. That's not inconsistent, is it?

WITNESS FREDERICK: It seemed to everybody in the control room, whether they were NRC or GPU or B & W, they call came to the same conclusion, that there wasn't anything aprticularly significant about that spike.

MR. HAYNES: That it was not due to a pressure spike. It was due to electronic signal or transient. Electrical transient.

WITNESS ZEWE: Some sort of transient that we would investigate through the electrical department to see what sort of interaction would case that.

MR. HAYNES: That was your evaluation?

WITNESS ZEWE: Sure.

WITNESS FREDERICK: What type of transient can cause a 2 million cubic foot building to pressurize and depressurize that quickly?

MR. HAYNES: I thought we were talking about the instrument.

WITNESS FREDERICK: That's why none of us considered it plausible. It's impossible to do that.

MR. HAYNES: I wouldn't say it was impossible. I thought it actually occurred.

WITNESS FREDERICK: Based on our training, it was impossible. It was completely foreign. If you look back

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through everybody's training and the FSAR and safety analysis and the building construction, you will not see a paragraph that projects that type of transient. Nor will you see it in anybody's training as far as -- that is so particularly foreign and unbelievable that it has absolutely no significance. That's why nobody did anything about it for two days.

MR. FRAMPTON: Would you say the same about the in-core thermocouple readings?

WITNESS FREDERICK: Yes. Looking back on them, they're very logical but at the time they were read they make no sense.

MR. FRAMPTON: Would it be fair to say that at the time these readings came off the wires that they were so incredible that they weren't believed?

WITNESS FREDERICK: The engineer that took them said they're garbage. They don't mean anything. Wait until I tune these instruments and we will take some readings.

MR. HAYNES: Do you agree with that?

WITNESS ZEWE: Which part of the statement?

MR. HAYNES: That the fact that you had some thermocouple temperatures there in the core that were high and that you hadn't been trained for it, that therefore they were unbelievable, the readings?

WITNESS ZEWE: Not totally, no. If the indications

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off scale are high enough, I would hope in retrospect it would have meant something more to me then. But I couldn't say that it would have.

MR. HAYNES: I guess my question is, is the fact it's not discussed in the FSAR or covered in the training, does that make such indications on the instrumentation unbelievable. therefore you would not consider them in evaluation of an event?

WITNESS ZEWE: No, that isn't true.

WITNESS SCHEIMANN: I would have to say that isn't necessarily true also.

WITNESS FREDERICK: I believe I said indecipherable or meaningless, not meaning that they would be -- that they should be purposely ignored just because you have never seen it before. If you don't understand it, there is not much you can do about it.

WITNESS FAUST: I don't know that it would have changed what we did.

MR. HAYNES: I'm not saying it would. I'm trying to understand why something that is not covered in the training or in the FSAR, your perception of why it would be meaningless to you.

WITNESS FAUST: I wasn't aware of the thermocouples, for one thing. I'm not so sure even if I was aware of them and -- hey, that's not right. If anybody would have

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considered my saying it that significant.

WITNESS FREDERICK: Again, none of us were presented with that thermocouple information. We were presented with this information and obviously made no conclusion from it. I'm saying the reason I made no conclusion from it, I was the one he stepped on by the way, that it was absolutely meaningless because it tells you nothing. If someone said to me that an explosion will cause an instantaneous spike like that, I would tend to disagree with that anyway. I would expect to see the pressurizer dive slowly.

MR. HAYNES: I believe this pressure peak was something like a 6-second duration from the time it started until the time it came back down to pressure. Just a few second.

WITNESS FREDERICK: If someone deciphered that from that strip chart -- excellent work. Commendable.

(Laughter.)

WITNESS SCHEIMAN:: Especially since the darn chart is only in 15-minute increments.

MR. HAYNES: Is this the only place pressure for the containment is reported?

WITNESS FAUST: All we saw.

WITNESS SCHEIMANN: As far as I was concerned was like this, that quick. Boom, it was there. Boom, it was gone. It wasn't: "Hey, this is increasing," that type of

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thing.

MR. HAYNES: So your recollection is the spike was much faster than a few seconds; is that correct?

WITNESS ZEWE: Yes. I'm convinced even that day, I was convinced that it didn't go completely off scale high and that it only recorded up to 28 pounds. I don't know how high it got.

MR. FRAMPTON: What would off scale be in that case?

WITNESS ZEWE: 60 pounds.

MR. FRAMPTON: Gentlemen, this has been a long day. Thank you very much for your help and your cooperation.

As I said at the beginning, we had a chance to review and we have available to us all of the transcripts of your former interviews with I & E and your depostions taken by the President's Commission. I would like to give each of you a chance before we finisg to bring up anything in addition to the subjects that have been covered in those interviews and in our questioning today. That is, are there subject matters or areas that haven't really been gone into at all in your previous interviews with I & E or the President's Commission or today that you think are important to the accident or important to the ramifications of the accident or the lessons we ought to be learning from the accident that really haven't been covered before that we ought to be

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looking for? Are there any areas or subject matters that haven't been touched that you think are pretty important?

I would start with Mr. Frederick.

WITNESS FREDERICK: Having been given the opportunity to voice such comments before other committees, I feel I have been properly verbose on that subject.

MR. FRAMPTON: Mr. Scheiamnn?

WITNESS SCHEIMANN: I kind of go along with what he says.

MR. FRAMPTON: Mr. Zewe?

MR. ZEWE: I think the reason we are where we are at now, and I'm looking at it more personally as the company Met Ed goes, is that I think the undue press coverage and media coverage has contributed to our situation right now, which has certainly hurt the industry and hurt us and hurt the people and certainly contributed to the effects of the whole industry in general. I don't think enough has been said and I don't know if enough could be said about the media coverage and the very poor response that they have shown and the dissillusionment they have over the accident, over covering the accident, the effects and the real detrimental effect that they had on the nation as a whole. I think we could have gotten through this accident and corrected it to sufficient magnitude so that it would not endanger the public again, and we could go on from there, but

I'm not sure if we can ever go on from here with the way the media and press has really made a circus out of it. That includes their tremendous influence and pressure certainly influenced and pressured all the commissions we talked to at every level, particularly when -- a fine example of that was related to me very strongly by the subcommittee -- the Udall Commission. This was related to me from Mr. Miller because I was not involved in the public hearings with them. They were very nice to us. We went there as a group. As soon as they got the camera people there, they were totally different. Totally vindictive was the word, and pointed. No longer dealing with human beings. It was on another latitude.

I think I could see that same thing with the President's Commission. I could see that same thing with members of the NRC when they were trying to have the right light in respect to the press coverage to show that they were good and we were bad. I could not, being a member of Met Ed now, go out to the public and say anything that they wouldn't totally disbelieve and that wasn't because we didn't tell the truth. I totally believe that.

I believe during the whole thing, and I was immediately involved with an awful lot of the decisionmaking and some of the related words that were put out by the company, and totally tried to be honest. They got slaughtered for it. When a Congressman tells a vice-president of the company who

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I felt acted very, very well that maybe everybody's too defensive and that's why they took him apart, but to call him a liar, that he lied, wilfully lied, is totally disrespect for a human being. We can't say to a Congressman that you're a liar, but they can certainly have any freedom of speech they choose for whatever reason they want. It's a lot of political soapboxing. I think we all realize that.

I don't know if we can overcome that, but it certainly hurt everybody involved and certainly hasn't helped anything. And that is only my subjective views. Some of it is very objective, though, because it's cases that actually happened. That's why I totally refuse to talk with any member of the press. I have been contacted quite a bit. I make no comments. Not that I didn't have comments or not that I didn't think they could be constructive, but I would be misquoted. I have relatives in the area here that have told me that the reporter has gone down the street and asked five or six different people things and passed six by until he came to the seventh one with something derogatory to say or something really enlightening and then the camera lights were on and they had a story.

We didn't educate the people about nuclear power for the last 25 years. It's a black box and they're using that tactic to sell newspapers and the right stories. I just wish something could be done to put the responsibility

on the press. I think they do have tremendous responsibility and certainly are not living up to it. Even though I was involved very heavily in the accident and some of the decisions I made contributed to the accident, I feel I acted more responsibly than they did.

MR. FRAMPTON: We appreciate your candor and your comments. Mr. Faust?

WITNESS FAUST: I couldn't relate to that any better.

MR. FRAMPTON: Gentlemen, thank you very much.

(Whereupon, at 7:02 p.m., the interview was adjourned.)