UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

# THREE MILE ISLAND
# INVESTIGATIVE TASK FORCE

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VOICE: -- placed on -- or any training did you remember a small break pipe LOCA that would stablize above 1000 (psi) rather than one that would stablize, oh, say at 500 pounds?

VOICE: From memory, prior to the accident, which -- I might have changed quite a bit since the accident -- training was emphasized similarly to the simulator -- going to larger and larger pressure increases in the building and decreasing in the coolang system, put more and higher water in holding the pressure -- took the pressure when it leaks. I can't remember any special courses or training on that now.

MR. KUNDER: And I feel the same way. I can't remember off the top of my head. Like I say, we were probably all confused the day after the accident. But I don't remember them ever simulating that down there or our training department giving out that information, to the best of my knowledge.

MR. KEATEN: This is Bob Keaten on a slightly different topic:

Bill Zewe's crew reported that they were not anxious to close the block valve for the PORV unless they were really sure that it was necessary because they were concerned that, if they closed it, it would stick closed and be impossible to reopen. Do any of you have any experiences or opinions that would either agree or disagree with that? Did they know that there was a leak?

VOICE: No. Once they knew it was a leak, of course they closed the valve. But the point is that, they said they weren't anxious to close it unless they knew they needed to because they were afraid that if they closed it, it would stick closed. Have you had experiences in either that valve or valves of similar applications sticking closed that would make you sensitive to admit it?

MR. WALSH: There have been very many situations where valves have stuck closed. There would be a high P-T or whatever around it. A lot of -- like sample lines on the pressurizer having a -- manually-opened -- the small valves for pressurizer sample -- not when we were operating, fortunately, but that did stick closed. In the secondary plant that was common nature. They always stuck closed. There isn't a valve hardly on the plant there that didn't take six operators to open it.

MR. BIRN: Excuse me, this Jim Birn.

Are we talking about limitorque valves now -- their operators?

MR. WALSH: Yes, limitorque.

VOICE: I probably would have hesitated to close that. If I knew for sure I was leaking PORV --

MR. WALLACE: We'vehad a little bad luck on in unit one and unit two on those valves -- they're not operating -- they're not opening and they're not closing. The only

thing about those valves -- are in a bad envoronment. You know, I've been down there. We've had a lot of bad luck with them. Of course, I see now that they've come up with another type valve, different design and things like that. They should have kept that -- that philosophy before they cause it, I guess.

MR. WALSH: This is Walsh.

There was a lot of -- I guess more concern with that crew of maintaining pressurizer level, and they, when the level went up, they turned off HPI. Do you think that was counter to the kind of training you guys had? Say with the simulator or with just general discussions on that? Level was going up and pressures down -- going or you aren't too concerned with the pressures. Would you turn HPI off?

VOICE: Sure the operator would. I'm sure of that. You know, like I said, it's a solid system, what the hell, you want to be putting water in it for? Of course, that's ignoring temperature and pressure. You know, if you're just looking at system wide -- volume -- you know, but your question, ah -- oh, I don't think you'd turn off the pumps if pressure is going down.

MR. KEATEN: The trouble was, it came down and bottomed out. You'd say it had bottomed out.

VOICE: Well, pressure was staying and Faust was not sure it was bottomed out.

MR. WALSH: It bottomed out at 1200 or below -- you hit 1200 pounds in six minutes and so -- but that would be pretty steep -- that would be a fairly steep -- but then it would start. They had on a -- they must have assumed that the pressure would come right back up. That's what you're telling me. And that much is sure.

VOICE: But there's noting in your training that was stressed that -- say if the safety system is actuated -- determine why it was actuated -- there is not set criteria for determining when you turn off the safety system when it's bren automatically actuated? Is there any criterion like that that's never covered?

VOICE: That's true

MR. KEATEN: You're stating you've had, Bernie, that it was not covered?

MR. WALSH: No, it's not covered.

MR. BIRN: This is Jim Birn. In reading through the reports and things, it appears to me in a lot of cases when the plant tripped, you did initiate ES on low pressure? That was pretty normal? And so, it was normal practice just to reach over and bypass ES as soon as pressurizer level started back up?

MR. WALSH: Well, not necessarily level, you're looking more at pressure -- you'd make sure you had a level.

VOICE: There may be some procedurally-allowed --

the actual loss-of-pressure procedure requires you to bypass the signal so you can take manual control of the flow.

VOICE: The procedures says take manual control and regulate the flow --

MR. WALSH: That's correct. So bypassing the HPI is completely in complinace with the design.

MR. WALSH: And most of the time on a trip, okay, most operators are trained that the procedure goes through numbers on the pressurizer -- you know, level, when you start pumping. Most operators reach over and start the second makeup pumps, 'cause it's hard to keep the pressurizer from blowing down, you know, if you just wait. Most guys just go over and hit it.

MR. KEATEN: Bob Keaten again.

Let me swithc again to a different topic. We're coming down to the end and there are a couple of things I want to talk about. As you are aware, as a result of the accident on the morning of March the 28th, there was a significant transfer of a radiocative -- presumably both liquid and gases purged into the aux building, and subesquently released from the aux building to the environment.

As of today, the various investigations have not been able to focus in on what really was the one leading pathway of release from the reactor coolant system into the aux building. If any of you have any information that would

help us find out what pathway or pathways were the ones that really occurred, I'd be very interested in hearing that.

MR. WALSH: I've looked at that. I don't know. They keep contending, you know, that supm pumps were fof and they didn't pump water. I don't know how that water got over there. I've looked at it. In fact, I worked with Bill, we both looked at it. I had -- I don't know.

VOICE: We got a good bit of data that says those pumps did get turned off after 120 minutes. As far as we know, they were never turned back on.

MR. WALSH: Yeah, that's right.

MR. KEATEN: Which wouldn't have been enough to --

VOICE: Right. "cause at twenty minutes into the accident there wasn't any core damage, so that water would just have the normal primary coolant activity. It wouldn't be the kind of hot water that was donw there later on.

MR. WALSH: I never heard anything, ah -- the first two--two-and-a-half months on that, okay. Everyone said they didn't know where the water came from. Then -- one day I saw someone, I don't know if it was from B&W -- brought over one of the graphs from the RC drain tank. Did you ever see anything on the RC drain tank being pumped down after the accident? For a period of time it looked like the RC drain tank had been pumped down and it was for a forty minute period -- twenty minutes later it was for another forty minute period which -- and the

thing was pegged out at greater than 150 gallons a minute which constituted many thousands of gallons coming over from the primary system in this.

The way that the graph looked it was right shortly after the time of the accident. It showed a lot of spikes in the graph which looked like maybe a pressure surge going into the tank. And then the thing bottomed out at zero, where it should be; and then took a straight line off thepaper at greater than 150 gallons a minute; and then went into a straight line for aobut 40 minutes, went straight right back down to zero; stayed there for about 20 minutes and then came back up again.

MR. KEATEN: Do you remember how far into the accident this was?

MR. WALSH: Well, you can't really tell, because the chart is not dated quite properly. I guess on the second day. Which (inaudible) Don did make his entry at least for the date March 29th and at this point, the guy that was over there at the time was just using all these lines and the pressure excursion was going into the tank and going by that, it might have been a 15 minute or 30 minute period after these excursions occurred that pumping took place.

VOICE: Mr. Walsh: this is on the -- would the flow from the drain tanks to the -- would it normally go to the waste -- the plant's waste receiver tank?

MR. WALSH: I believe normally it goes to the plant's

RC bleed tank.

VOICE: There is a flow recorder on that?

MR. WALSH: There is a flow recorder in the control room. And the guy that brought this over, he -- you know, like you say, I never heard anything. I -ever heard one of anyone pumping any water out of that tank. And this guy comes over and he assumes that this is an automatic function -- the tank gets too full; the valve opened and pumped out which is not the case here.

MR. KEATEN: I know you told me about that graph, but I've never seen it since nor heard about it.

VOICE: A GPU man spoke to Lex about it.

MR. KEATEN: Do you know who that was?

MR. WALSH: I don't remember his name right now, but I know when he came up, he really started talking to me about it. So I went over to show them what we had and all. Like John was saying, that guy was under the assumption that valve would open automatically, which it doesn't. It'll close automatically, but it doesn't open automatically.

MR. KEATEN: I guess I'd like to close by giving you guys an opportunity to bring up anything else that you think you'd like to get out, either relevant to what we've discussed, or relevant to something else.

MR. BOOHER: I think we ought to have a pay raise.

(Laughter.)

MR. KEATEN: I'm afraid you got the wrong audience for that kind of --

(Laughter).

MR. WALSH: (Inaudible).

MR. WALLACE: Is it true now that we're getting -- could be fined for this operation under the new NRC regulation that came out last month?

MR. KEATEN: This was one of the recommendations of the NRC short-term lessons learned group --

(Laughter.)

MR. KEATEN: Under certain circumstances, yes. I'm not sure that that's actually been put into effect. There has been an awful lot of discussion and an awful lot of people saying that that's not a very good idea, so -- honestly I don't know where it stands.

MR. WALSH: I want to say a couple of things. Now, you know we went into extended training programs and, you know, NRC is dictating everything they want, you know, my curiosity is when is GPU going to take a stand? You know, everybody in the world makes rules. And of all it costs us money to comply with everything. Sure, it might be a little early but some place along the line, somebody has to stop something.

You know, it's just like -- you know, I'm sure the exams are going to be harder and there will be more people and I don't know for sure if it's going to make it go away.

MR. KEATEN: I understand your question, Bernie, and it's a very good issue and it's one that -- within the Service Company we've had some discussions about as well, as I am aware of these discussions (inaudible), and one of the things that this group is supposed to be doing is to make recommendations of the things that we think really need to be done; and a corrollary of that is, that when the NRC comes out with some things that we don't believe need to be done, we're hoping to flag that out and say, here's one that these guys are saying, do it; our own findings indicate that it's not really necessary or it's not going to be beneficial or in a couple of cases, it may in fact even be contrary to what you need to do. And then, use that as information to make a decision as -- all right, this one it's not necessary, but it's not that painful, so we'll just go ahead and do it; this one is not necessary and it is really painful, so we ought to stand up and fight about that one. So, we are planning to go that way. This group is hoping to have an interim report in about another month.

VOICE: Is that right? And you

MR. KEATEN: And you know how that works. Deciding to fight the NRC regulations is not the same thing as winning that fight.

MR. WALSH: I understand that.

MR. KEATEN: "Cause they're probably in as much

trouble as we are -- and getting through anything to 'em is really tough.

MR. KEATEN: Okay, if no one has anything else, I'd like to thank you guys for being here and giving us all this information today.

(Meeting adjourned.)

MR. KEATEN: This is an interview with George Kunder and George, I guess I'd like to start off the discussion by asking you to describe for us as best you remember, when you got into the control room on the morning of March the 28th and what was going on and what was the perception of the people at the time you got there?

MR. KUNDER: I arrived in the control room approximately ten minutes of five, is my recollection, and when I arrived, Tim Brian was in the control room and Scott Wilkeson was in there; Fred Scheimann and approximately two of the operators -- I can't remember the faces any more. They seemed to be concentrating on the pressurizer level over in the area of the makeup control panel in the console. Someone had informed me that we had experienced a turbine trip, and subsequent reactor trip, a rupture of the drain tank rupture disc and the pressurizer level was pegged high. As I tried to gain an assessment of theinstruments for myself -- which was somewhat slow because of my unfamiliarity with the console of the plant -- I did not that the pressurizer level was virtually pegged. I can't remember if it was totally pegged or very close to being pegged. The operators throught the course of my attempt at assessing the situation -- indicated that they were letting down in order to reduce pressurizer levels. I questioned -- at some point in time how long they had been -- they had indicated pressure had gone low -- and when the high pressure

injection was actuated.

I asked how long it was actuated because it seemed to me that apparently the system had been overfilled, presumably through the high pressure injection and they indicated that it wasn't on for very long. Mostly qualitative assessments at that point. Ben Brian had noted to me -- at one point that the releif valve line -- seems to me I remember a number of -- he said it was coming down and the number was something like two hundred and thirty degrees. That's the number I remember.

And based on that, it made sense; it was consistent with the fact that we had a trip -- we had high pressure and the reactor coolant trip -- and the relief valve apparently had opened, and presumably had opened longer than the quenching capability would permit, and allowed the rupture disk to blow. And that was consistent in the sense that I had experienced that similar kind of phenomenon at unit one years ago during the startup program. Based on the fact that the indicated temperatures were coming down, that seemed consistent -- and I didn't pursue that particular item any further at that point.

The general perception appeared to be concern that, while everything appeared to be steady-state, there was still a lot of activity going on and the main concern in the control room was the pressurizer level being high and the inability of the operators to regain control of the pressurizer

level through what they perceived as inventory controls that were in effect at the time.

Another problem that existed -- and I understood Bill Zewe to be working on -- was the apparenty high level in the hot well. As things developed -- I guess I was there for I would judge maybe ten or fifteen minutes before -- my impression of the situation was that we had a very unusual situation, something that I had never seen before -- I had a difficult time assessing all the parameters because I pretty much had to draw it out of the people who were really trying to concentrate on what they were doing. So I asked for additional people to be called in. And I requested Wilkeson to call in Dubiel and Spelitz, all my lead engineers, and I think I asked him to call in on coming shift supervisor and foreman because I felt we needed additional operational experience in, tool They felt it when they were pretty hard-pressed to cover everything and, you know, try to understand what was going on in all these areas of the plant.

I guess that -- so as not to ramble on -- that was the environment. The best way I can characterize my impression -- initial reactions.

MR. TSAGGARIS: George, Lex Tsaggaris.

Still in that same time frame when you initially came in, do you recall any perception of radiation problems?

MR. KUNDER: No.

MR. TSAGGARIS: Do you recall any radiation alarms that were in -- that were indicatinm abnormally?

MR. KUNDER: If there were any in, I didn't observe. Un, my reaction was that board was pretty well stable in terms of little alert or alarm lights being lit. They sort of jumped out at you when they start coming in. Sok there was no radiation problems, apparently.

MR. KEATEN: George, do you remember who it was that briefed you on the status? Was it one person, or did you just talk to whoever was available or what?

MR. KUNDER: It was more than one person. And I can't remember specifically who I spoke to at any one time. I remember talking to Ken Brian relative to relief line temperatures; some of them had shut off, questioning the operators on different things that had occurred or questioning where the other pressurizer level indicator was so I could check that -- I was trying to derive as much information as I could from those guys and I have a habit of wanting to see the instruments myself and so I was trying to find them, which is not that productive on my part to evaluate, because I didn't have experience in the control room.

So, it was a combination of operators and shift foreman and Ken Brian and maybe -- and Scott Wilkeson in the control room at charts doing things like getting status too.

VOICE: Okay now, let me get things clear: at the

time that you came in, Bill Zewe was not in the control room and this was as best as you can remember about ten minutes of five?

MR. KUNDER: That's what I recall, yes. I think that the gate records, if I recall correctly, showed me coming through the gate around a quarter of five. It would have taken me at least five minutes to come through the security center-- I remember seeing the relief valves with their atmospheric dump open on unit one and I tried to raise anyone in the control room but no one answered so I just yelled over the page that the dumps were open just in case they weren't aware of it -- and I went over to my o-fice, put my brief case in there; I don't know why I made that stop, but mainly to get my hardhat, I think, and I proceeded right up to the control room of unit one.

MR. KEATEN: I understand.

VOICE: Did I understand you correctly, that as part of your initial gathering of information -- I won't call it a briefing since I know it really wasn't, -- that you were informed that the drain tank rupture disk had gone?

MR. KUNDER: Yes. I'm pretty sure somebody had told me that and I went over and tried to find -- I think at one point in time I walked back to try to find the indications for the drain tank level, etc. with the individuals. I just seem to remember going back there, but anyway, I do remember seeing

the building pressure recorder. That's over on the main (inaudible). I observed that was about two psi in the building. So again, that made sense to me although there was no proof that the rupture disc blew based on my previous experience when we blew the unit one rupture disc. It made sense to have some small amount of pressurein the building from that -- due to flushing of the water.

MR. KEATEN: I'd like to pursue a little bit that previous experience of yours on unit one. This was what, a normal reactor trip?

MR. KUNDER: I believe it was associated with a trip. In my own mind I have never since gone back to reivew that circumstance on unit one, but it may have been a condition where we lost our vital bus and -- or at least the power supply to the NNIs, which would have given the electromatic relief valve an open signal, because the pressure -- I believe it would have been the pressure -- either the pressure actually went high or the instrumentation failed high and opened the electromatic. I think it was that, but I may be confusing two incidents. At any rate, the relief valve opened for an abnormally long time, something like 30 seconds or longer, and we may have had even some higher-than-normal temperatures in the drain because, of course, you didn't have any release of radiation in the reactor building. I don't believe anybody was in the reactor building when this occurred. So that's why

that kind of thing made sense to me.

MR. KEATEN: Now, in this very initial time frame that we're talking about, in the parameters that people were telling you, did anyone mention the reactor coolant system pressure?

MR. KUNDER: I'm sure they did at some point. I remember looking at pressure.

MR. KEATEN: Um hum.

MR. KUNDER: And at the time, you know, with all the things going on and trying to just concentrate on the big picture, so to speak, adn I hadn't reached the point where I had begun to focus on (inaudible) but I did not that the pressure was down -- something around 1100 psi, 1200 psi, and my judgment of that, hwich was very cursory in retrospect, was that somehow, we had lost the bubble in the pressurizer; either collapsed it through an excessive in-surge and ended up at a low pressure and recovery of that pressure again would depend upon forming the bubble again in the pressurizer. And I really didn't think the problem through far enough to concentrate on the saturation temperature and the hot leg temperature -- I'm not sure I can even remember the numbers right any more; but it was somewhere around 550 or 560. Generally, 550 is about where the $T_{ave}$ immediately after trip. So again, that was close to the values I would expect to see, but pressure was low. It bothered me, but I explained that every quickly in

my mind as being the fact we had lost the bubble and we hadn't regained pressure control. They did have the heaters on -- but it was never considered that they weren't covered enough.

MR. KEATEN: Jumping ahead for just a minute, at what point in time, if you remember, did somebody draw the conclusion that the primary loop was really saturated and that there were probably gas bubbles in the primary loop? Was that considerably later in the morning?

MR. KUNDER: Yes. I believe that we all drew that conclusion simultaneously -- we were in the control room discussing with a bunch of people you know -- I don't know who really comes up with the idea at first -- it sort of mutually develops. But when we knocked off a pump and later attempted to restart the pumps and -- by that time we learned the hot leg temperatures were climbing narrow range instrumentation. And we tried to start the other pump and then -- I guess the think that -- it was that combined with the high temperatures led us to conclude that we may -- when we tried to start the pump -- it wsa an immediate conclusion -- but during that ten or fifteen minute period when we were trying to restart the coolant pumps and we weren't getting any flow, that we started to realize that we had some type of vapor lock. That's the way I conceptualized it -- we had a big bubble in there and we just weren't pumping anything. By that time we had rein-

itiated high pressure injection.

VOICE: (Inaudible) two places you had the full pump.

MR. WALLACE: Two points -- two questions on the reactor coolant pumps. First of all, was there a specific indication or pair of indiciations, that everybody focused on which said -- "that's happening -- we got to try to restart a pump".

MR. KUNDER: I can't remember. I think that it's possible -- and this is spectulation -- that the operators at the console, who are expecting to see the onset of natural circulation, didn't see the behavior that they were expecting. And, of course, the hot leg temperatures continued to climb. And I believe the danger there, at that time, was that, I thin, we had to signal a problem. I guess at that point in time I wasn't focusing on the instrumentation directly myself. (Inaudible).

MR. WALLACE: From what you could see, when that decision was made, was that basically made with the on-shift watch standers, or were there some other collection of people who were involved in that decision to go ahead and try to start the pumps?

MR. KUNDER: Well, at that point in time, I believe that Mike Ross was there; and next Joe Logan was in there, and there were a number of senior people who were trying to

evaluatte the behavior of the primary system. I can't remember any specific individuals who -- whether it was the crew or some of the other individuals who suggested it.

I don't remember myself, thinking, hey we got to start that pump. I don't think that I thought that at that point in time. A lot of our ideas were collectively assessed, you know, so forth, took place and it's hard to recall (inaudible).

VOICE: Second point. Do you know why or did someone try to figure out why the first three pumps didn't start?

MR. KUNDER: At the time, I'm sure there was an answer, but I can't remember what it was.

MR. KEATEN: George, I want to ask you the kind of question that, at this late date, is extrememly difficult to answer, but I ask it anyway. If at the time you had originally gone in and you were looking at the control instrumentation and getting data, if there had been installed the kind of thing that everybody's now talking about -- the saturation meter that shows the relationship between pressure and saturation pressure -- that meters had been there and you had seen it and seen that, in fact, the pressure was sitting on saturation pressure, would that have made any difference in the way you thought about the pump?

MR. KUNDER: Oh yeah -- but that would presume that

I had thought this kind of a scenario through and understood the dynamics of a small-break LOCA.

MR. KEATEN: No, I'm trying to ask you a different question. Supposing we hadn't thought it through, but you simply know what you know then, plus what you know as a matter of fact, that the pressure was at saturation?

MR. KUNDER: I don't know. It might have, but then again, there's no guarantee that it would have. I tend to be less analytical and more operator-oriented in the plant. The confidence I strike with -- generates from my knowledge of the plant -- you know, I tend to react more as the operators would have reacted because of my experience at the simulator, which is because that's the only real operational experience that I have in operating the controls. And -- I guess we've become somewhat conditioned through previous trips and subsequent inadvertant actuation of high pressure injection that, when we have that kind of condition induced -- such as we experienced also at the simulator -- the recovery is marked by a pressurizer level coming up and pressure coming up. And this anomaly is just one that we hadn't experienced. Perhaps, just being bothered so much by that anomaly and not being able to get my mind set in analytical fashion -- it would be easier for one to do these a little bit more removed from the impact of wanting to get the thing under control, directly. I think that it would tend to offer a resistance to trying to figure

that problem out. But knowing what we know we know now, I think that analysis would be pretty much an automatic thing.

MR. KEATEN: Oh heah. Knowing what you know now.

MR. KUNDER: I can't answer the question.

MR. KEATEN: Let me ask you a couple of other questions -- I still want to focus on this very early period before we go past it.

The time you came in, Bill Zewe was not in the control room -- he was dealing with problems in the condensate polisher. Who did you perceive was in charge of the control room, or was that clear?

MR. KUNDER: Well, the control room, my perception would be that the shift foreman was the guy in charge.

MR. KEATEN: I had -- I mean, was he acting like the guy in charge?

MR. KUNDER: Well, without knowing who specifically -- well, I was told over the phone that Bill Zewe had asked me to come in, so I -- in the back of my mind was that Bill Bailey was the shift supervisor on duty at this time.

MR. KEATEN: Yeah.

MR. KUNDER: When I came into the control room, Ken Brian was there -- I guess I didn't really think that much about who was in charge. Looking back, the guy in the control room who had the continuity and really had the responsibility was more Fred than anybody, I think.

MR. KEATEN: Now, then when Bill came back into the control room, did you -- did it appear that he was really in charge of the activities?

MR. KUNDER: Yes. He was the responsible shift supervisor. He did have as much perspective as anybody did in the whole event.

MR. WALLACE: This is Wallace. George --

MR. KUNDER: I would say "in charge" if I may interrupt. The same question came up with the NRC inquiry just yesterday. My perception of who was in charge was that Bill, as the SRO of the unit, was responsible for directing the activity of theunit. The question of whether, for instance, I as senior member of the staff, was in charge is best characterized by myself as -- there was some time that I consider had to transpire and some realization on my part of what the plant status was before I could assume the broader control, the broader responsibility for theunit. I feel that I did assume that to a great extent -- in the terms that I felt responsible to get additional assistance called in for what I perceived was a very serious situation comparted to routine previous trips, if you will. And in all that time I would perceive that Bill would report ot me as the senior individual because Bill's responsibilities continued to be direction and control of the emergency actions on the unit. So I perceived myself as taking responsibility as senior member of the staff

in support. When Joe Logan arrived later on, it took some time for him to become aware of what was going on. And there, I'd say that more of an informal turnover took place in that I perceived Joe as assuming responsibility. About that time it was time to declare the site emergency. Between Bill and myself, that realization became apparent. And he took one set of actions relative to announcing to the plant and I took another set of actions in trying to muster my engineers to start making phone calls and get into the emergency plan activities. And I viewed Joe then as the emergency director. When Gary came in, he received the same type of assessment -- very quickly briefed on these activities -- and then he became emergency director. And he formally announced it in the control room. There was a progression of who was in charge and that's the best way I can characterize it.

MR. KEATEN: As far as the operation of the plant itself is concerned, Bill Zewe was really more or less the continuous thread through this?

MR. KUNDER: I think so. I tried to offer him backup and advice where I felt it was appropriate and qualified to do so. Many times he took actions that I would characterize as giving him "passive concurrence -- like securing the pumps. I don't think I ever told him to secure the pumps. The recognition of the low pressure and high temperature condition which was outside the bounds of NPSH operation was on

their part. And I became aware of that and I did not see anything wrong at that point with securing the pumps. So, by not saying anything -- so to speak -- or sometimes, I may even have actively concurred. In that sense, I pretty much was offering whatever expert advice I could offer at that point.

MR. KEATEN: At that point, at the time that you were aware of the desire to secure the pumps and concurred in it, what did you expect to be the true emergency cooling?

MR. KUNDER: Natural circulation.

MR. KEATEN: Did you have any memory of deliberate actions that were taken to increase HPI flow prior or concurrently with securing the last pump -- IA pump?

MR. KUNDER: I don't remember anything. The only recollection I have -- and this I guess pretty much stands out in my mind was -- I believe it was after we had secured the pumps --very, very shortly after securing the last of the pumps -- the tack that I was misled to take was that we were going critical. And I had previously asked that boron samples be taken so that engineers could perform a shutdown margin calculation. This was much earlier -- maybe 20 minutes after I arrived or something like that -- but I had then received some initial reports from Dick Dubiel, who had arrived at that point of time and I indicated that I had to go down and coordinate that effort. It indicated that we had

about 700 ppm in the primary. Well, that sure (inaudible) what the boron was and I went over to the panel and wheel it was 1000 -- a little over a thousand ppm. And that concerned me very much. And I told him he, go back and get another sample. He got another sample -- an additional sample result was avaiable shortly thereafter and he said the thing was 400 ppm. We had two analyses. One read 400 or something and the other one was slightly more. I said -- I went over this again and after the pumps were secured and which, with hindsight, it was the NI's responding to the increased voidings by seeing more neutrons -- but it's increasing, I thought. We're going critical because we were already over almost a decade on to the intermediate range. So it was really that set of indications which led me to -- pretty much -- call out to start high pressure injection again. We discussed a little bit. There was some hesitation and we finally said, hey -- initiate high pressure injection. We saw that we got big problems and we didn't really know where the hell we are. So, I never looked at the panel to determine if high pressure injection was being started; I just assumed it was. I assumed they would carry out those instructions. And I believe they were, even to this day.

It was very shortly thereafter then, that he called back the information that he gave me on the sample lines and that's when I was on the phone with Dick -- yelling melted

fuel -- lights started coming in and that's really when the radiation indication became very apparent.

MR. KEATEN: Okay, I want to return to that point in just a minute. But before I do, I want to ask you a question on the sidelines. Today, do you understand why it was that those initial boron samples read so low?

MR. KUNDER: Yes. We concluded that due to the increased voiding the steam that was in the coolant system being circulated around was getting into the sample lines rather than the concentrated boric acid solution, so that would give you an apparent lower boron concentration. Of course, as the voiding increased, the steaming became greater and therefore the boron concentration was being reduced.

MR. KEATEN: Where are the sample lines?

MR. KUNDER: They take off -- I've never seen unit two sample lines, exactly, where they came off, but I know where they come off the line in unit one. It's on the letdown line. And they were letting down, so they were getting the same voiding flow through that flow path. And it would be somewhere down in the vicinity of the letdown curlers in the building. Physicially it comes out and is sorted through a very tortuous path -- a long path which eventually goes over to the unit one sample lines. It had plenty of opportunity to recondense and somewhat cool down and give us just what we were seeing.

MR. KEATEN: Let me now come back to the point that you were just leading into: when you heard that there was increased activity in the coolant sample, did you immediately draw the conclusion that that had meant core damage?

MR. KUNDER: Yes.

MR. KEATEN: At that point in time, did you in your own mind, at all, make any guess as to what those words "core damage" mean?

MR. KUNDER: I perceived that we were leaking. At that time, I don't think I characterized the damage as intolerable -- as anything more than that we were over-heating the comre somehow. They only thing I can say, that I believe was in the back of my mind that we had some sort of thermal effect heating effect that would have given us that problem. I don't know how strongly I thought that but that's the kind of thing that was in my mind. I felt that we had some type of core damage ever since we got the first indication of that activity. Six hundred MR's per hour in unit one sample lines was really extrmem to me and, of course, you know, it lit up like a Christmas tree and it pervaded through the whole panel within minutes. It was so extreme that there was no question in my mind that we had site emergency. And it wasn't too long -- and I didn't perceive us as having a loss of coolant accident which came in much later. In fact, for many days, the term "loss of coolant accident" has always been

associated in my mind as a, you know, a big pipe break that's almost impossible to bteak. But nevertheless, it has the same effect. I didn't --

End Side One

MR. TSAGGARIS: George, Lex Tsaggaris.

You say you perceived it as a loss of inventory rather than a loss of coolant accident. Where did you --

MR. KUNDER: You had to look at the way I perceived loss of coolant accident -- to me a loss of coolant accident just meant the pipe break without any pressure --

MR. TSAGGARIS: Where did you think the loss of inventory was?

MR. KUNDER: At that time, I wasn't sure.

MR. TSAGGARIS: Did you know that, subsequent to all the radiation alarms going off that the PORVE block valve had been shut and that --

MR. KUNDER: No.

MR. TSAGGARIS: You didn't know that the PORV had been open all that time?

MR. KUNDER: I wasn't aware that we had closed that block valve until -- it must have been some time around, maybe 7:30 to 8:00, in that time frame, because I do remember telling Don Haverkamp that's what we had found. But I knew that I was not aware of that up until at least we got into the general emergency.

MR. KEATEN: George, let me back up some more. At

the tiem that the radiation monitors all lit up, what did you start doing then? Did your role change? Did you stop trying to diagnose the plant or did you continue doing that, or what?

MR. KUNDER: Well, I had very quickly believed in my mind that we had done everything that we physically could do to ensure that we had coolant to the core in terms of initiating high pressure injection again. But we didn't know what else we could do offhand, but when we did get the alarms it was clear that we were in a site emergency situation and had to implement the emergency plan. And for a second I thought, boy, this is going to look good in the papers. But, it's probably -- just gaining that realization was something itself. But then I think, from there on, it was just more a mechanical reaction based on previous drills that had.

MR. KEATEN: And that's what I'm driving at --

MR. KUNDER: I turned around -- excuse me, I don't think my role changed. Bill still continued to attempt to diagnose what was going on in the plant and Mike Ross assisted him in that, I'm sure. I can't remember what everybody did exactly, but I turned around and instructed two of my engineers to begin making the phone calls per the emergency plan.

I think things did get a little bit confused in the sense that, you know, who's going to do this, who's going to do that. But we sorted that out fairly quickly, and we had

communications established in ECS. The nuclear engineers automatically went back and got the isoplex and the overlays and began their calculations. Joe Logan at that point being n in the control room, I perceived as the emergency director and I was doing this as really assistance to him, which is my function in the emergency plan.

So, I guess that, at that point in time, I did transgress into assistant to Joe. So that's about the only sense, I think, that my role changed.

MR. KEATEN: Part of what I was dealing with is at that point in time then, did your attention shift more to implementing the emergency plan rather than looking at the control panels.

MR. KUNDER: I think it did. For about a half an hour or so I may have gone back to the panel to further assess what was going on for a moment, but I don't think it was that long.

MR. KEATEN: In the calculations that the nuclear engineers started doing, were they making an attempt to predict what the releases were likely to be?

MR. KUNDER: In general, that's the first response in the emergency plan. You set up these overlays; you get the metereology that's significant at the time and basically use the reactor coolant monitor as a source term and this is a very conservative approach for assessing the off-site dose

prior to receiving data back from the on-site and off-site monitors. So they would pick the appropriate overlay and these predict what the dose would be for the first receptor off-site. And the number I heard was like 10 R at Goldsborough. Of course by that time we were moving along 90 miles an hour and, you know, it's a big one all right. And that was our function. But the only thing that we were doing --

MR. KEATEN: Excuse me, let me characterize this point. The thing that they were doing, they were taking the reactor building monitors as their source term and calculating chi over Q and all those kind of things. But they were not going back into the reactor and say, well, this is what we'll likely end up releasing from the reactor and that's what the source term is. I don't think they did that -- it doesn't sound like the short map predictions, George --

MR. KUNDER: But I did not stand over them to assure that they were making these calculations correctly or anything like that, or really paying close attention to what they were doing specifically at that point. I was more interested in assuring that communications off-site were established and checking with Joe on verious things, some of what I did I don't remember at all.

MR. TSAGGARIS: George; Lex Tsaggaris.

With regard to that 10 R projection at Goldsboro, I'm just trying to get a relative time frame -- can you recall

whether that projection was made before or after the general emergency was declared?

MR. KUNDER: Before.

VOICE: It was before.

MR. KUNDER: As amatter of fact, I thought that based on that number, Gary declared a general emergency. It wasn't maybe five minutes or so -- had elapsed. I can't remember.

VOICE: Okay, what I'm trying to get a feel for is was the projection made closer to 7 or was it made clsoer to 7.24 when the general emergency was declared?

MR. _UNDER: I think it would have been closer to 7.25.

VOICE: Okay.

MR. KUNDER: That's speculation for me.

MR. WALLACE: George, to get back to the beginning, when you said you came to the control room, you were looking at some of the instruments, you mentioned pressurizer level. Did you look at some other things like the pressurizer pressure, the steam generators, makeup pumps were on, or did you use the computer log?

MR. KUNDER: I looked at pressurizer level, looked at the recorder chart on pressure, and I remember viewing the alternate pressurizer legel indicator on the right console. I'm sure I looked at other things, but I can't remember looking

at anything else. And I don't recall ever really going over to the computer and looking at any data on the computer. Alth Although, let me say, I may have. I just can't remember ever having done that, let's put it that way.

MR. WALLACE: Do you remember where the low pressure was at, or the cure trend -- did it look like it was going --

MR. KUNDER: Well, I indicated before that it was very gradually decreasing, but looking at that one-hour section of strip chart, it was appearing somewhat level. Of course, I looked at reactor building pressure itself. I'm sure I must have looked at a lot of other indicators, but they just don't come to mind any more.

MR. WALLACE: Okay, down a little further down the line, there was an evaluation done -- where the pumps were alarming -- of looking at the pump curve. Were you involved in actually looking at the pump curve and you and Bill and Ed maybe saying that well, here we are. Remember?

MR. KUNDER: I did that after the fact. After the pumps -- the first set of pumps were secured, I went over and I got the hot leg temperature and looked at the pressure and went to the curve and the procedure that was laying on the desk. I'm not sure which one that was, but that curve is located in a couple of our procedures. And I did verify that we were below the curve for one-pump operation and very close I recall to another curve for two-pump operation that

we were just about right on and I remember also looking at the RC pump and the flow was decreasing slowly and I guess we were somewhere around 40 percent or so on the indicator and somewhere around thirty percent is the point where we tripped it. It was decreasing with time and --

VOICE: At that point when you noticed that you were at or below the curve, did anybody do an evaluation saying why are we donw here in pressure -- can we either lower the temperature or raise the pressure and get back to an operating range?

MR. KUNDER: I think that as fast as things were happening, the attention span being diverted by so many things I know I didn't. I don't know if the other fellows thought about that or not. No one brought it out, that's for sure.

MR. WALLACE: George, Ed Wallace.

You described there were a lot of thigns happening fast, yet as you go back and look at the conditions as they change -- the historical data -- there were not a lot of things physically taking place in the plant if you look at real time. Can you describe some of the things that come to mind today that were taking place that were diverting people from focusing on the main issue of what's happening in the plant?

MR. KUNDE: Well, for myself, I guess it's best just to speak for myself. I had t phone conversations; one

with Gary Miller and another conference call with Gary and Jack and Lee Rogers and the conference call too -- I can't remember anymore the time -- probably ten, fifteen or twenty minutes. Jack would ask some questions that I didn't have the answer to and I'd go back into the control room and look around and come back -- that sort of thing. They had believed at one point that the B steam generator had a stem leak in it somewhere, and that the steam leak into the building was contributing to the pressure in the reactor building -- the continued high pressure. And that was further supported by a variance in the pressures between the steam generators. So we were in the process of securing that and I was trying to judge -- does that make sense -- I'm sure I looked at some of the -- that's what I said. I'm sure I looked at a lot of the indicators and I just -- at any one time I can't think of all the ones I looked at.

Questions may have arisen when people showed up; when, for instance, Bubba Marshall. I asked him initially to try to get a boron sample so I could still stay close to what was happening in the control room and could see what was happening. He went off and made some preparations to go over to the lab. Dick Dubiel came and I was thinking in terms of first of all making sure we got the sample analyses and having him make sure someone was looking at containment entry. But that was pretty much routine when you have a trip that we

would eventually take a run over to the reactor building and assess the evolutions and corrections of problems prior to restart. So I asked him to go down to the lab and make sure that those guys were on the ball. Frequently we had less than peak performance from the technicians and some of the -- in this case we ahd an exceptionally good one directing Scott Wilkeson to do some things.

A lot of time I must have spent traversing the control room looking at indications and trying to figure out what was going on. My thought process, I guess, never did concentrate specifically on that core, with respect to core cooling, but it's a thought process I don't think that would be looked at in the same light as you would have looked at a lot of other angles you tend to focus on. I think it was later on after you had the failure of the -- leakage in B generator so that wasn't so (inaudible). There was things of that nature and (inaudible).

MR. KEATEN: George, this is Bob Keaten.

Once Gary Miller arrived, and took over as the emergency director, what was your role then?

MR. KUNDER: Oh, I continued in really assessing Gary and Joe in carrying out the emergency plan. Again, principally in the communciations area, because Dick Dubiel addressed himself to the dose assessment and communication with ECS. Manning was pretty well assured by that time because,

first of all, a lot of people called in plus, by the time the accident -- the general emergency came about, there was a lot of other people coming in for shift change in the operations HP groups and some of the foremen and other supervisors inthe plant (inaudible). So they were addressing themselves to that aspect of the emergency plan. Gary was looking at the whole broad picture. Bill Zewe and Mike Ross were, as I recall, addressing themselves to the plant for, say the first half hour to an hour or so of the initiation of the emergency plan.

I guess it was some time after 7:45 perhaps, that we began to, as a group, I can't remember the specifics -- address ourselves to core cooling. And this was after communications had started to move and we had people making phone calls and that could continue without any new direction. Dose assessors were doing their thing; Dick Dubiel was pretty much handling the plant concerns. From then on, Gary as well as myself, Seelinger, Ross, Lee Rogers (who had arrived), Bill Zewe, Ken -- tried to assess what our next move in the plant would be. We had high pressure injection in effect in terms of cooling. The RCS was still intact from the leakage standpoint and by that time various members of the staff were aware that the relief valve had been opened, apparently. And, as far as what we were going to do next, and if that doesn't work, well, what are we going to do after that?

And Ivan Porter and some others were looking at temperatures in RCS and they were looking at indicator guides -- hoping they were existing -- you don't have that wide range system. That
s in unit one -- for more thermosamples in unit one. So the role I played was just assisting any way I could in both a technical manner in mustering my engineers to do things where I didn't have at least -- and were assisting in the communications aspects of the emergency. I spoke to Diemoller and Haverkamp directly, the State Police (inaudible) and stuff like that. And that continued in some -- you know, throughout the day.

VOICE: Do you remember the first discussions of this group that you were describing with respect to core cooling and whether at that time the perception was clear that in fact you had had a LOCA and what the discussion were as to what you should do next?

MR. KUNDER: I think it was cleasr that we had som steam binding in the system and to get cooling you had to get pressure injection through that core and somehow assure that was going through the core. And I believe -- at least I perceived -- that we were coo-ing the core by means principally of steaming and superheating that steam. I, at some point in time, maybe eight to nine o'clock, I drew the conclusion myself that we had the core covered. I don't know that that

meant -- in my own mind -- that we had no voids -- I know it wasn't cool but I felt that we were probably cooling the core sufficiently that we weren't you know, going to have any kind of melt-down or anything catastrophic would occur.

I know later in the morning one of the thoughts that really bothered the hell out of me was, if we remain in the mode we were in at that time, there was no way of getting that steam vented off. I was wishing that something would break at that point, so the steam would elak and we could get the cooling that way and guarantee that the water would somehow go through the core and fill it up. What I was really concerned about -- became concerned about -- was that if we were continuing to pump water into the pot and it was removing heat principally by boiling off, we'd be concentrating boric acid and I was worried that we'd end up forming a slurry of boric acid so thick that you'd virtually stop all cooling in that mode as well. Then we'd really be in the shits.

We we -- were trying to consider all the concerns that each one of the group thought up. We knew we had to kind of keep high pressure injections down. Some time later in the day it was throttled back a bit because we were concerned about using all the water via the steam. We had no followup action and it was the result, I think, of at that concern plus some others that we started to consider decreasing pressure and trying to get on to the core floods. There was one way to

stop it. Another source of cool water is the RCS directly into the pot. Maybe you'd have a chance of getting on the decay heat which -- I don't think we recognized all the consequences were -- in fact, it could have been a disaster. And, of course, in retrospect it may have done a lot more damage and w what existed early on in the accident. But nonetheless, that was an attempt to come up with another approach to the cooling with some fall back positions. I can't remember any of the specific meetings although I can remember thinking -- my concerns were the boric acid concentration and things of like that and I remember seeing Lee Roger's face in the supervisor's office and Ross's -- and trying to (inaudible) -- and trying to figure out what the next move might be and then we'd get together and -- all of us endedup concurring on a course of action. And we tried to make sure we had some long-term modes set, and some fallback positions set and then we'd take some action and I guess we shifted concentration back to make sure that all site monitoring was takning care of and muster a list of changes to come into the control room and make use of -- monitoring. Then -- I'mm sure things were compounded with the fact that we had to go into face masks for a while. Looking back, that almost seemed all routine.

(Laughter.)

(Inaudible). It's hard to rmember anything other than that except I -- the trip up to the capitol.

MR. KEATEN: Right after the PORV block valve was closed, the primary system pressure increased significantly. Do you remember whether at that time there was a concerted attempt to start one or more cooling pumps?

MR. KUNDER: I can't remember any more.

MR. BIRN: George, this is Jim Birn.

Long about that time, the NRC estimates there's like fifteen to twenty people in the control room.

MR. KUNDER: I would say that's correct.

MR. BIRN: Was it still pretty well organized in there? Where were these people located, primarily?

MR. KUNDER: Well, we had -- there was a -- I tended to stay either in or near the shift supervisor's office so I could communicate with my guys making calls and communicate the status there right outside on the phones. There was a large number of people around the corner -- I don't have the count -- fifteen sounds like a fairly good characterization. Probably in some parts back towards the I&C shop and the enterance to the control room there was maybe more than that when we evacuate I'm sure there was more than that especially the ECS and brought them up to the control room. There were ten people up near the console and near the CRO's including Gary, Logan, Faust, Zewe and the operators on the incoming shift. There had to be at least 10 of 'em.

Every once in a while Gary made known in no uncertain

terms to -- keep the damn noise down.

(Laughter.)

It was a -- I'd characterize things as reasonably calm. I felt extremely good about the whole carrying out of the emergency plan and all the activities. There was some -- actual initial confusion -- in terms of figuring out who's gonna get the communication established with ECS and who's getting out the drawings. And I was looking around for the procedure and somebody got that out. It jelled together fairly rapidly and I don't think that was of any real detriment or concern. It was sort of a natural evolution for us, from a state where we recognized our big problems to the point that we could get into an organized framework for carrying out the plan.

MR. KEATEN: So the amount of people there did not make any mass confusion?

MR. KUNDER: I don't think that it hurt significantly, no.

MR. WALLACE: George, Ed Wallace --

MR. KUNDER: Some time it was even comforting to have enough bodies there you could just grab a guy and say, you do this. And didn't have to worry about who had the watch and look around for someone -- that sort of thing.

MR. WALLACE: Could you characterize normal communications in the control room before the accident between the

operators? The thing I'm looking for is -- whenever they're in there, when they're taking actions -- I'm looking for communications between the CROs and the foremen and their shift supervisor that are going on in that unit at that time?

MR. KUNDER: I find it hard to characterize except in the sense that I didn't notice any problems in communication. I was aware of Bill deciding to do some things that he tended to discuss that with the operators and when it was excessively noisy he'd make sure of getting complete enough information and htings like that. I guess I didn't pay attention to that aspect sufficiently.

MR. WALLACE: When an operator takes an action -- this is Wallace.

When an operator takes an action at a panel, is there any oral communciation to the foreman or supervisor? Or would the general categorization of the communications be to go up and if it's within certain bounds just to say, do this?

MR. KUNDER: I think it's the latter. I'd characterize it to more of the latter.

MR. WALLACE: Under what circumstances would you say that he would then go outside of his normal activities at the panel and start to describe his activities to the supervisors? In what fashion would he do that? Would he

do it on a -- would he walk over to him and do it on a personal basis, or would he more or less announce it so that other people in the control room would know what activities were taking place?

MR. KUNDER: I guess I'd seen it in many ways. The one that sticks out in my mind the most is he'd turn around after he'd done something and say, hey, you know, I tried to open the block valve and it didn't open. You know and it's your response -- you're the foreman or -- at times he may call the guy up to have him assess the instrumentation himself and render an opinion. But largely, when he goes to perform an operation he does it and I'd say there's not that much communication with anyone else about what he's doing and what he's seeing unless you're effectiveness comes up.

MR. WALLACE: During the morning of the accident, how well informed do you think the people were standing back away from the panel -- or maybe even the people who were at different sections of the panel -- of all the activities that were taking place? Was specifically thinking about activities with pumps and valves and -hanging conditions and the state things that were being attempted?

MR. KUNDER: I don't think that the information details at the time were conveyed -- I won't say that -- weren't conveyed that much to the general people in the

in the control room. And that's pretty much been my experience -- might be standing from here to you from the console with three, four -- about six people between me and the console -- all waiting for some effect ot occur and I'd have to some -- many times look myself to get my information. If you ask a question it pretty much interrupts concentration somewhat to get the answer that I want. So I'd say that there's not that much information conveyed. It's very easy with engineers coming in and other people coming in to not know what's going on for quite a long time and have to pretty much have someone go back and brief them. What I tried to do on occasions, but like the engineers knew that all the radiation alarms were up. I told them, hey it looks like we've got a lot of fuel loose. And, we're really not sure where the heck we are. So to make sure of the calculations -- that we had a lot of core cooling.

MR. KEATEN: This is (inaudible). When you came in to the control room and were intitially getting acclimated, you noticed that the reactor building pressure was up a little bit; you noticed that the primary cooling system pressure was down. Was there any thought in your mind at that time that you should use that as a basis to declare a site emergency?

MR. KUNDER: No. After the fact, it would have been, you know. But at that time, I didn't perceive it as a

-- as a loss of coolant or a loss of inventory situation and therefore, as one of our action levels, I didn't perceive it could be a factor. My basis for declaring a site emergency and increasing that to a general emergency was the severity of the radiation indications that were occurring.

MR. KEATEN: Anybody have any more questions on this early period?

MR. WALLACE: Yes, one question. This is Ed Wallace,

George, do you recall -- you described it when you came into the control room before the Christmas tree effect took place on the radiation panel -- do you recall anyone going up there and looking at that panel?

MR. KUNDER: No.

MR. WALLACE: (Inaudible).

MR. KUNDER: (Inaudible).

MR. TSAGGARIS: George, Lex Tsaggaris.

Do you recall any alarms on a letdown? Intermediate cooler or letdown cooler?

MR. KUNDER: No. I don't recall any alarms that were received. The alarm boards were pretty well lit up. Qualitatively, I would find it kind of hard to give you even an estimate of how many there were. Therewere quite a large number of them.

MR. KEATEN: This is Bob Keaten.

I guess I do have one more question. When the decision was made to turn off the reactor coolant pumps and attempt to go on natural circulation, did you or were you involved, in any discussions or considerations of the limits or precautions that are in the procedures with respect ot when you go on natural circulation?

MR. KUNDER: Well, I was, you know, coming from unit one training where, in general, guidelinse -- I guess at that time though, I don't think I -- I don't recall discussing the precautions at that time -- discussing what we were looking for.

MR. KEATEN: Did you remember anybody pulling out the procedure and looking ot see what the conditions were for going on natural circulation?

MR. KUNDER: I don't remember seeing anyone doing that. There was a procedure that was on the desk; I don't remember what that procedure was or looking at it. You know, I looked at the desk -- there was a procedure turned open to the page with a figure on it -- and that's what I was going after so I went over and looked at it. I couldn't tell what procedure that was. It might habe been the one dealing with natural circulation.

MR. KEATEN: Do you remember seeing in the control room open steam tables or anybody looking at a steam table during that period of time?

MR. KUNDER: No.

MR. KEATEN: You're aware that the precaution that I'm talking about is the degree of sub-cooling for the reactor coolant system before you go in natural circulation. To your knowledge, nobody really checked that and you didn't?

MR. KUNDER: That's right.

MR. KEATEN: Later in the day when things (inaudible) form the governor's office, did you go along with them?

MR. KUNDER: Yes.

MR.KEATEN: The request that came in -- did it specify that it be Gary Miller or the plant superintendant or the station superintendant who would go, or --

MR. KUNDER: I became aware of the request through Gary. He either had a direct communciation with, I believe it was Jack -- Jack Herbein, or someone related to Gary. I couldn't be certain of that I'm speculating -- but Gary -- I think I remember him indicating to me that he specifically was requested to go along with Jack Herbein up to the Governor's office to give him a briefing and, of course, he seemed very upset at having to leave the control room when we in our hearts felt that we were nowhere near out of the woods, so to speak. He had asked for -- said "I want you to go along" because he thought I'd have a little better chance of calling the site and getting the printout of the sequence of events or any other data that might be pulled together.

He felt that I had a little bit more continuity having been there since approximately five in the morning and could offer some additional informationif they needed it. I'm not sure at taht time if he intended forme to really -- give any briefing or even participate in the briefing but he wanted me along in case he needed some backup information. So he made -- while I was getting information, he was still continuing to direct the activities and, I believe he, at the time, turned over as much information and control to Bill and Logan as he could and assured himself that the plant was -- while not turly stable was approaching some stability and it wasn't really -- we weren't in any significant transient at the time and b going up there and calling back that he'd keep at least in touch. That's what occurred.

MR. KEATEN: George, lets -- do you recall at any time during your trip over to the governor's office or any time later, an order coming over to stop steaming from the steam generators?

MR. KUNDER: I recall prior to going ot the governor's office that Gary was told that -- again this is speculative as to how he received the information and so forth -- but I believe it was in talking to Jack on the phone -- that the Governor wanted us to stop steaming the generator because of theperception that the steam was carrying radioactive emissions with it. And we had made efforts through

Dick Dubiel's group to send someone up on the roof and try and monitor the steam to verify that it was not contaminated or -- at tleast the radiation coming from it was okay.

That was done with the result that there was no concern and -- through that I know Gary was under quite a bit of prassure.

MR. TSAGGARIS: So you did try and verify that you weren't contaminating the atmosphere at least from the steam generator?

MR. KUNDER: That is my understanding that someone physically went up on the roof and with a monitor -- a survey instrument -- and verified that that coolant was not radioactive. I can't attenst to it directly. Records might show h hat they had problem samples. I just don't know. The samples were done in the generators. It seems to me that we could get remits back from the feed -- thorugh either direct measurement of the line or coolant sample.

MR. TSAGGARIS: What problems did that present you at the time? Did you have another mechanism? Was a condensor available at that time?

MR. KUNDER: Well, when we got the initial request or order, whichever way it came, to secure the steam dumps, we -- I don't believe we had full backup so far and we were still attempting to regain that and, of course, that was expedited with a much higher priority after that order. We didn't just

secure until we did have adequate vacuum to go back to the condensors. Because, you know, that was our only means of cooling. No way could we steam it. That was the conflict we were referring to. So it was some time -- I wouldn't speculate as to how long it took from the time we were ordered to close that thing to when it actually went closed.

MR. KEATEN: Bob Keaten.

George, in retrospect, do you think that in any sense the situationwas aggravated by you and Gary being absent from the control room long enough to make the visit to the governor?

MR. KUNDER: I guess that I didn't think it at the time but you now, when you get your mind diverted to another endeavor you're not thinking about the plant or the core, you know? Who knows, perhaps if we were able to stay there, we would have gained some insight that would have been very beneficial. I can't really answer that question fairly.

MR. KEATEN: I have one very general question that I'll ask. But before that (inaudible).

MR. WALLACE: Ed Wallace.

One other question with regard to a couple of things -- particularly during htat period, and I think also earlier, Gary has said that he had directed the operators to maintain HPI full on both pumps. Particularly before he left for the governor's office, he said "put it on and leave it on", if

I remember the way he stated it at the ACRS. Do you know ifthat was done and do you know who he said that to?

RM. KUNDER: I remember Gary saying that -- I remember him saying that nomatter what you do -- and I believe he said it point blank to Mike Ross, Bill Zewe, at least. I can't remember seeing their faces there, but I'm sure it was those guys that, you know keep that coolant -- keep that high pressure injection on. I want to make it perfectly clear -- you don't take it off. It seemed to me sort of at the time inappropriate to even say because I couldn't even envision anybody not wanting to keep it on. It was the only way to get water into the core. Anyway. But he did emphasize that.

MR. WALLACE: In the way he stated it, would you have interpreted it -- what he said -- to be full flow or within the limitation to keep the pump running and maintain pressurizer level or some other set of conditions that would be a matter of interpretation by the operator on the panel?

MR. KUNDER: It seems to me that by that time we had -- information which suggested that if we maintain the minimum flow of 250 gpm, that that was at least sufficient, and I believe that when we left for the governor's office, we did not have full flow. This is basically my recollection -- of course we could go back and look at the records. But I don't think he made the distinction at that time. I think he was saying, keep it on. I think that he say that it was

procedure B that we were following at the time.

MR. WALLACE: Can you recall any earlier times when a similar kind of order might have been given by Gary to maintain HPI to either full or to some other condition?

MR. KUNDER: I seem to recall that the order as being given mid-morning. but I can't remember specifically.

MR. BIRN: I have some questions leading up prior to and into it, the accident, if this is an appropriate time. This is Jim Birn.

One of the things that led to some confusion was the sampling of the generators, that evidently the A and B sample lines were mislableed?

MR. KUNDER: Yeah, well I wasn't that close to that particular operation. I was just aware that they were sampling for high activity. In fact, offhand, I can't remember how we perceived we had primary-to-secondary leak. Except that perhaps it was the sampling -- I'm not -- I'm not familiar with thenew system.

MR. BIRN: Some of the transcripts indicate that they tumbled to that right away like maybe somebody had perceived that they had this problem for a long time. Would you in your position know anything about this?

MR. KUNDER: I don't think I remember even being aware of crossed sample lines. Except that I remember hearing something to that effect, of course, after the accident.

MR. BIRN: As -- and I gotta ask this because I'm not familiar with the organization. As technical superintendant, does all the work requests and design changes, and whatnot, cross your desk?

MR. KUNDER: No, not all. Work requests as a rule, do not cross mydesk. Except for work requests that would require PORC review and approval. As chairman of the PROC at that time, I may have been one of the persons to review and approve a work request that required that type of approval.

MR. BIRN: Who would make that determination as to whether it took PORC approval or not?

MR. KUNDER: Porc - approved procedures related to nuclear safety-related work in nuclear safety related systems or work that could affect that.

MR. BIRN: Okay, so anything that was --

MR. KUNDER: Anything that was QC in nature or was safety related would necesarily have to go thorugh PROC. Sometimes if there was a generic procedure involved with that work, it would nto necessarily go through the PORC. Just review the procedure to perform work, using the previously approved generic procedure. That could be done without going through PORC each time it was performed. But you asked chain modifications -- do all go thorugh my department. But again, they do not necessarily go through me. The way it was set up, the lead engineer may approve the change modification

after he filled out the safety evaluation and takes care of any design-related work prior to the mod, but the way the specs are laid out, the superintendant was the person who is responsible for approval of all the change modifications. And that might be myself in the absence of the unit superintendant. There are some that I have reviewed before, but not all. And in unit two, my tenure dates back to early December 1978, so I am not aware of all the jobs in unit two, because I don't have that responsibility.

But ever since I took the unit two position, I did like in unit one; I requested all change mods include me on circulation -- I could review and see what the package consisted of and if I did see a problem, I'd send it back to who initiated it. It wasn't -- I didn't see a hundred percent of the packages.

MR. KEATEN: Before I get to a more general question, George, let me turn to the situation with the EFW-12 valves. The review of the procedures and tech specs indicate that the, that we had a procedure, a surveillance procedure in effect which was a violation of the tech spec.

MR. KUNDER: Um, hum?

MR. KEATEN: But I qute (inaudible). And that procedure --

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