

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

THREE MILE ISLAND  
INVESTIGATIVE TASK FORCE

Taped Interview No. 3  
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1 VOICE: -- and we contacted them by phone and then  
2 they would tell us when we could go to automatic on the  
3 system based on their ICS brush recorder charts down in the  
4 relay room. Our major variable condition, which should tell  
5 us when we were nulled out for the pump was transfer from  
6 manual to automatic, really was not that. It read another  
7 parameter and it really didn't tell us the information we  
8 needed in order to accomplish that task.

9 MR. KEATEN: And did that get modified? Can you  
10 now make that transfer from the control room?

11 MR. ZEWE: Yes. But we're still not sure what  
12 parameters that we're balancing out.

13 MR. TSAGGARIS: Bill, Lex Tsaggaris speaking.

14 Does this same problem exist in the unit 1 ICS?

15 MR. ZEWE: No, I don't. Unit 1, ICS has the  
16 measure variable you know exactly what you're looking at, all  
17 right, and that's based on the experience and operation that  
18 it is, it's you know, exactly how to put it into automatic and  
19 what the signal is looking at. We had some of the same  
20 kinds of problems initially at Unit 1 to where we refined  
21 it. But I see many cases that where the experience that  
22 we gained in Unit 1 was not applicable in Unit 1 or the  
23 knowledge was not gained. Mainly from an engineering stand-  
24 point, like in Burns & Roe, Gilbert. Since we are the same  
25 utility that operates it. We have that common bond, but

1 it seems like I have always viewed from my standpoint is that  
2 there has been very little knowledge gained between the,  
3 between Burns & Roe and Gilbert, the things that Gilbert did  
4 in design which Burns and Roe could have learned from in  
5 further refinements, were not done, I'm not sure why that is,  
6 if engineering was so far along, that they couldn't change it  
7 in time, or what have you, but I just think, from my own  
8 standpoint, it just shows a very lack of communication between  
9 those two groups, in many areas.

10 MS. TSAGGARIS: My question is asked primarily  
11 from a Unit I startup. Is there anything that from your Unit  
12 II experience, with relation to control systems and their  
13 similarity to Unit I, that you feel needs to be addressed prior  
14 to the Unit I startup? Are there any problems with the ICS  
15 in its manual and automatic control behavior that needs some  
16 changing in Unit I?

17 MR. ZEWE: No, there's not, that I can think of none.

18 MR. WALSH: Bill Walsh.

19 I have a question on a slightly different subject.  
20 Ken Lucien has discovered some stuff in that when he was  
21 looking into the demineralizer systems for the polishing  
22 systems about some wiring changes and some solenoids and had  
23 been manually overridden. I wonder if you, Tom can you remember  
24 what valves those were?

25 VOICE: They would be the solenoid locking valves  
for the motor air to the outlet valves.

1 MR. WALSH: I think so.

2 Did he have discovered that there had been, you  
3 know, what looked like unauthorized, just on-the-spot wiring  
4 changes in the panels, where terminations on some of the  
5 valves were disconnected and then some of the solenoids on  
6 these valves were put on manual override. Were you guys  
7 aware of any sort of maintenance or operator action that may  
8 have been done in that system to make that happen?

9 MR. ZEWE: Not that I'm aware of, no. Any changes  
10 should be promulgated through the right chain of events to  
11 make sure that the wiring drawings are changed and that ECMS  
12 are issued for those. There shouldn't be any, you know, on-  
13 the-spot spur of the moment changes unless it's an immediate  
14 response on an emergency, but it shouldn't be, you know,  
15 something that's left undone.

16 MR. KEATEN: So, as far as you know, it wouldn't  
17 have been something like an operator, say taking a solenoid  
18 from a manual override position on the air valves?

19 MR. ZEWE: Only if he's directed to do that in the  
20 course of the procedure and he receives some other direction  
21 right? And there is cases in the procedure where you might  
22 be required to override something, all right, for a particular  
23 evolution. But it should, in turn, have you restore it back  
24 to its normal condition. But you certainly wouldn't lift  
25 leads and so forth. And leave it that way, you know, for

1 some particular prupose without modifying it.

2 MR. WALSH: You mentioned, or some of you mentioned  
3 that there were guys down there, engineers working on the  
4 system for great periods of time, would it have been their  
5 policy to say, well, let's try this, let's see what happens  
6 on E valve or -- do you view this, you know, the way this  
7 system ended up, that maybe it was installed incorrectly and  
8 was never checked?

9 I just wondered, how did he get from where it was  
10 supposed to have been wired to the point where it is row where  
11 some of them are incorrectly wired, obviously, you know,  
12 either had never been terminated in the first place, or maybe  
13 they had been removed. And then some of the valves, but not  
14 all of them, were overridden.

15 Now I can see if a guy had a problem with the  
16 transfer, and his valve hadn't gone, he might go across and  
17 override all the valves, but not just some of them. I just,  
18 maybe this is just a hopeless question, but you have no idea  
19 of how that could happen?

20 MR. ZEWE: Everything should be documented and then  
21 anything else would be purely conjecture, you know. A to Z.  
22 I couldn't comment on that.

23 MR. TSAGGARIS: Bill and Ken, Lex Tsaggaris again.

24 My final question is, here I asked about the  
25 control system. How about the condensate, condensate polishing

1 and feed water system? Any concerns to put your license on  
2 Unit I also? In Unit I that you would regard as (inaudible)  
3 systems any concerns you would have upon restarting Unit I?

4 MR. BRYAN: I do not. I think it is a much better  
5 designed system but then its proven itself and I don't have  
6 any problems myself with it at all.

7 MR. FREDERICK: The only problem areas I see that  
8 are in Unit I, and you wouldn't call it a feed water transient,  
9 but its hard isolating heaters to take it out of service for  
10 repair?

11 MR. BRYAN: (Inaudible) valve to fiber. Other than  
12 that there's a limit to pumps.

13 MR. BROUGHTEN: This is Gary Broughten. For those  
14 of you who were cross-trained on both units, do you go through  
15 a special training program that emphasized a difference between  
16 Unit II and Unit I? Is that the way you're being cross-trained  
17 or is it not a program that is oriented that way?

18 MR. BRYAN: This is Ken Bryan.

19 That's part of the program but it's not any majority  
20 of the program. There is a book they have out with differences  
21 between Unit I and Unit II that's part of the study programs.

22 MR. BROUGHTEN: And that's available through the  
23 training department?

24 MR. BRYAN: Yes.

25 MR. BROUGHTEN: Do you feel that's a comprehensive

1 tabulation of the key differences between the two units?

2 MR. BRYAN: Yeah, but it's difficult to sit down  
3 with that book and learn that difference. You can't do all  
4 these different things. You can't do that. You have to go  
5 look at the systems first. Learn it for what it's worth and  
6 then for a refresher, go back and look at the differences.

7 MR. BROUGHTEN: Does that document cover both  
8 primary systems differences and secondary systems? Ways of  
9 dissipating rad waste and so forth?

10 MR. BRYAN: Yes.

11 MR. ZEWE: Ken and I went through two different  
12 cross-referenced programs. I went through it initially and  
13 Ken went through the program as it exists today. His was  
14 tailored for him. Because he had a license on Unit I and he  
15 was licensing on Unit II. And now, what we do it is we  
16 tailor a program for an individual, or we have in the past.  
17 The original cross-licensing, everyone was licensing Unit  
18 I and we were all licensing Unit II. But the training was  
19 a little bit different but it covered the same things, the  
20 differences and then it went into the specifics also.

21 MR. KEATEN: Any other questions in this area?  
22 If not, before we start into task two, I'm going to suggest  
23 that we break for lunch.

24

25

1 MR. KEATEN: This is a resumption of our session  
2 of this morning and I would like now to turn to the items  
3 that are listed in our task two, which is the questions of  
4 the operator and staff as such. And I would anticipate that  
5 we spend basically the rest of this afternoon that we're going  
6 to be doing things in this topic and I think is where we have  
7 a large number of questions. And I want to start off.

8 Bill, in your testimony, and also in discussions  
9 that we had in addressing one of the reports that we had  
10 written, you pointed out that you would, at the time following  
11 the trip and up to the time that the pumps were turned off, you  
12 were taking actions bases upon the information that you had  
13 presented to you and actions that appeared reasonable in terms  
14 of the particular item that you were addressing. What in your  
15 mind and, I'm really not just addressing this just to Bill,  
16 but to all of you. What in your minds was the reason why the  
17 primary systems pressure was lower than you would normally  
18 expect following a trip?

19 MR. FAUST: Craig Faust speaking.

20 My initial reaction, my thinking was that, over  
21 feeding the generators, or refueling the generators during  
22 it somehow started dropping pressure on us. Because I was  
23 really -- I thought any way, I was moving a lot of water into  
24 the generator. The valves were wide open I knew that initially  
25 from when I -- the moment we re-established, so my initial

1 reaction was that Tave did start dropping, and I was just  
2 starting to cool down the primary pretty fast. Later on the  
3 low pressure I was trying to force on, I thought with other  
4 indications we started having, the seam lines (inaudible) not  
5 a large one but one that was actually, I wasn't seeing all the  
6 indications I felt I should see for it and I was seeing others  
7 that supported that -- falling temperature and pressure going  
8 up. I thought it was somehow causing what we were seeing at  
9 the primary.

10 MR. KEATEN: I read somewhere, and I don't remember  
11 where, that there was also either a problem or there was a  
12 suspected problem with the pressurizer guage?

13 MR. BAILEY: I suspected that -- I didn't know why  
14 the pressure went so low to that particular point, but I had  
15 thought also that the emergency feed had forced the pressure  
16 low, but I didn't know why the pressure wouldn't recover  
17 faster than it appeared to be recovering. And I attributed  
18 that to the suspected problem with the pressurizer heaters,  
19 which had been a problem in the past were not working at  
20 full capability to restore system pressure. So I had it test  
21 -- thought of having a pressurizer heater breakers checked  
22 to make sure that they were still shut and see if we could  
23 determine if the heaters actually were on and trying to restore  
24 pressure. And that's only because of the area of the heaters  
25 in the M-20 area, when you have a trip the area becomes

1 very humid and hot and we have experienced problems before  
2 with various pressurizer heater operations.

3 MR. WALSH: Bill, Pat Walsh.

4 Did you get any feedback on that? I remember  
5 reading that in interviews that you checked that. Did you  
6 ever remember getting any feedback on that information?

7 MR. ZEWE: I don't remember exactly who it was but  
8 I do remember obtaining some feedback of the fact that the  
9 pressurizer heaters appeared normal down at the pressurizer  
10 heater cabinet and I'm not sure of that time frame, how soon  
11 after I had asked or exactly at what point I had asked for it.  
12 Okay, I'm not sure anymore of that time frame if that was half  
13 hour, an hour, time I don't know.

14 MR. LONG: Bob Long.

15 Bill, did you have anything to indicate that you  
16 had trouble with those?

17 MR. ZEWE: I think what I understood you to say  
18 is that you didn't it was based on past experience. You didn't  
19 have any indications that led you to feel that there was a  
20 problem.

21 MR. LONG: Then you were just kind of guessing  
22 from past experience?

23 MR. ZEWE: Right. I didn't know that we had an  
24 opening in the primary system and that the pressure should  
25 recover and I said, well, the feedwater brought it down and  
it appeared to try to recover several times but it didn't.

1 And I thought that well, the pressurizer heater capacity  
2 wasn't bringing the pressure back to (inaudible) 55 where  
3 it should be. But that was the only indication that pressure  
4 was not recovering and the heaters should have recovered  
5 pressure.

6 MR. KEATEN: Keaten again.

7 Bill, first, in retrospect we, all of us, are now  
8 sensitive to the fact that pressure had dropped down to  
9 the saturation pressure of the system. But at that time  
10 and really again, I am trying to address the time particularly  
11 up until the pumps went out, were you aware, or was someone  
12 aware of the fact that you were sitting in saturation condition  
13 in the primary?

14 MR. ZEWE: No.

15 MR. WALSH: Was there a steam table in the control  
16 room?

17 MR. ZEWE: Well, I think there was one in the  
18 operator's desk which I had xeroxed off during our startup  
19 program and I had a xeroxed off sheet that were steam tables  
20 and were in my desk also, and I just didn't realize that  
21 we had the saturation conditions. I don't know why I didn't  
22 pursue that further, but in my own mind, I never really thought  
23 in that direction. You know, think saturation. And I'm not  
24 sure why I did not. Now it's --

25 MR. FAUST: This is Craig Faust. This is where  
I think that the time element fits some, because

1 some of the things I can vaguely remember all right and I  
2 said before by hearing pressures low but holding but I'm  
3 not sure -- I'm not really not sure if I can assign a value  
4 to that now, but I didn't hear afterwards. It turns out, that  
5 when I actually heard those things, there was quite a bit of  
6 time in between. When I was hearing these different things,  
7 it didn't seem like it was that long.

8 MR. LONG: Bob Long.

9 Ken, you came in the control room after this  
10 sequence started, when there were other people coming in. Did  
11 you or do you remember anybody else who came in after the trip,  
12 half hour or an hour, who began asking kind of diagnostic  
13 questions, and did they -- who was the first one to kind of  
14 question that saturation condition?

15 MR. BRYAN: This is Ken Bryan.

16 I don't remember that question being asked until  
17 the time I left.

18 MR. LONG: That was late in the afternoon?

19 MR. BRYAN: No, six thirty or seven.

20 MR. ZEWE: No. All the persons that I had talked  
21 to in that whole morning, I don't know, must have said, I  
22 don't know, many, many, many times what in the world could  
23 lead to normal plant temperatures? We were barely normal  
24 at that point, but the abnormal high level and the low  
25 pressure. And it just didn't seem like anything was happening

1 as far as the primary plant goes. The temperatures -- at  
2 this point -- I know that when I left the control room, we  
3 were at about 527 degrees because I remember making the  
4 comment that we'll have to secure the fourth pump if and  
5 when we go less than five and a quarter. So we must have been  
6 real close to that point.

7 And then we kept asking ourselves out loud you  
8 know, trying to force ourselves to think, you know, of how we  
9 could get into that situation where pressure remains low.  
10 And when I came back to the control room, somewhere around  
11 five I guess it was, I left about twenty after four once we  
12 had steam established and the primary was somewhat stable  
13 and it was about 5:27 or 5:30 or so and I came in. George  
14 was there and already talking with Ken and Ed and Craig you  
15 know, and we were all still asking ourselves that same sort  
16 of question, you know. Like what do we really got, what  
17 failure do we have that's really going to give us. And I  
18 was really looking at some, you know, some weird instrument  
19 type failure that had caused us to have a low pressure. But  
20 it was just a black area that we couldn't force ourselves to  
21 try to determine why we actually had that.

22 MR. FAUST: I was also, during that time period,  
23 pretty insistent about having a primary or secondary leak.  
24 Well, maybe you didn't want to hear it, but I kept telling  
25 them that I think we got a primary or a secondary leak in the  
B generators and some of what we were doing was guage gearing,

1 keeping the hot well, keeping vacuum which would flood  
2 nominally you know, the next flood vacuum we got high on. We  
3 had already had a pretty severe drop in indicator level in the  
4 condensate storage tank, which indicated that we got something  
5 moving in there and we got to stop it. And the first thing  
6 was, you know, you heard that trying to eject and we were going  
7 down there and finding the line sheet. The air line sheared  
8 off causing the valve to remain open.

9 The primary systems, to be equally explained, were  
10 quite primary transient. You'd have to be abnormal line or  
11 steam shower or something like that. As soon as they got  
12 to the large transient in the generator, it was easy to make  
13 those conclusions.

14 You know I was -- once you found the solution to  
15 the problem, you don't necessarily look for two. That's where  
16 where we were -- you know if we could have ignored the second-  
17 dary transient and just looked at the parameters by itself,  
18 we probably would have picked it up. That we had a leak, as  
19 we had more systems than we need. That was the problem.

20 MR. TSAGGARIS: Lex Tsaggaris.

21 Just one more further question because I'm not  
22 sure from the sequence of events what the status of the high  
23 pressure injection was at the time that you're saying that  
24 overfeeding the generator perhaps would have been the reason  
25 pressure was low. At that time frame, I don't remember, does  
anyone know what the aux feed was doing at that point?

1           MR. BRYAN: From what I remember was, but you have  
2 to realize I'm on the secondary, but what I remember we were  
3 cutting back slow because we were trying to maintain the  
4 level we regained in the pressurizer at that time. It  
5 seemed like, you know, we were in there pressure down here and  
6 level there and it's staying there, that the impression that  
7 I was getting was that the main purpose -- the cause seemed to  
8 be the secondary side, what happened to the generator when  
9 I cut feedback, at least that's what I thought.

10           MR. TSAGGARIS: I guess my question would have been,  
11 even taking into account the fact that you perhaps overfed your  
12 generators, you still had high-pressure injection going there  
13 at any reasonable flow rate, that should be enough to take it  
14 to raise pressure and obviously, from what I'm getting from  
15 the status of the HPI, (inaudible) wasn't thought of because  
16 you really weren't pumping that much water in. In other  
17 words, even if you didn't consider that you had an opening  
18 somewhere in the system, and try to explain the drop in  
19 pressure by overfeeding the generator, the fact that if you  
20 had full HPI on, you know that should have been enough it  
21 seems to me to more than compensate. You did have full HPI  
22 on. But then they cut it back. This is what I'm saying.  
23 I keep stressing that time is a big thing here. We didn't  
24 realize so much time was going by. Especially during the  
25 first two hours.

          MR. BAILEY: If you really looked at the first

1 interview, most of us said that less than a minute had gone  
2 by before we found a (inaudible). We also thought that we had  
3 control over the pressurizer level before it went solid and  
4 we really didn't. There were a lot of things we thought were  
5 happening and they were all out of sequence in our mind.

6 MR. KEATEN: Along that same line, when we were on  
7 tour the other day, Bill, you were pointing out that the --  
8 where the indication is the reactor cooler-type temperature  
9 and pressure and panel and point out the fact that is an  
10 indicator and not a re-order. And that when you went around,  
11 I believe it was you yourself, that went around and checked,  
12 and by that time we now know that the ruptured disk had  
13 already bolown so the pressure was down. My question is, do  
14 you remember when it was that someone was first convinced that  
15 that rupture disk had blown? And I think that same period of  
16 time (inaudible) of the pressurizer.

17 MR. ZEWE: I don't know if we actually knew that  
18 day at all or the next day that for sure that we had reached  
19 high enough pressures to blow the rupture the disk. We  
20 knew at some point there that we had some kind of malfunction  
21 with the drain tank where we could have had a hole in the  
22 drain tank or a problem with the instrument top, you know,  
23 or the release valve stuck open, something like that, but  
24 the ruptured disk itself, I didn't have any means that I knew  
25 of to tell how high the pressure had actually got to blow  
the rupture disk and there's a multiple of other things.

1 There are other failures that could have taken place. The  
2 first time during that day, when I realized, you know, that  
3 something had broke on the drain tank, I thought that, well,  
4 we did have a complete loss of feed rapidly. Maybe we blew a  
5 code and the drain tank initially just overpressurized, all  
6 right. And that once the code reset, you know, we weren't  
7 still losing water. But here, again, the exact time at which  
8 some of these items went through my head, I really couldn't,  
9 you know, say twenty minutes into it, an hour into it; and I  
10 really couldn't define that.

11 MR. KEATEN: I understand.

12 MR. BRYAN: Ken Bryan.

13 I thought we associated that morning, sometime  
14 after it was up to power line maximum?

15 MR. ZEWE: I'm not sure that sequence.

16 MR. BRYAN: Sometime before 6:15 we got (inaudible)  
17 the power.

18 MR. KEATEN: Let me ask you the kind of question  
19 that is going to be extremely difficult to answer. If you  
20 can't, don't try. But, thinking back to what you knew then,  
21 now what you know now, but what you knew then, if there would  
22 have been a recorder, so that you would have seen the  
23 pressure trace on that time frame -- I realize the pressure  
24 had gone up to the ruptured disk pressure and then dropped back  
25 down when the ruptured disk broke, -- do you think you would

1 have drawn any different conclusions from what you did?

2 MR. ZEWE: Most certainly. Because I know how  
3 quickly pressure turns on the tip and in how the relief valve  
4 comes open and then it recloses it again. And if that pressure  
5 shows that the pressure remains high after a considerable  
6 period of time, knowing that that coolant system and every-  
7 thing else there for the drain tank and that a large volume  
8 of that drain tank. Yes. At least, I would hope to think  
9 that I would have.

10 MR. KEATEN: I understand that.

11 MR. ZEWE: We definitely would have because we have  
12 had other trips where the relief valve lifted and seated  
13 normally and we would have seen those traces.

14 MR. KEATEN: It's in all the reports.

15 MR. ZEWE: You know, we could have seen what a  
16 normal reactor drain tank pressure transient looked like and  
17 we would have seen that this one was different than that and  
18 you would have said well, why is it different. And we probably  
19 would have made a conclusion that something was wrong with the  
20 release valve.

21 MR. WALLACE: Ed Wallace.

22 Let me ask the question a little bit differently  
23 for my own purposes maybe. When you went over to look at  
24 the panel, specifically you were looking for certain things  
25 to draw some conclusions. What were those things?

MR. ZEWE: There was no way to operate both tanks.

1 At that point, we know one of the sump pumps had been on and  
2 the sump pumps were turned off. At least, I don't believe we  
3 looked at that until after that and we saw an elevated temper-  
4 ature with zero pressure and offscale low level, all right.  
5 And I remember it went through my mind that, yes we did pop  
6 the relief and the safety and she blew into the tank; the tank  
7 couldn't handle it. The tank developed a hole and then leaked  
8 over to the sump. That plus we thought the secondary leak that  
9 were leading up to too, resulted in the water that was in the  
10 building.

11 MR. WALLACE: One of the areas --

12 MR. ZEWE: But we did know there was still a  
13 continuing thing.

14 MR. FAUST: Craig Faust speaking.

15 This was very fast during that day. I had three  
16 things in my mind about what I did and what might have happened  
17 to the generators. You know, I was looking for things that it  
18 was turing out to be and I heard we had a high sump level, too,  
19 in the reactor building and I was actually considering a leak  
20 in the emergency feedwater. But it happened before where we had  
21 a break in the emergency feedwater. And we got it again.

22 MR. KEATEN: Bob Keaten again.

23 Bill, I want to go back to a point that has been  
24 discussed several times tonight. Just simply want to ask you  
25 if you know any more than when I heard you testify before the

1 ACRS. You say that with respect to the tail pipe temperatures  
2 downstream of the PORV that you remember being told temperatures  
3 and it, I remember your testament correctly as 230 to 235  
4 the readings that we have been able to get out of the data are  
5 in the range of 285. Did you know why that discrepancy exists?  
6 From what you remember and what was seen on the computer?

7 MR. ZEWE: The only thing that I could say is that  
8 the first temperatures that were printed up, I believe, about  
9 425 or 430, if I recall right, were it had to be some mis-  
10 communication between the person that asked for them and me.  
11 All right, the second set at 525, if you look at it, they printed  
12 two of these temperature -- they printed RCV-2 temperature first  
13 Then the computer paper moved and advanced the paper, then he  
14 asked for three more readings. And he really printed one of  
15 the code safety's twice. And he took that reading. And in  
16 talking with Ken Bryan who took that data, he feels now that  
17 that is how the second readings came up at 230 or  
18 228. Whether he punched them in and looked and seen three  
19 numbers. Really didn't look RCV 1A or B or 2; he seen those  
20 three temperatures all together.

21 MR. KEATEN: Um, hum.

22 MR. ZEWE: And he gave those readings. Why the  
23 first one was 283 and I heard 232, and George Kunder heard  
24 the same number, was just either his voice inflection or he  
25 just, he looked at it, read it off differently, but those

1 were the only numbers that I had heard. That at 5:30 could  
2 be explained thatway as a for instance, as I showed it to Ken  
3 about a month ago I guess, the computer sheets because he  
4 hasn't seen it since that day, all right. And I showed him  
5 and it had RCV 2 then it had the next point and it says data  
6 and it goes PAPA and then it prints out RCV 1B, I think, out  
7 twice and then RCV 1A out.

8 And normally it would be all three of them. And it  
9 printed out one of them twice and he just took all of those  
10 numbers and said, you know, that's 228 now. I think maybe the  
11 confusion point there.

12 MR. KEATEN: Still dealing with the very early point  
13 of this time, as you mentioned earlier about 15 or 20 minutes  
14 later after the trip, you left to go down to the condenser  
15 because the hot well problems. There are a couple of us are --

16 MR. ZEWE: The other control room operator was  
17 assigned to the secondary plant and I had Ken Bryan in there  
18 helping out and so I had felt, since I was more experienced in  
19 Unit II on the secondary side, that I would go out and try to  
20 establish the hot water level so that we didn't indeed lose  
21 vacuum because I still had the intent of putting on feedwater  
22 heating and putting on the normal feed system again. And the  
23 last shutdown that I was involved in was, whenever we had a  
24 leak on the EAC system and we took the turbine off the line from  
25 about 92 percent power down and we had a very severe hot well

1 level control problem that I handled personally also and  
2 directed the AO because we overflowed the hot well that day.

3 So I went down there with that intent on trying  
4 to reject the water from the hot well and to blow down the main  
5 vacuum pumps to find out what the leak that was reported on the  
6 condensate booster pump was and to find out the status of the  
7 polishers. So that's when I left and I went down there and I  
8 helped isolate the suction valve for the two-A condensate booster  
9 filter pump, looked at the polisher valves and they were all  
10 shut, asked the operator how they got shut and he said that  
11 when got back and first looked at them, they were shut after  
12 the trip. I said the polishers were it -- isolate the feed  
13 valve themselves.

14 So then I proceeded then to blow down the moisture  
15 separators for the vacuum pumps and direct the operator to  
16 continue, to do that and also to go over and verify the high  
17 hot well levels and then go over and try to open up COV-12  
18 manually because before I had left the control room we had  
19 started the condensate pump and I couldn't get suction pressure  
20 to the condensate booster pumps. So none of the condensate  
21 booster pumps would start. So I went over to COV 12 and looked  
22 up and the handle wheel was off of it. So I went in and tried  
23 to find a ladder and a hand wheel and tried to open up the valve  
24 which we later found the hand wheel and we cracked open the  
25 valves, lowered the two keys so they could open it up from the

1 control room. Which we did and I thought then that we could  
2 reject the hot well water so we opened up the reject valve  
3 manually and, as I found out, the COV 57 and its series, the  
4 valve had that line that was broken. So we had the instrument  
5 guys get down there and repair that.

6 At that point then we were holding back and the hot  
7 well was high. We just had to get 57 open and the COV 12 was  
8 now open so then I headed back to the control room. And I  
9 thought that I was only gone 10 or 15 minutes, but I guess  
10 it was considerably longer than that. And when I got back was  
11 when George was already there for several minutes by that  
12 point and there was talking up there in trying to bring him  
13 up to date and decide what course of action.

14 MR. KITTELSON: Just to cover something you just  
15 said. The aux operator hadn't informed you people that the  
16 polisher valves had been shut. Did you realize that they had  
17 all been shut before he lined it up in his post seram  
18 procedure and came up in the control room?

19 MR. ZEWE: I didn't know it -- find out until I went  
20 down and seen that they were all shut and asked him, all right,  
21 why he didn't shut them. What happened? And he said, I don't  
22 know, but they were open when they were doing the resin transfer  
23 and then when he went over and he seen that line move which  
24 is right in front of the polishers. After that he said he  
25 was looked and all the valves were shut but he wasn't sure

1       how much time had elapsed.

2               MR. KITTLESON: But he didn't tell you people until --  
3       or you weren't aware of it until after you went back down?

4               MR. ZEWE: Right. And really, I didn't care at that  
5       point because we were on emergency feed and in restoring normal  
6       feed, we had plenty of time to do that. And he had come up  
7       to the control room anyway to help out, all right, to see  
8       what he could do, too. For the (inaudible). Because at that  
9       point that we tripped, I really didn't worry on the resin and  
10      everything else.

11              MR. KITTLESON: Well his initial action was to  
12      secure all the (inaudible) except two.

13              MR. ZEWE: (Inaudible.)

14              MR. KITTELSON: Yeah.

15              MR. ZEWE: That should have been his action, right.

16              MR. KITTELSON: Well, now that's what he did, and  
17      when he did that wouldn't he have checked or noticed that the  
18      two valves the two beds that he had on the line, the discharge  
19      valve should have been open. Has he got any indication that  
20      the valves were open or shut at that time?

21              MR. ZEWE: I didn't have any indication, no. And  
22      I haven't asked him yet if that was true if he definitely had  
23      them on the line but anyway, he knew that we didn't have flow  
24      anyway, so it wouldn't have made any difference, I guess, if he  
25      had lined them up and the (inaudible) valve reopened and then

1 we shut it as soon as he left or what. I'm not sure.

2 MR. BROUGHTON: (Inaudible). Could you say a few  
3 words about the fact that the hand wheel was not installed  
4 on that valve. Was that because the maintenance should have  
5 been in progress or do you have the background?

6 MR. BAILEY: It's just that the handle had vibrated  
7 off. That's my estimation. There is a ventilation ductwork  
8 that runs directly underneath the valve, the valve is about  
9 12 feet in the air and then the ventilation ductwork runs  
10 underneath it and it goes down and over. And the vibration in  
11 that line I believe just loosened up the handwheel. We have  
12 had several hand wheels fall off of motor operated valves and  
13 just split, just come off, you know, hit the floor and broke.  
14 In this case it had fallen off and had vibrated between the  
15 ventilation duct and the one post right there. And when I first  
16 crawled up on there, I couldn't find it so I sent an operator  
17 for a ladder and a pipe wrench so that we could operate the  
18 stem of it and when he was gone I looked and I found a hand  
19 wheel so I put it on and I was opening it up when he came back.

20 MR. KEATEN: You don't normally have some sort of  
21 a keeper on those things to keep vibrations from vibrating  
22 them off?

23 MR. ZEWE: There's a keyway on the shaft that fits  
24 in the hand wheel itself. But there's no locking device to  
25 keep it on. It's just a press type fit.

1 MR. KEATEN: No cotter key or something like that?

2 MR. ZEWE: No, not on that particular type, no.

3 MR. WALSH: Walsh.

4 If I could get back to some of the primary indica-  
5 tions when the primary coolant flow started decreasing and you  
6 started to get the reactor coolant pump alarm, what were you  
7 attributing that to? What was your thought process for the  
8 pump problems and the decreased levels? Was it obvious at  
9 the point where you were securing the pump what the problem  
10 was or were you -- didn't you really have any idea what was  
11 going on?

12 MR. ZEWE: When I got back to the control room and  
13 I'm not sure if it was some time at five o'clock or later,  
14 all right, would be the first time I had noticed that we were  
15 having any flow oscillations with the pumps and that wasn't  
16 long before we had to secure the first two pump itself. All  
17 right. And then here again, once George Kunder had pulled  
18 out the curves for the net positive suction head for the  
19 coolant pumps all right. And we were right at or below the  
20 new positive suction head to the pumps and I figured that that  
21 was why they were cavitating, all right. But I didn't know  
22 why they were that low in pressure. All right. And at the  
23 time I didn't know yet, you know, the reason why the pressure  
24 was low. It was within the next, I don't know, 20 minutes  
25 or so is where we, or less than, I guess, it was within a

1 few minutes and we decided to secure two pumps. Based on the  
2 high vibration and the flow oscillation.

3 MR. WALSH: Is flow on the recorder in the control  
4 room?

5 MR. ZEWE: Yes, it is.

6 MR. WALSH: Was there a decreasing trend on that  
7 thing? Did that tell you anything? Was it going down  
8 steadily on that recorder or was it just, you looked at it  
9 and it was low and pressure was low and you put them together  
10 and said we have suction head net problems?

11 MR. ZEWE: When I was looking at it, I was looking  
12 at the indicator, not the recorder. All right, this is  
13 right next to the flow recorder. All right, the flow  
14 recorder even though it reads in zero to a hundred percent,  
15 all right? We only have a, our max flow has like an 82 or 83  
16 percent flow indication. So I go by, I was looking at the  
17 indicator rather than the flow chart.

18 MR. WALLACE: Ed Wallace.

19 During that 45 minutes, roughly, that you were  
20 out of the control room, what was taking place in the  
21 control room?

22 MR. ZEWE: I don't know, but I think they were just  
23 holding their own up there.

24 MR. BRYAN: Essentially, I was trying to control  
25 the cool down rate and was having once again problems with

1 the B generator filling up. Everything, I threw valves  
2 in stages and I isolated them and didn't seem to have any  
3 effect in terminating them.

4 I was watching that fairly closely just myself  
5 trying to figure out what pumps -- trying to get other  
6 indications of if I did indeed have a primary or secondary  
7 leak or not. And I was also going over on the secondary  
8 side of the plant there, taking hot well levels, seeing if  
9 I could get it coming back on level. I though I said something  
10 to somebody else, too. Not somebody else, I was talking to,  
11 I don't know if that was before Bill left or not.

12 I told two aux operators, one to go out and check  
13 the main turbine to make sure that one of the (inaudible).  
14 The other one, I think that was when we first noted the  
15 ghigh hot well level, it was for me to get on and make sure that  
16 we indeed had the blowdown. You know, checking that, started  
17 to talk about getting 29 POV -- not 29 but 59 isolated. It  
18 hadn't been throttled down, the discharge valve or on the  
19 isolation valve we didn't want them to just pop open and threw  
20 the pump over it due to the decrease in pressure. We were  
21 somewhere down in (inaudible). We were (inaudible).

22 MR. KEATEN: Bill, I want to understand specifically  
23 who was in the control room at the time you came back up. That  
24 must have been about five o'clock. Who, then, was in the  
25 control room?

1 MR. ZEWE: Ken Bryan, George Kunder, Ed Frederick,  
2 Craig Faust. Scott (inaudible) was up there and I forget  
3 the other man's name that was there -- Keven Hartley. And  
4 Fred Scheimann was there, of course, and I'm not sure how many  
5 AO's were there at that particular time. But other than the  
6 shift auxiliary operators, I don't believe there was anyone  
7 else.

8 MR. KEATEN: You had what, two or three engineers?

9 MR. ZEWE: Three.

10 MR. KEATEN: Three engineers, two shift supervisors,  
11 a normal crew.

12 MR. WILLIAMS: This is Ron Williams.

13 Did you guys find yourselves being emotionally high  
14 or concerned or in any kind of distress of any feeling of  
15 anxiety while you were going through the early operations?

16 MR. FAUST: Not until we started taking off on the  
17 RC pumps did I start feeling, you know, the weight at that time.  
18 I didn't know the reason why I didn't want to do it, I didn't  
19 want to take RC pumps off. And I couldn't answer the question  
20 why I didn't want to. It didn't seem the way I wanted to  
21 go at the time. I just didn't know everything that was going  
22 on. That's what it amounts to, I guess.

23 MR. ZEWE: As I view it, it was like, so many time  
24 you know, before, in that you had a problem you would just  
25 keep on and deal with that problem and trying to correct it

1 but it wasn't at the point you know, to where everyone was  
2 hyperactive or totally out of control or anything like that.  
3 It was just another problem that you were trying to overcome.  
4 Which happens quite a bit and no two trips or no two problems  
5 are exactly the same and they have just certain problems that  
6 you have to deal with. All right, the first real time that  
7 I emotionally had a very hard time is when I declared the  
8 site emergency when everything just had to come in.

9 MR. WILLIAMS: No, I was really speaking about the  
10 early period in the transient. Did you feel you were beset  
11 upon or anything like that? I guess the answer is really no.

12 MR. ZEWE: I don't think we did at all, no.

13 MR. WILLIAMS: Did you caucus at all, or try to  
14 figure out what the hell was going wrong or did you sort of  
15 stick by yourselves and man the segmented sectors of the problem?

16 MR. ZEWE: Everybody there knew exactly what we  
17 felt, that we had but we just didn't have the answers.  
18 Normally, when anything happens like that you sort of talk out  
19 loud, you know, you just hope for any input from any source  
20 you know that you can use. And we certainly didn't keep any  
21 secrets. I did assign certain people to certain cognizant  
22 areas, like Fred Scheimann and Ed Fredericks were the makeup  
23 system and pressurizer level and pressure, right? I assigned  
24 them over there, but they were aware of everything else and  
25 we just talked back and forth: what do you see, what do you

1 think, why do we have the high level, why do we have the low  
2 pressure, any ideas? You know, we kept going over that again  
3 and again, but we were --

4 MR. BRYAN: We were buty trying to break pumps; we  
5 were busy, one man I remember definitely we were trying to  
6 confirm whether that pressurizer level was true or not. It  
7 took time for them to do that and at least they were into  
8 that, trying to figure out ways to verify it on the computer  
9 and what-not. I was busy fabricating primary leaks and main  
10 generator leaks and --

11 MR. KEATEN: Ed, this is Bob Keaten.

12 Ed, you were on the makeup panel, if I remember  
13 correctly, and were you watching the pressurizer level?

14 MR. FREDERICK: What time was that?

15 MR. KEATEN: Okay, I'm in the relatively early  
16 period, up until the time that the pumps were turned off.

17 MR. FREDERICK: Yes. I was mostly relying on  
18 Fred for that thing.

19 MR. KEATEN: Is that right?

20 MR. FREDERICK: During the time the level was  
21 increasing so rapidly, I was watching pretty closely, but then  
22 once it went off-scale, I thought it was (inaudible) with  
23 Craig and I was going on over there. Trying to obtain informa-  
24 tion about not being routine and not being able to change the  
25 main pumps, changes in the (inaudible). We were each going

1 over and focusing on each reading: pressure is going down;  
2 pressure is going up. (Inaudible).

3 (Laughter.)

4 MR. KEATEN: So you were still --

5 MR. FREDERICK: So that it was still solid, okay,  
6 well (inaudible) and go on the one before and just get it to  
7 the (inaudible). You know, I'd go over and look at it every  
8 once in a while. That's why Kunder's eyes were crossing in  
9 a jam.

10 (Laughter.)

11 He was on that thing. You know (inaudible).

12 MR. KEATEN: So you were basically just operating  
13 in response to the information that he was feeding you  
14 currently?

15 MR. FREDERICK: Yeah, seeing as how well we were  
16 (inaudible) about feedwater. Talking about how Bill was  
17 gone, I didn't even realize he was gone for a half an hour  
18 or so. He was there everytime I looked around. The next  
19 time I heard him he was coming back in the room. I (inaudible).  
20 To me, it was just a few minutes.

21 MR. ZEWE: You knew I was gone, right, because I  
22 left.

23 (Laughter.)

24 MR. FREDERICK: I hadn't realized that he'd been  
25 gone. I didn't even realize there was that many people in the

1 control room at that point. But Ken was there. I looked  
2 over and saw George talking to you and we were starting to  
3 talk about the RC pumps, so that's about when I became aware  
4 at that point of it.

5 MR. KEATEN: I'd like to pursue this just for a  
6 moment. You guys have repeated a point, I think, very clearly  
7 that your perception of time was not what you would expect it  
8 to be. Don't this, following other trips, where you have had  
9 events and time seemed to go a lot faster than you probably  
10 would have, or was this case special in that regard?

11 MR. ZEWE: (Inaudible) and I think we were aware  
12 of it. The main one we had was the steam generator release  
13 leak and it was pretty quick. The plant was stable right away  
14 or just about. It was over.

15 MR. LONG: Bob Long.

16 During that, even that short period of time you  
17 lost track of time.

18 MR. BRYAN: This is Ken.

19 Well, I'm sure we lost track of time but we  
20 didn't -- it didn't become so significant as it did with this.

21 MR. ZEWE: I think, what Craig said, not documented  
22 anywhere but, we mentioned the fact that had difficulty  
23 remembering the April 23rd transient -- the sequence of events  
24 and after that that's why we suggested tape recorders or some-  
25 thing like that in the control room. We had, you know, a

1 shorter term and things to remember, but we knew we were  
2 having trouble remembering it and we were saying things got out  
3 of sequence because of the time was put up a threat. And  
4 that hasn't been a negative long-term affects and I had the  
5 same reaction to things pretty much (inaudible).

6 MR. KEATEN: Let me tell you the reason for my  
7 question, very specifically, is the fact that you tend to  
8 compress time a bit, makes me feel that you may very well  
9 have been under more pressure than you're realizing at that  
10 point of the -- pressure -- is because we tend to compress  
11 time in and psychological suffer a memory losses. (Inaudible)  
12 memory loss. And it -- what I'm driving at is the plant such  
13 really something like a reactor trip really is, I think,  
14 a -- generator (inaudible).

15 MR. ZEWE: It has to be. I'm not saying that it  
16 (inaudible) to forget things but he couldn't keep on thinking.

17 MR. KEATEN: I think that's probably true.

18 MR. BRYAN: Sure. Of course all of us, it's true,  
19 knowing so much about psychology.

20 (Laughter.)

21 MR. WILLIAMS: Ron Williams.

22 Did you rely on your own feelings and background  
23 and understanding of the plant or did you use the procedures  
24 and, if you did try to use the procedures, did you find that  
25 they were helpful or confusing? What is your reaction to that?

1 MR. BRYAN: Like I said before, we had too many  
2 symptoms to be able to single out which procedures took  
3 priority over the others. Which casualty was it that we were  
4 in, we could have been devoting step-by-step procedures to  
5 and letting the other procedures essentially fall by the  
6 wayside.

7 As it turns out, the most significant symptoms weren't  
8 even on the plant panel, we weren't looking at them. Reactor  
9 coolant drain tank and the temperatures coming out on the  
10 computer to us were secondary indications. But they were the  
11 ones that we should have picked up on.

12 MR. KEATEN: Let me pursue this a little bit more  
13 specifically with you. I think this was one of the major  
14 lines of questioning we want to follow.

15 If you talk to a man just about a normal reactor  
16 trip, or a turbine trip which this one appeared to be during  
17 the early phases of it, there are a couple of things from your  
18 testimony I know you tended to immediately. Is it the normal  
19 practice to pull out the turbine trip or reactor trip procedure  
20 and run down it? Or do you normally rely on your memory on that?

21 MR. ZEWE: You would after you take immediate  
22 action, then you would go back and look at those procedures.  
23 But you make sure you have done all the actions. We never  
24 fully got immediate actions on everything.

25 MR. KEATEN: Right now, I'm just addressing the

1 normal trip. And normally, if you would go through these  
2 immediate actions in securing letdown and then you'd pull  
3 out the procedure and go through it.

4 MR. ZEWE: This thing changed from the point that  
5 I found out that the generators were dry, the change from the  
6 normal trip.

7 MR. KEATEN: So in this case, you did not in fact  
8 have the reactor trip procedure out?

9 MR. ZEWE: Not right at that point, no. Later  
10 on, I'm the one that, and I can't even put that in time frame  
11 that I went over, that I just went over immediate actions on  
12 a reactor trip and then I was into another one, I think Ken  
13 handed to me.

14 MR. BRYAN: That was the first procedures.

15 MR. KEATEN: You pulled that out in the first  
16 15 minutes.

17 MR. BRYAN: Yes.

18 MR. KEATEN: I remember reading --

19 MR. ZEWE: We set it up and then we put it away  
20 again and then we got it out.

21 (Inaudible.)

22 MR. KEATEN: Your normal procedure would be to have  
23 somebody read them out loud or at least have somebody read  
24 through them and make sure there's --

25 MR. BRYAN: Actually, that should be the switching

1 and tagging operator doing that. But let's just say I never  
2 got back around to the procedures.

3 MR. KEATEN: Part of my question is along the line  
4 of at the time that you have even a relatively normal reactor  
5 trip and not the kind of thing we had on March 28th, did you  
6 really have enough people available to do these things that  
7 need to be done?

8 MR. ZEWE: Normally?

9 MR. KEATEN: Normally, yes.

10 MR. BRYAN: Well, it's just that -- let me say that  
11 -- you have a guy who we could just pick up the phone and have  
12 him do the paperwork, read procedures and have a guy to  
13 leave the foreman free to take an overall view and see what's  
14 going on.

15 In our case, we had both CROs and the foreman on  
16 the panel and that was Bill left to take the overview. It  
17 seemed to me to be a distinct advantage to have that third  
18 CRO over there. It's not that we were missing something, that's  
19 our normal staff on our trips. We only have two CROs.

20 MR. WALLACE: But are you saying that as a result  
21 of the reactor trips that you only had two CROs? Was the  
22 foreman monitoring a panel?

23 MR. BRYAN: Yeah, probably, that's if he's in the  
24 room.

25 MR. WALLACE: On a normal reactor trip?

MR. BRYAN: Yeah, we done that before on other trips

1 Fred usually winds up on the panel. (Inaudible).

2 (Laughter.)

3 MR. LONG: Just from listening today, it seemed  
4 to me a few minutes ago, and that Frederick was being referred  
5 to Fred being glued to pressurizer level, I was wondering what  
6 you fellows feel about the NRC's judgment that undue attention  
7 was given to avoiding a solid system. I'm not sure how you all  
8 feel about that. About any portion of that accident (inaudible)

9 Was that -- is that -- if I left the con -- the  
10 interviews that I did with you and as I listen today, it  
11 seemed that there was an awful lot of other things that were  
12 being considered and yet they have chosen to say that's really  
13 what you were glued to. How do you feel about that? Was  
14 that dominating all of your decisions?

15 MR. FAUST: We would that was a considerations  
16 -- this is Craig Faust speaking. I think if we would have  
17 caught on to the fact that during those initial two hours there,  
18 that we'd reached saturation temperature and pressure in the  
19 system, and I guess that going solid -- I guess it would  
20 have changed our attitude a little bit, because that  
21 realization at that time. It was definitely apparent that we  
22 didn't catch that. When we started, when I first just  
23 myself started talking about going solid, it seemed like it  
24 was later. But we you know, started talking about not going  
25 solid, and this was -- after.

1 MR. KEATEN: After the site emergency had taken  
2 priority?

3 MR. FAUST: That's my impression. I don't know  
4 about anybody else but, until that time why we thought we  
5 were controlling it. That was the impression that I got. Once  
6 we started talking about taking pumps off, things started  
7 changing. When we got to that stage, why, there really, there  
8 was something going on here that we're not seeing. And we  
9 couldn't figure it out. And I just remembered basically being  
10 after the pumps were off and site emergency was declared that  
11 I had shifted my position over to makeup systems and I had  
12 started hearing that we were not going to go solid and we  
13 don't want to go to solid. That's the way I remember it.

14 MR. WALLACE: Ted Wallace here.

15 What, in your minds and whether it was discussed  
16 or just individual thought processes -- what were the factors  
17 which ran through your mind that supported the desire to not  
18 go solid?

19 Or if you wanted to go solid, why didn't you --  
20 wasn't it suggested or why didn't it happen?

21 MR. FAUST: Number one, you are not allowed to go  
22 solid.

23 MR. WALLACE: And what is that --

24 MR. FAUST: (Inaudible). It was also B&W simulator  
25 which is to say, if you go solid, you all go out for a beer.

1 (Laughter.)

2 You were always trained -- don't go solid.

3 Now the emphasis is not on what is going to happen  
4 after you go solid, it's just that you shouldn't be there.

5 MR. WALLACE: Is the basis for that fact of not  
6 taking a plant solid understood, or was it understood at the  
7 time you had to talk about it now? At the time, did you  
8 understand the basis for those conditions which you were  
9 trained not to violate?

10 MR. FAUST: Well, I don't know whether that's the  
11 same (inaudible) as anybody else's.

12 MR. ZEWE: I had operated solid in the Navy on  
13 several different occasions and solid plant operation is very  
14 tricky because of the pressure response, particularly using  
15 such high volume flow pumps that we do here -- a pressure  
16 spike (inaudible) you know, could be tremendous in a very  
17 short period of time. I knew the solid (inaudible) is  
18 a very trick evolution because you had to strictly control  
19 any of your pressure slip. And I did not wind up solid.

20 MR. WALLACE: Had you any training to discuss the  
21 rate of change of pressure of a solid plant in your plant?

22 MR. ZEWE: The only training we might of had in  
23 that was in going hydro in the system.

24 MR. WALLACE: Where you have pressure changes.

25 MR. ZEWE: Well, I was just saying, that's the

1 only way that we talked about it. Otherwise, we didn't  
2 really talk about going solid under our casualty situation at  
3 the plant. So there --

end tape.

4 (End of tape recording.)  
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