UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the Matter of:

IE TMI INVESTIGATION INTERVIEW

of Kenneth Bryan, Shift Supervisor

Trailer #203
NRC Investigation Site
TMI Nuclear Power Plant
Middletown, Pennsylvania

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NRC PERSONNEL:
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SINCLAIR: The following interview is being conducted of Mr. Kenneth Bryan. Mr. Bryan is the Shift Supervisor at the Three Mile Island Nuclear Power Facility. Present time is 3:18 p.m. Eastern Daylight Time. Today's date is May 16, 1979. The place of the interview is trailer 203 which is located immediately outside the south gate at the Three Mile Island site. The individuals present for the interview will be, interviewer Mr. Dorwin R. Hunter. Mr. Hunter is an Inspection Specialist, Performance Appraisal Branch, I&E Reactor Construction Inspection. Also attending the interview will be Miss Tracy Binion, Inspector Auditor from the Office of Inspector and Auditor, U.S. Nuclear Regulatory Commission. Also attending is Mr. Chip Foster. Mr. Foster is also an Inspector Auditor, Office of Inspector and Auditor. My name is John R. Sinclair. I'm an Investigator, Office of Inspector and Auditor, U.S. Nuclear Regulatory Commission. Prior to the interview being conducted, Mr. Bryan was provided a copy of a document explaining his rights concerning information to be obtained regarding the incident at Three Mile Island. In addition, Mr. Bryan was apprised of the purpose of the investigation, its scope and the authority by which Congress authorizes the Nuclear Regulatory Commission to conduct the investigation. On the second page of the advisement document, Mr. Bryan has answered three questions. The questions and Mr. Bryan's replies will now be recorded as part of the interview.

SINCLAIR: Mr. Bryan, do you understand the document?

BRYAN: Yes I do.

SINCLAIR: Second question. Do we have your permission to tape the interview?

BRYAN: Yes.

SINCLAIR: Third question. Do you want a copy of the tape and transcript?

BRYAN: Yes.

SINCLAIR: Okay, thank you. Okay, at this point I would like you to provide us maybe a brief work history, work in the nuclear industry and any training which may be pertinent.

BRYAN: Well, I started work with Metropolitan Edison Company at Crawford Station in Middletown, coal power plant, and I came down here in 1969 in the training program Met Ed had set up for control room operators and it was in a 42 week course and that's basically how I got into the industry. We went through the 42 week training course that Met Ed has supplied and from there I went on to get my RO license.

SINCLAIR: RO is?

BRYAN: Reactor Operator.

SINCLAIR: Reactor Operator. And all your time you spent here at Three Mile Island?

BRYAN: Yes, all my time has been at Three Mile Island.

SINCLAIR: Okay, thank you. At this point I'll turn it over to Mr. Hunter.

HUNTER: Okay, Ken after the 42 week training course you then received your reactor operator's license and you are a control room operator in which unit?

BRYAN: Unit 1.

HUNTER: And then you were promoted to Shift Supervisor from a Control Room Operator?

BRYAN: No, my second position was a Shift Foreman in Unit 1.

HUNTER: And then?

BRYAN: And then Shift Supervisor.

HUNTER: When did you obtain the position of Shift Supervisor in Unit 1?

BRYAN: Station Shift Supervisor. Approximately a year ago.

HUNTER: And in that position you are...you have a senior license on both Units 1 and 2?

BRYAN: Yes sir.

HUNTER: Okay. Okay, Ken, realizing that it's been a while since March 28, the March 28, you were working the 11:00 to 7:00 shift on Unit 1, if I understand your position at that time.

BRYAN: That's correct.

HUNTER: And that would put you onsite somewhere right...right prior to 11:00 on the 27th. What was the...what were your duties on Unit 1 at that time on the 11:00 to 7 what were you...what were you involved in in Unit 1?

BRYAN: We were in the process of heating Unit 1 up. This is...we just finished refueling outage, we were heating Unit 1 up to put it back on the line.

HUNTER: Were you doing any special testing, Ken?

BRYAN: Not that I recall.

HUNTER: Just a...it was a normal heat up, normal procedures?

BRYAN: Yes.

HUNTER: What was the...what was your plan for the morning of the 28th on Unit 1, just continue heat up?

BRYAN: I...I don't remember if we had done the second vent on the control rod drives or not, you know, I really don't remember.

HUNTER: Okay, then...

BRYAN: I think we were the whole way up.

HUNTER: Alright.

BRYAN: It seems to me like we were getting ready to...there...there was something holding us up in deborating and I...I don't remember what it was.

HUNTER: Okay, it's alright. And early in the morning apparently you received a called from Bill Zewe on Unit 2, the Shift Supervisor on Unit 2. Can you characterize that particular call that you had from Bill?

BRYAN: No, I didn't get a call from Bill, I called Bill.

HUNTER: Okay.

BRYAN: They announced over the page system that the turbine had tripped in Unit 2 and at the time we needed st..., we were using Unit 2 steam for feedwater heating and turbine seals in Unit 1, and I called him to find out if the reactor had tripped and whether we needed our aux boilers or not and he said that it did and he said why don't you come on down and give me a hand and that's when I went down.

HUNTER: Did he indicate to you anything other than a reactor trip, turbine trip? Can you give me any kind of point status at that time?

BRYAN: He mentioned that he had ES injection already.

HUNTER: Does that mean anything to you as far as...was that unusual on Unit 2?

BRYAN: It has happened before in Unit 2 on a turbine trip.

HUNTER: Okay. About what time then did you get to Unit 2?

BRYAN: 4:08.

HUNTER: Your fairly specific as far as your time how did you know exactly when you got there?

BRYAN: Cause it was right after I got there, but when I got there I noticed that the feedwater valve...we weren't getting any feedwater to the steam generators and Craig was standing in front of me. He looked down and said the 12's are shut and he opened the feedwater valves...

HUNTER: Okay.

BRYAN: ...that's right when I got there.

HUNTER: Ken, and when you walked into the control room, what keyed you to say your not getting any feedwater, what did you look at?

BRYAN: The first thing I noticed when I walked in was the Tavg indicator and was 592 degrees, 596, and it was a little hot and I looked over the steam generators and the levels were low and I said you don't have any feedwater.

HUNTER: Did you notice anything other ther the Tavg in the fact that the levels were...but were they actually at 10 inches or were they that low, do you recall?

BRYAN: They were that...they were low.

HUNTER: They were low, they were very low.

BRYAN: Yes.

HUNTER: Okay. Was there anything else that you noticed, did you notice anything about the auxiliary feedwater, the emergency feedwater pumps at that time or was that just your comment?

BRYAN: That was my comment at the time. That all happened right away. I looked at Tavg, I looked at the steam generator levels and I said you

don't have any feedwater and Craig was standing between me and the 12 valves, well he was right in front of them, and he looked down and said the 12 valves are closed, and he opened them up.

HUNTER: Okay. Did the...did...were you then...were you two fellas then or everybody in the control room, were you aware of the feeding of the steam generators at that time and if you were how did you know when he opened the 12 valves?

BRYAN: Well the levels started to come back.

HUNTER: Okay. Does that take time or does it occur right away?

BRYAN: It takes some time, yeah, we're talking a minute or two I guess.

HUNTER: Alright, Craig mentioned something about the...the noise monitor being on the A generator and that there was....

BRYAN: You could hear the feedwater.

HUNTER: .... water hammer, splash in...in...

BRYAN: Yes.

HUNTER: ...and the water entered the steam generator, do you recall hearing that?

BRYAN: Yes, that's the first I've heard of that since that night, but I do remember it, we could hear something on the steam generator and we assumed it was the feedwater.

HUNTER: Okay, did...did...what...did you walk over and look at the feedwater station at that time? In other words to backup Craig or see what he was doing, look at the feedpump pressures or are there actual, number of feedpumps running, anything...anything specific that you did when they took...opened the 12 valves backup?

BRYAN: No, I...I think...the next thing I went over to look at was the pressurizer level.

HUNTER: Okay, lets...

BRYAN: I was still...it was either that or the condensate pumps because he didn't have...it seems to me there was only one condensate pump running at the time or something. So I'd just walked in and I was just trying to take a look and see what else is going on so I didn't pay too much more attention to the feedwater at that time.

HUNTER: Okay, Tavg was high? No feedwater flow, they got the feedwater flow back, the 12 valves were closed and now they are open, the next thing you indicate you throttled it up to pressurizer level do you remember what...what it was at the time you looked at it?

BRYAN: It was either still pegged high or just barely starting to come ... come off the top of the scale.

HUNTER: Did that strike you as being unusual?

BRYAN: Oh yes! Well...

HUNTER: Looking back at your training, but go ahead...

BRYAN: With that high Tavg, I guess it...you know...you could expect a higher than normal level.

HUNTER: Okay, Tavg should have come down to about 545 or so and it was 50 degrees higher, 40 something degrees higher rather, being at 592, okay. When you saw the high pressurizer level what was your...what was your reaction then and what did you look at?

BRYAN: I looked at letdown flow and we were...there was a guy on...he was trying to control letdown flow, increase letdown flow and reduce the pressurizer level.

HUNTER: Okay, and the... if my notes again are right, 8 minutes into the event, apparently Ed Frederick was at the...at the pressurizer level panel and also it could've been Fred Scheimann also was there.

BRYAN: I think Fred was there when I...

HUNTER: Okay.

BRYAN: ...I remember Fred being there.

HUNTER: Alright, and he was trying to increase letdown flow? What about the actual makeup flow, the pressurizer level is high, the 17 valve which is the makeup valve would be closed....

BRYAN: Right.

HUNTER: ... if it's fixed on automatic and I assume that it was, that's the indication we're getting. What about any makeup flow through the high pressure injection path or the reactor coolant pump seals?

BRYAN: Well you still have seal injection flow...

HUNTER: Would the operators ever secure the seal water injection flow that you're aware of? Would that be normal?

BRYAN: Would they secure it?

HUNTER: Or have they...or would they routinely secure it or do they ever secure it or....

BRYAN: No, that's not a normal....

HUNTER: ...and the procedures they normally keep the seal injection operating?

BRYAN: Yes, yes.

HUNTER: Okay. Well then you assume that...or did you notice whether there was one or two makeup pumps on to make any seal water injection?

BRYAN: I thought at the time that there wasn't any on.

HUNTER: I've been reading some of the things. I want to make sure because I'm getting some different information and I want to make sure that...can you tell me why you maybe thought that, or maybe..maybe they weren't off. That's what I need to know?

BRYAN: Maybe they weren't, it's true.

HUNTER: Yes, that's what I want to make sure.

BRYAN: I don't know how I came across this opinion but that morning I assumed that they were off with the high pressurizer level and increase in letdown and I thought we had secured them because of the fact that we had a solid system and you didn't want to keep the head of the makeup pump on the reactor coolant system.

HUNTER: I understand.

BRYAN: But I just....just yesterday I was talking about it and I... they say there was one running yet, I don't know.

HUNTER: Okay, fine. The...as they shift...as the...looking at your shift Unit 1, or Unit 2, and again looking at the seal water injection, would the operators normally keep it on to protect the pumps? Will the pumps run without seal water injection?

BRYAN: Oh, yeah.

HUNTER: Is...is it detrimental to the pumps at all?

BRYAN: No, you can run without seal injection.

HUNTER: Okay, so the reactor coolant pumps could run...

BRYAN: Yeah.

HUNTER: ...your leakage then would just be out not being supplied by the seal water injection?

BRYAN: True.

HUNTER: Okay. An item that I wanted to look at is that...early on you indicated in a previous interview that, there's some previous information that we have is that the...in previous interviews that we've done that the core flood tank valves were closed or were closed while you were there.

BRYAN: Yes.

HUNTER: Can you elaborate on closing those valves and what the...your philosophy or your...the reason for those valves being closed if you were involved?

BRYAN: Yes, we had, pressurizer level was still high and core flood system is designed for a loss of coolant accident to reflood the...the core and with the full pressurizer we didn't need any more water at the time we thought, so we closed the...isolation valves in the core flood tanks.

HUNTER: Procedure for closing those valves or how..how...how did you go about closing them? Do you have to go unlock them and energize the breakers and then close the valves? Is that the way they were set up?

BRYAN: Yep.

HUNTER: Who...who unlocked the valves? Do you recall who...who...did you send somebody down or did Bill Zewe send somebody down?

BRYAN: I don't know.

HUNTER: Okay.

BRYAN: Somehow or another by the time we got to that, the valves were energized I don't know...

HUNTER: Okay. When you close them...close them, do you leave them closed, I mean do you leave the electrical breakers closed, and were they sitting there in the energized position?

BRYAN: Yes, so that it can be reopened.

HUNTER: Okay. Reopened how? Manually, with a switch?

BRYAN: With a switch from the control room.

HUNTER: What about any automatic opening of those valves?

BRYAN: There is none.

HUNTER: The ES does not open those valves?

BRYAN: No.

HUNTER: Okay. Later on in the day those were reopened?

BRYAN: Yes.

HUNTER: Well, did you happen to be there when they were reopened?

BRYAN: No.

HUNTER: Okay. Did you happen to look at the steam generator, the condensate pumps were secured, the atmospheric dumps are automatically

labeled but when the condensate system is...no...the circ water pumps were still on so the atmospheric dumps were not in operation, the turbine bypass was in operation. Did you happen to look at the turbine bypass valves and...at that time and if they were functioning or were on automatic?

BRYAN: I didn't look at those, I looked at header pressure and header pressure was holding.

HUNTER: Holding steady?

BRYAN: Yes and indicating that the valves were working properly.

HUNTER: It looked normal to you...

BRYAN: Right.

HUNTER: ...then at that time? Okay. There seemed to be a problem with hotwell level and it was fairly soon after you got to Unit 2, Bill Zewe ended up going to the Turbine Building and looking at hotwell level, can you elaborate about the hotwell level and what the problem is with hotwell level at that time?

BRYAN: We had a high indication in the control room and Bill went down to check the site glass and he came back and said, "The site...it was

out at the top of the site glass" indicating that actually had a high level in the hotwell and I think that's about the time we secured the circ water pumps to automatically go over to the atmospheric relief valves so that the steam we were dumping back to the hotwell would go out the atmospherics and start reducing our inventory of water in the hotwell.

HUNTER: The intent at that time was to get the condensate pump back or booster pump and get the reject system back in and reject the hotwell back to the steam generators.

BRYAN: Capacity, yeah, well at that time we opened the... we wanted the atmospherics opened, it was just so we'd be blowing steam out instead of saving it, thus reducing the water inventory that we had in the hotwell.

HUNTER: Okay. Do you know what the problem was with the hotwell?

BRYAN: The more I think back on it we didn't...we weren't feeding anything, everything just ended up in the hotwell.

HUNTER: That...that would be your evaluation of it now by just by again looking back at it?

BRYAN: Yeah.

HUNTER: You weren't involved in getting it squared away and finding out what was wrong with it, if it would have a failed level control system or ... or whatever?

BRYAN: Oh no.

HUNTER: Okay. The ... through some inter ... of the interviews I've come across in the fact that the reject line off of the condensate system, the downstream valve on the reject line on Unit 2 is normally throttled. Are you aware of that, or are you aware of the problem? Is that for a specific reason?

BRYAN: Yes, the automatic control valve sometimes fails open.

HUNTER: What's the result if it fails open then?

BRYAN: Get a low...a low suction pressure to the feed pumps and the feed pumps trip.

HUNTER: And low feed pumps tripped and then would cause a run back or a Unit trip?

BRYAN: Yep.

HUNTER: Okay. Is that thing going on for a substantial amount of time, that you're aware of?

BRYAN: All I can say is that I know it's happened twice.

HUNTER: And the valves have been throttled....

BRYAN: Since then to...

HUNTER: Okay.

BRYAN: ...to prevent that.

HUNTER: Alright. Were you involved at all in the demineralizer problem in Unit 2, other than just discussions with the other fellows?

BRYAN: No.

HUNTER: ...because that ended up being the problem that they had, okay. Were you ever involved in any of the trips in Unit 2? A turbine trip before from any source? Personally, you know you'd have...you'd have the...

BRYAN: Yes.

HUNTER: ...you'd happen to have the...

BRYAN: I've been there for a couple other ... I was ... I'm just trying to think...

HUNTER: Let me go a little further, Ken. During the trip that you had that you have seen...if you have seen a trip, have you seen the ES initiated before on a routine or a normal plant trip in Unit 2?

BRYAN: No, not while I was there.

HUNTER: Not while you were there, okay. But again you said it didn't surprise you that it had initiated because you...had you reviewed trip reports from the other trips that showed that ES had in fact initiated?

BRYAN: I can't say that I actually reviewed a trip report it just...we all talk...

HUNTER: Okay.

BRYAN: ... if a trip or something happens.

HUNTER: Supervisors or other people, the operators had talked and you were aware that that was the problem, okay? How did you feel about pressurizer being solid, personally, and you look ... look back at your training, does that...did that...did your training key on trying to maintain a pressurizer other than solid?

BRYAN: Oh yes, yes, we tried not...we tried to maintain it with a bubble.

HUNTER: Can you give...give me a feeling of...of what the problems you...you would have visualized with allowing the pressurizer to go solid?

BRYAN: Well for one thing, once you get solid whatever your discharge pressure of the makeup pumps is it goes right onto the system.

HUNTER: Let's say the discharge pressure of the pumps is approximately, it could go as high as I think 2900 pounds...?

BRYAN: Yes.

HUNTER: ...if you take the primary system solid and you have the pumps, I would be under the assumption you'd lift the safety valves at 2485 pounds...

BRYAN: Right.

HUNTER: ...and you'd be sitting it on safety valves.

BRYAN: That's true.

HUNTER: Have you fellows discussed that?

BRYAN: That night.

HUNTER: In your training or...?

BRYAN: Oh, no.

HUNTER: Did you fellows discuss it that night?

BRYAN: No.

HUNTER: You know, Fred Scheimann or anybody with you that morning?

BRYAN: Not that I'm aware of.

HUNTER: Okay. You indicated that with a solid pressurizer you might have been inclined to shut down the makeup pumps. Is the reason because the fellows are that sensitive to that solid pressurizer level that they would tend to...to go back to almost no makeup pumps or minimum makeup just to maintain that...try to maintain pressurizer level?

BRYAN: Well, really once you get a solid pressurizer you don't need any makeup, at least we didn't at the time, and like you say you're just not set there and operate on the relief valves.

HUNTER: Okay.

BRYAN: And, the relief valves aren't designed to set there and operate, you know, with a steady flow of water through them like that and once you get back to a... to get back to a situation that you...you can get another bubble again and you may not be able to get the relief valves to reseat.

HUNTER: Have you seen in Unit 1 or 2 of the case where the relief valves have in fact failed to reseat? Have you ever had that type problem in either of these Units?

BRYAN: No, but we've never sat there and operated solid.

HUNTER: Okay.

BRYAN: ... with coolant water through them.

HUNTER: You say the main steam safety valves failed to reseat due to failures, other than that one time have you seen any fail to reseat?

BRYAN: No.

HUNTER: Okay. In one of the interviews that we've had they indicated that they had trouble with the A makeup pump failing to start, in one case the makeup pump...the fellow may've held...failed to hold the switch over for more than a time delay to allow the oil pressure to build up. In another case the makeup pump tripped in like 26 seconds after the heater had been sitting there running for that amount time.

BRYAN: Is this that...that night we are talking about?

HUNTER: Yes, and that morning. Are you...I...I...I can understand why if the man doesn't hold the switch for the 3-1/2, it depends on the pump, or 4 seconds for the lube oil pressure to build up. I can understand why the pump would trip back out. I'm having difficulty and so

far I haven't been able to determine why the pump would trip after 26 seconds and it was just sitting there running. Have you seen this problem with those makeup pumps or with the makeup pumps where maybe the lube oil system fails, or we get a pressure spike, or something, that would...the computer didn't printout a low lube oil pressure which it would normally do I think if that was the problem so I couldn't key onto that low lube oil pressure.

BRYAN: No, I haven't seen that problem.

HUNTER: Alright. The reactor coolant drain tank was a problem the morning when you came over to Unit 2, and you indicated that you had walked around and looked at the reactor coolant drain tank and I believe that some words about...it may be pumped down or whatever and when you got around it was empty. Would that indicate the rupture disc had gone at that time ... to you? Or do...you know...?

BRYAN: Not...not right away.

HUNTER: Do you know what time it was you walked around and looked at the reactor coolant drain tank?

BRYAN: No I don't.

HUNTER: Do you have any feel for the time frame?

BRYAN: It was early...within the first hour.

HUNTER: Okay. Had...have you seen the rupture disc blown on the coolant...reactor coolant drain tank in Unit 1 or Unit 2 before? Or been involved in that type of event?

BRYAN: No. no.

HUNTER: Is it...is it unusual for the reactor coolant drain tank to be hot and high temperature on a reactor trip or a turbine trip when the...after the power operated relief valve opens?

BRYAN: That's not unusual, but it was unusual that it was empty.

HUNTER: Okay. Did...when you went back around did you tell anybody or did you talk with anybody about that particular item?

BRYAN: I think that happened, if I remember the sequence of events right, when I came back around after I had seen that the drain tank was empty, it was in a couple of minutes that we got a Reactor Building fire alarm.

HUNTER: Okay.

BRYAN: And that's when we went, I started looking at the temperatures in the Reactor Building and they were increasing.

HUNTER: The temperatures of the containment, Reactor Building temperatures, were increasing?

BRYAN: Um Um.

HUNTER: What about the containment humidity, do you have that available to you to look at?

BRYAN: No.

HUNTER: Okay. The temperature recorders I believe you indicate...

BRYAN: Yes.

HUNTER: ...there are temperature recorders that look at containment temperatures? Do you recall what the temperatures were?

BRYAN: Specifically, no. There...I was looking at a trend, you know, they were all trending up.

HUNTER: Okay. What would that indicate to you?

BRYAN: That we had a leak in the reactor building.

HUNTER: Okay. Did you key that to anything? Did we primary coolant leak or secondary leak or steam leak in the steam generator or was there some... discussion at that time?

BRYAN: Yeah, with the drain tank being empty and the temperatures going up I think that's when we decided we had blown the rupture disc.

HUNTER: Okay. Did you look at reactor building pressure at that time?

BRYAN: Yes.

HUNTER: Do you recall, was it a trend or do you recall any specific pressure numbers?

BRYAN: Around 2 pounds.

HUNTER: Do you recall any discussion about the B steam generator?

BRYAN: Yes.

HUNTER: Give me a feel for that if you would.

BRYAN: We had the levels increasing in the B much higher than the A and we thought...we thought we had a primary-secondary leak in there and we isolated the B steam generator.

HUNTER: Okay. That...with the B steam generator isolated and you need to steam to atmosphere or you are steaming to atmosphere, prior maybe to getting your circ pumps back on, is there a physical valve line up that's required to prevent steaming the B generator or will it just not steam? Do you recall?

BRYAN: Yes, you have to close the...you have to close the feedwater valve...we closed the feedwater valves and the block valves for the dump valves. I don't recall if we had circ water back on...I don't think we did.

HUNTER: If you didn't have circ water, do you close the block valve on one of the atmospheric dump valves upstairs in the main steam area?

BRYAN: Yes.

HUNTER: If you had circ water on then would you have closed the block valve on that B side of the condenser?

BRYAN: If we had circ water on it would have closed itself and we could've reverted back to controlling on the hotwell till the pressure got up so high and then we'd have to close the manual valve at the block valve for the atmospheric relief valve anyway, you'd end up closing up.

HUNTER: What about on the turbine bypass? Is it split also, the turbine bypass valves?

BRYAN: Yes.

HUNTER: Would there be a manual valve you would have to close on that also?

BRYAN: There, there, yes.

HUNTER: Okay.

SINCLAIR: Let me break here. The time is 3:45 p.m., we are going to take a break here to change this tape.

SINCLAIR: Alright. The time is 3:50 p.m., and we are gonna continue the interview with Mr. Bryan.

HUNTER: Okay Ken, this is Hunter speaking again. We just discussed isolating the B steam generator and discussed the atmospheric and the turbine bypass valve manual isolation. I'd like to move to the power operated relief valve, the RB2 and the isolation valve on that. In your early stay in the control room did you review the condition of the power operated relief valve, the discharge temperatures and what did you see?

BRYAN: I looked at the indication in the control room. That indicated it was closed. I printed out the thermocouples on the power operated relief valve plus the two electric ... code safety valves and they all three, the temperatures were all fairly close which indicated ... I didn't ... never thought that the code safety valves opened. So with the temperatures of the three valves being close, I didn't think that the electromatic was open at this time.

HUNTER: Okay. One thing you indicated you didn't feel like the code safetys... Did you review the pressure chart to see what the pressures went to during the trip?

BRYAN: 2355, I think we tripped at, and that's when they started going down.

HUNTER: Okay. So you didn't feel like you got to a point where a safety should have lifted?

BRYAN: Right.

HUNTER: Ah, and the temperatures were reading the same within a few degrees?

BRYAN: 10, 15, maybe 20.

HUNTER: You would suspect if the RB2 valve was open that the temperature would be much higher than that?

BRYAN: Higher than the other two.

HUNTER: The difference between would be higher, okay? So you didn't suspect a problem at that time?

BRYAN: No, I didn't.

HUNTER: Okay. An area that ah...you learned later that the power operated relief valve had in fact been open and they had in fact isolated it to the MOV, my understanding is at that time you were in Unit 1 and somebody called you and let you know that it was open, right?

BRYAN: Yes, it was Mike Ross.

HUNTER: Okay. So I...that's fine I got to the point. Now, when you called up the power operated relief valve temperatures on the computer did you call up on the demand log? You said you called this out?

BRYAN: Yes.

HUNTER: Okay. So the numbers that you called up are available and we have been through the particulars.

BRYAN: I turned them out twice probably within twenty minutes, maybe even three times while I was there in the morning. Twice within twenty minutes or so I believe.

HUNTER: It's...would you know the time frame that you printed them out? You guys don't initial the log, so I can't tell who prints out what. Was it within the first half hour or maybe an hour ah, of the when you came over?

BRYAN: Within an hour.

HUNTER: Can you key it to an event. Were you doing something when the...?

BRYAN: It was after I noticed the drain tank was empty.

HUNTER: Okay. So it would be fairly quickly but not within the first ten minutes or so?

BRYAN: Oh, no.

HUNTER: Okay. Reactor coolant flow was decreasing fairly quickly into the event apparently it started decreasing. Did you review the reactor coolant flow and watch it as...you know, discuss it with the... Bill Zewe or any of the other people in the control room?

BRYAN: Yes, Mike Ross was there by this time I think also.

HUNTER: What was your impression of the flow decreasing?

BRYAN: We didn't really know right off...you know.

HUNTER: Okay. Now I'm gonna ask you again, I want you to be very honest because I want the information. I want to go back and key that you had a high pressurizer level, okay? And I want to also go back and say did you review the reactor pressurizer pressure, the reactor coolant system pressure, did you look at it during the time that you were there, like between well, I think you left somewhere around whatever, 9 or 9:30?

BRYAN: 6:30.

HUNTER: That's right, 6:30. Did you look at the reactor coolant pressure during that time?

BRYAN: Yes, we did and all I could say, at first we didn't know, and we thought maybe we were getting to a point where the temperature was too high for the pressure and we were starting to cavitate the pumps. They were forming steam in the pump cavity or something, or net positive suction head wasn't enough at this temperature for the pumps to operate properly.

HUNTER: Okay. Do you have curves available to you to use...to look at... to give you an idea about where the pressure should be versus temperature?

BRYAN: We have our heat up and cool down curves.

HUNTER: Did you look at any of those, or was anybody looking at them that you were aware of?

BRYAN: If I remember right we were already outside the curves so we weren't looking at any.

HUNTER: But you were aware, you were aware that you were outside the curve? How did you find out, how did you determine that? Was it automatic because you know the curve or the temperatures?

BRYAN: With the temperature we were at and the pressure we were at we knew we were outside the curve.

HUNTER: Okay. What does that mean to you being outside that curve?

BRYAN: In relationship to what, you know, the reactor coolant pumps?

HUNTER: Uh, that's part of it.

BRYAN: See the heatup and cooldown curve is based on alot of different things and it's just...it's one...it's compiled into one curve but each line has different meanings.

HUNTER: I understand. Do you have in fact like a...I'll look at you and I can talk and I'll draw a picture with my hands but the left hand line of course is the nil-ductility transition limit, okay? And if you go all the way over to the right hand side of the curve, there's a saturation limit curve that's over here.

BRYAN: Right.

HUNTER: Now there's pin compression limits and pump limits, whatever inside of that but what does that...you're actually outside of your saturation limit. What does that mean to you?

BRYAN: Oh, we could be forming steam bubbles. We could be forming steam at that pressure.

HUNTER: And the reactor coolant pressure at that time was...ah...it varied around by 1200 pounds, 1000, whatever it was.

BRYAN: Yes.

HUNTER: Okay. And the pumps were still on, okay?

BRYAN: That's true.

HUNTER: Flow was down but, and the auxiliary ... the emergency feedwater system was functioning if you will and you were releasing steam to the atmosphere. So you were fairly stable from that standpoint, but the key issue that keeps coming back to me, okay, is that the pressure was low and if you take ah...if you take the Tavg and walk over to 545 when at that time you were about at 1000 pounds and go up and take your xy plot

and ... it would put you outside of that ... or, you were moving right around the saturation.

BRYAN: Right.

HUNTER: Did you discuss that with anybody or did anybody come up and discuss that with you? Do you recall any detailed discussion of it or comments by anybody?

BRYAN: No, I don't recall any detailed discussion of that. It was mentioned and that's all I remember.

HUNTER: Okay. The reactor coolant flow decreased and the shift ended up taking off two pumps and they took off the B pumps leaving the A on and this was my understanding is due to spray. Is there any other reason that you know of that you would pick the B rather than the A?

BRYAN: No. You need the spray. No, I don't know any other reason.

HUNTER: Okay. I don't either, I just want to make sure that I'm finding the key to ... going to get all the information I can. Ah, were you there when they secured the last two pumps?

BRYAN: What time was that?

HUNTER: Ah, well the first two went off 74 minutes into the event which would be slightly, you know, would be past 5 and then the next one went off at 100 minutes which was right before 6.

BRYAN: Yes, I was there.

HUNTER: Okay. One of the discussions that apparently went on or it appears to have gone on was going on natural circulation when you take these reactor coolant pumps off. Give me a feel about natural circulation and what you...what, your understanding of natural circulation, and what's required to go on natural circulation. Besides the fact that you turned the pumps off when you were there, but look ... go through a little bit of your understanding. I'm not the ... I'm a B&W expert now, I guess, but give me your feel for the natural circulation requirements and talk procedure if you want to, I don't mind you talking about a procedure at all, and talk ... whether or not you had a procedure in your hand or whether or not you saw somebody with a procedure.

BRYAN: I don't recall seeing anybody with the procedure at this time. I'm not saying they weren't.

HUNTER: No, I understand.

BRYAN: But ah, because by this time...

HUNTER: You didn't have one.

BRYAN: No, I didn't have one. There were quite a few other people in the control room by this time and I know the problem was to turn the reactor coolant pumps off and to go on natural circulation but I know if the steam bubble was in the top of the steam generator, which we didn't know at the time, you can't get natural circulation very well if you can't get flow around the whole loop and I guess that's what we had at this time and natural circulation doesn't work as well without it.

HUNTER: Is there any requirement to raise steam generator levels prior to going on natural circulation?

BRYAN: Oh yes, you have to be at 50 percent. Well, I don't know if it is required before you secure the pumps. The emergency procedure is if the ... all flow reactor coolant pumps trip the steam generators go on level control at 50 percent, through the emergency feedwater valves.

HUNTER: And that's 50 percent on the...which range?

BRYAN: 50% on the operating range.

HUNTER: 50% on the operating range. What would that give you on the startup?

BRYAN: 95%.

HUNTER: 95%? Good enough.

BRYAN: The emergency procedure is probably written for operating at some percent power when the steam generators are already higher in that level or around that level.

HUNTER: Okay.

BRYAN: So if you would lose all four reactor coolant pumps you already have your...the level established in the steam generators.

HUNTER: Let me go back when...were you there when they secured the first two pumps?

BRYAN: Yes.

HUNTER: My understanding now is that they were trying to protect the pumps and if I'm wrong tell me.

BRYAN: That's true.

HUNTER: The pumps were vibrating and they were making noise. They were vibrating, the rpms were varying, they were getting ... the computer was printing out alarms on another backstop all pressure, etc., etc., so you guys had indication that the pumps were in fact under stress.

BRYAN: Right.

HUNTER: And so the first two pumps you secured, the B pumps, was anybody or do you recall watching the B loops the steam generator what the actual loops did at that time? Was anybody watching that particular parameter?

BRYAN: No. Not that I know of.

HUNTER: I can indicate to you by the charts and the graphs and review the event that when those two pumps were secured no backflow occurred. Not one smidgen occurred. Now if you secured two pumps and you still

have two running and there is no backflow, what would that indicate to you?

BRYAN: You say I have no backflow through the tube operating under its coolant pumps?

HUNTER: Through the two secured reactor coolant pumps, the two that are down. No backflow at all through the B generator when they took that off...when they took the B pumps off...they just died. That loop just died.

BRYAN: That would indicate that it's got a steam bubble on top the loop and you know the water can't flow the whole way through.

HUNTER: Okay. I want to make sure. I'm not used to the J-leg type generators but looking at the...you take off two pumps in a solid system you would expect backflow and that generator would in fact steam some and it would come to equilibrium and you would be sitting. You indicated that you picked up procedures when you came to Unit 2. Do you recall which procedures, emergency procedures that you reviewed?

BRYAN: Turbine trip and reactor trip.

HUNTER: Were there any others that you reviewed?

BRYAN: No.

HUNTER: Okay. Part of the turbine ... reactor trip procedures, I think in both of them requires a sample to be taken on the reactor coolant system after the trip. Did you, were you involved in that particular request?

BRYAN: Yes, more or less. It might have been done by someone else also but I happened to see Dick Dubiel, he's the Chemistry Supervisor, he's the HP and Chemistry Supervisor, and I said you know you got a requirement here for a greater than 15 percent power change, you have to take a sample, and he says yes. Whether someone else had told him that before or I was the first one I don't know.

HUNTER: Did you get the results back on the samples while you were there?

BRYAN: No. I was sitting in Unit 1 when they took the samples. That's when we found out that we had some problems.

HUNTER: Okay.

BRYAN: Cause the sample lines run into Un't 1, they come by the hot machine shop and into the sample room and when they put the thing on recirc we got the high radiation alarms in the hot machine shop and the sample room.

HUNTER: Okay. What about the boron concentrations? Were you there when an earlier sample was taken? I'll go a little further. The situation that you are talking about occurred after the pumps were off, okay, but apparently somebody requested that the chemistry lab place the... obtain a boron sample for the shutdown margin check and the calculation for restart, whatever the requirements are, and they put it on recirc early. There was no radiation problem at that time.

BRYAN: Early, what do you mean?

HUNTER: That was at 4:45 or so and you got the sample about 5:00 and then they called it into the control room and it was 700 parts per million. Do you...were you aware of that particular number?

BRYAN: No. That's the first I heard that.

HUNTER: Okay. Well then the second sample was in fact later on, and another sample, and Dick Dubiel had two people split the sample. Were you aware of the results of that sample? That was after you left.

BRYAN: No.

HUNTER: Okay. When you were in the control room did you look at the source range instrumentation, the intermediate range instrumentation?

BRYAN: No, I didn't.

HUNTER: Were you aware of any emergency borating that was going on?

BRYAN: No.

HUNTER: Okay. You were not involved in any discus[illegible]by the...taking off the second set of pumps. Were you involved in a d[illegible]ussion as far as natural circulation and the requirements? Do you recall discussing that? Kunder was there, okay, Mike Ross, Bill Zewe...

BRYAN: Brian Miller.

HUNTER: Brian Miller was there?

BRYAN: Yeah. Right after Brian came in was when I went back to Unit 1.

HUNTER: Okay, I understand that.

BRYAN: And, no I wasn't involved in that conversation.

HUNTER: Okay. There was some discussion about ah, well let me go back again I'm just trying to fill in some blanks, the auxiliary feedwater...I mean the auxiliary steam system is used for Unit 1 for feedwater heating I gather during the normal heatup. Unit 2 needed the auxiliary feedwater for ah...to maintain a vacuum after they had tripped. Ah, and ah so when Unit 2 came down you needed to from Unit 1 to supply them steam for the vacuum. Did you guys get in a discussion at that time about supplying auxiliary steam?

BRYAN: Yes.

HUNTER: Was it a, did you end up supplying steam to Unit 2?

BRYAN: Uh, huh.

HUNTER: How did you, how did you end up, I have got the impression from some interviews and all that Unit 1...that there was some hesitancy at first to supply steam and I guess that's the best way to rightly put it. Did somebody, were you over in Unit...

BRYAN: You can't run both Units with one aux boiler and Unit 1 was sitting at the point where we were about ready to go back on the line.

HUNTER: Okay.

BRYAN: And we were already heated up. The Unit 2 was down and we knew it was going to be down for awhile. I'm speaking of a day or two at least you know at this time, and the decision I guess was made, earlier we will get Unit 1 on and we'll worry about Unit 2 later, but, as it turned out during the course of the day and that we had to get turbine seals on the Unit 2 for the cooldown, we...you know...we just took Unit 1 back to nothing and gave Unit 2 the steam.

HUNTER: Okay. Then do you recall...was the decision to supply Unit 2 steam while you were in Unit 2 or had you gone back to Unit 1?

BRYAN: I left Unit 2 early. The decision was Unit 1 gets the steam.

HUNTER: Okay.

BRYAN: And there was a couple of control room operators called and said they want steam and I kind of ignored that and I forget somebody else called up a couple of times and Mike or Bill or somebody called later on and said we decided we are going to put the seals back on the turbine in Unit 2 and this and that. So we started cutting back on the feedwater heating in Unit 1 and we ended up cutting it back almost to nothing.

HUNTER: And then...Unit 2...then you were able to maintain better seals and get the vacuum? In order to not dump steam to the outside that's my understanding that they have to have one of these ...

BRYAN: You have to have a vacuum.

HUNTER: Gland seal steam system on a vacuum, okay. I have in fact covered all the areas that I need to cover, do you have any questions or is there anything that you would that you need...oh I have one more question. This is sort of off the cuff. Jim Floyd was in Lynchburg.

BRYAN: Uh, huh.

HUNTER: And did he talk with you on the phone that morning?

BRYAN: Yes, he did.

HUNTER: What was the discussion? Did he ask you questions about Unit 2?

BRYAN: Uh, huh.

HUNTER: You were back in Unit 1 at that time if my time frame is right.

BRYAN: I don't remember the specific questions, but they had heard about it down there and he had called and he wanted to know some temperatures, radiation monitor readings, and I gave him those numbers over the telephone. He was down there with Bernie Smith and I guess some of the head people from B&W were all sitting around talking about it.

HUNTER: Okay. I just wanted to make sure that that was the type conversation you had. He wanted some numbers and you gave him the numbers. Did you have to take any messages to Unit 2 or did you have to go to Unit 2 to get any messages or it was it just a general conversation?

BRYAN: It was a general conversation at first and I gave him the numbers off the top of my head that I had seen when I left there.

HUNTER: Did you have ... go and give him any more numbers?

BRYAN: Yes, I believe he did call back later on. Him or Bernie.

HUNTER: ...called and did they talk to you again?

BRYAN: Yes.

HUNTER: Okay. Did you end up in Unit 1 the rest of the day?

BRYAN: Yes.

HUNTER: You didn't end up back in Unit 2 at all?

BRYAN: No.

HUNTER: In Unit 1 then were you with Greg Hitz I think, or some of the fellows who were over there in a support function as far as supporting Unit 2?

BRYAN: Well, yes.

HUNTER: Right, okay. And what did they do with Unit 1 during the day? Did it stay in hot shutdown or did you fellows go in and cool it down?

BRYAN: I don't remember if we cooled it down that day or not. We cooled it down that day or the next day.

HUNTER: Okay.

BRYAN: I don't remember what day it was.

HUNTER: Did you make any tours into Unit 2 at all? I know Greg Hitz ended up going in with an auxiliary operator and doing some tours. Did you do anything like that?

BRYAN: No, I didn't.

HUNTER: Okay. Any other areas of interest that you can think of that we need to that...you need us to look into?

BRYAN: No. The rest of the day I spent, was all in the Unit 1 control room, other than that, that's about it.

HUNTER: Okay. Alright. I don't have any further questions. Any of you have any comments at all? If not then we'll...

SINCLAIR: Thank you very much Mr. Bryan for coming down. The time is presently 4:11 p.m. At this time we will conclude the interview. Today's date is May 16, 1979.