

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

1 In the Matter of:

2 IE TMI INVESTIGATION INTERVIEW

3 of

4 George A. Kunder  
5 Superintendent, Technical Support

6  
7  
8  
9 Trailer #203  
10 NRC Investigation Site  
11 TMI Nuclear Power Plant  
12 Middletown, Pennsylvania

13 May 17, 1979  
14 (Date of Interview)

15 July 5, 1979  
16 (Date Transcript Typed)

17 246 and 247  
18 (Tape Number(s))

19  
20  
21 *7908290149*

22 NRC PERSONNEL:

23 Dorwin R. Hunter, Inspection Specialist

24 Thomas T. Martin, Inspection Specialist

25 Mark E. Resner, Investigator

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RESNER: The following is an interview of Mr. George A as in Apple,  
Kunder, KUNDER. Mr. Kunder is employed with the Metropolitan Edison  
Company at the Three Mile Island Facility. His job title is the Super-  
intendent, Technical Support for Unit 2. Present time is 10:45 a.m.  
Eastern Daylight Time. Today's date is May 17, 1979. This interview  
is being conducted in Trailer 203. It's located just outside the South  
Gate to the Three Mile Island Facility. Present for this interview, a  
Mr. Dorwin R. Hunter. Mr. Hunter is an Inspection Specialist with  
Region III of the U.S. Nuclear Regulatory Commission. Also present is  
Mr. Thomas T. Martin. Mr. Martin is an Inspection Specialist with  
Region II of U.S. Nuclear Regulatory Commission. Moderating this  
interview is Mark E. Resner and I am an Investigator with the Office of  
Inspector and Auditor, the U.S. Nuclear Regulatory Commission, Head-  
quarters. As you recall, Mr. Kunder, you were given a two page advise-  
ment document with your prior interview at which you signed and dated.  
And on that document you answered three questions, do you understand  
the above and you indicated, yes. Is that correct?

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KUNDER: That's correct.

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RESNER: Question 2 do we have your permission to tape the interview  
and you also indicated yes. Is that correct?

1 KUNDER: That is correct.  
2

3 RESNER: Question No. 3, do you want a copy of the tape? You indicated,  
4 yes. And you would like a transcript. Is that correct?  
5

6 KUNDER: That is also correct.  
7

8 RESNER: Ok. Mr. Kunder has already provided in the previous interview  
9 his educational job experience in the nuclear industry so we'll forego  
10 that and also like to be on the record that you are also aware of the  
11 fact that you're entitled to a representative of your choice should you  
12 desire one.  
13

14 KUNDER: Yeah, I'm aware of that.  
15

16 RESNER: Also that you're not compelled to talk to us should you not  
17 desire to.  
18

19 KUNDER: I'm also aware of that.  
20

21 RESNER: Ok, at this time I'll turn the questioning over to Mr. Hunter.  
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1 HUNTER: George, just to get back in the frame of mind that we were...  
2 our previous interview, you arrived onsite morning of the 28th fairly  
3 early, would you give us that time again and then we'll start from  
4 there?

5  
6 KUNDER: My best estimate is that I arrived in the Unit 2 Control Room  
7 about ten minutes of five.

8  
9 HUNTER: Ok. And when you came in the Control Room give us your general  
10 impression of what you saw and what was going on.

11  
12 KUNDER: Ok, I..when I arrived in the Control Room the people that I  
13 recall in the Control Room were Ken Bryan. Also the...I believe there's  
14 two Control Room operators at or near the console and the shift foreman.  
15 And I recall in particular that the shift foreman along with the operator  
16 who was assigned to the primary were observing the pressurizer level  
17 indication and upon questioning them I learned that the pressurizer  
18 level was high or out of sight on the quarter indication and they were  
19 attempting to re-establish level indication through as I recall letting  
20 down to the normal letdown path and attempting to draw a bubble presum-  
21 ably by using the pressurizer heater. I don't think I recall really  
22 looking at the heaters to see if they were on but most of what I learned  
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1 was by questioning the operators and then attempting to locate the  
2 instruments in the panel and confirming in my own mind that what they  
3 were telling me was indeed the case in terms of plant conditions.  
4

5 HUNTER: George did you recall looking at the makup pumps and the high  
6 pressure injection or the makeup flow system at that time?  
7

8 KUNDER: No, I don't recall.  
9

10 HUNTER: You indicated that they were in the process of letting down to  
11 obtain a bubble, heaters whatever, do you recall looking at the letdown  
12 flow at that time?  
13

14 KUNDER: No, I don't recall looking at it specifically.  
15

16 HUNTER: Moving to another area, in time, through other interviews we  
17 have indications that early in the morning that the coolant flood tank  
18 valves were closed. Can you give us information in that area or weren't  
19 you involved in that activity at all?  
20

21 KUNDER: No, I don't ever recall being aware that any valves in the  
22 core flood tank were closed and I presumed that you are referring to CFV  
23 1A and B which would be the isolation...  
24  
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1 HUNTER: They had been energized and closed due to the low pressure  
2 during your interview with the operator say in fact indicate that to  
3 you at that time?  
4

5 KUNDER: No. Are you referring to early in the morning?  
6

7 HUNTER: Yes, early in the morning, it probably occurred according to  
8 the interviews a few minutes before you arrived. If you arrived at five  
9 at four fifty or so we're looking in that time frame of four thirty...  
10

11 KUNDER: I'm not aware of that at all.  
12

13 HUNTER: ...though maybe that as part of the plant status that you had,  
14 in fact, picked that up or been given that at that time.  
15

16 KUNDER: No. Right now as I sit here I would have presumed that those  
17 valves were never closed but I have no knowledge of that.  
18

19 HUNTER: Ok. And we're going to pick on events so we'll take a little  
20 time in between these events and they are they may appear some frag-  
21 mented to some degree but we're going to take them one at a time. Make  
22 sure we get your impression of at that time as best as you can recall.  
23  
24  
25

1 KUNDER: Ok.  
2

3 HUNTER: At 4:45 approximately five o'clock to five fifteen a boron  
4 sample was called to the Unit 2 Control Room and the boron sample was  
5 seven hundred part per million do you recall getting that information?  
6

7 KUNDER: Yes.  
8

9 HUNTER: Do you know who reported the seven hundred into the Control  
10 Room and then who reported that information to you?  
11

12 KUNDER: I received a call from Dick Dubiel. Let me...before I answer  
13 that ask you the time again that you...  
14

15 HUNTER: Ok. There was two samples performed that day. One sample was  
16 around five to five fifteen and that was seven hundred parts per million  
17 sample. Now there was another sample performed around six o'clock or a  
18 little later than six and that one was four hundred ppm. To refresh  
19 your memory again Scott Wilkerson came across from Unit 1 and you may  
20 have seem him there you know or whatever but he was all he did apparently  
21 was pull the sequence of events post-trip review and he was collecting  
22 data but he also give a shutdown margin calculation on both of those  
23 those, based on both of those boron samples. The earlier one and then  
24  
25

1 he signed the second one he signed it off at six thirty that the shutdown  
2 margin was complete at that time and there was the shutdown was like  
3 2.445 percent shutdown even at 400 parts per million.  
4

5 KUNJER: Ok. I think I'm with you.  
6

7 HUNTER: Ok, go ahead.  
8

9 KUNJER: I was not aware of the times that those samples were drawn.  
10 But I did recall asking or confirming with Scott. He was doing a  
11 shutdown margin calculation and he needed to get a boron sample. My  
12 involvement with getting those numbers, came I believe it was within  
13 about a half an hour of arriving at the site and I had asked for shut-  
14 down margin calculation to be made and perhaps he did ask for those  
15 samples to be taken and he may have independently gotten the results.  
16 I was aware of the boron numbers following Dick Dubiel's arrival to the  
17 Control Room and I asked him to help out with getting information that  
18 we needed down in the Lab and at that time I recall contemplating the  
19 potential need to send somebody in the reactor building to assess  
20 conditions in there and that we would be needing to get reactor building  
21 samples and that sort of thing. I can't recall if I specifically asked  
22 for that but it was somewhere in the region of six thirty perhaps six  
23 twenty that Dick Dubiel called me in the Control Room and I believe he  
24 was in the Lab in Unit 1 and he indicated that he doesn't understand  
25



1 the sample results. He thinks there in error and he said the first  
2 sample result was somewhere around seven hundred ppm boron. And the  
3 second one they drew was in the range of 400 to and some ppm boron.  
4 And as I indicated on the previous interview that that revelation  
5 really struck me as a serious discrepancy and I began to consider if we  
6 were de-borating the rad coolant system through some process that I  
7 didn't as yet understand. So that's the time I became aware of those  
8 numbers.

9  
10 HUNTER: Ok, both the numbers then were given to you by Dick Dubiel  
11 when you asked him to go to the lab and do some work for you.

12  
13 KUNDER: Well, I was asking him really to go down and help coordinate  
14 the radiochemistry activities, make sure I had a senior guy that I  
15 could depend upon.

16  
17 HUNTER: One question, George, concerning this particular time frame.  
18 The possibility of de-borating the source re, were in fact, acting were  
19 in fact, increasing. You had some level changes that push you so low  
20 boron then you were losing boron or possibly diluting did you request  
21 samples from other tanks such as makeup tank, BWSI, actual boron levels  
22 at that time?

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1 KUNDER: I don't think I did, I know I didn't consider getting samples  
2 from the makeup tank but I did recall in my own mind I was concerned  
3 about the possibility of low boron concentration in the BWST. I can't  
4 remember if I asked for a sample of the BWST. It may have gone through  
5 my mind and I may have thought that it would take quite a long time to  
6 get a representative sample anyhow and then you know the information  
7 wouldn't really do me much good at that point because we had an immediate  
8 problem I couldn't wait. I did ask Dick to get another sample in the  
9 RCS however, at that point. And he may have intended to get that  
10 anyhow or it may have been in progress, I'm not really sure. But at  
11 that same moment after I got off the phone with Dick I went over to the  
12 status board and tried to learn what the boron concentration had been  
13 prior to the trip. And that status board is located behind the shift  
14 foreman's desk in the Control Room and I observed the concentration a  
15 little bit higher than 1000 ppm and I became very worried that we were  
16 de-borating the core and somewhere along that same time frame I became  
17 aware of the count rate on the source range being very high in the  
18 intermediate range indication was coming on scale. And that those  
19 indications lead me very strongly to believe that we were somehow  
20 de-borating reactor coolant system. And I couldn't understand at that  
21 point the..how that would occur.

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1 HUNTER: George, was your immediate concern of possible de-boration,  
2 did you how did you satisfy yourself that if you were de-borating what  
3 did you see being done or what did you do to counter that particular  
4 phenomenon or that particular activity?  
5

6 KUNDER: The first thing I did was to consider borating the system and  
7 I can't recall the specific conversation I had with Bill Zewe but I  
8 learned from Bill Zewe that upon hearing the low boron concentrations  
9 he did start the emergency boration from the boric acid mix tank. So I  
10 was satisfied that at least we were putting boron into the system and  
11 hopefully that would counter the apparent de-boration that I thought  
12 had been occurring. I also requested Bubba Marshall, who is in the  
13 Control Room at that time to review any possible means of getting  
14 demineralized water into either makeup purification system or the BWST  
15 or anyway that we can be diluting the concentrations of the fluids that  
16 are either being fed to the RCS or that may have been fed to the RCS  
17 through the high pressure injection.  
18

19 HUNTER: Did Bubba report back to you at some time later?  
20

21 KUNDER: No, I think...he never did report back to me and I think that  
22 the developments from that point on moved along pretty quickly in the  
23 direction of finally injecting BWST water into the core. You know, we  
24  
25

1 got into the emergency plant rather quickly and I don't think he would  
2 have the time to do a thorough job of researching what I was asking him  
3 to do.  
4

5 HUNTER: A short time thereafter the reactor coolant pump was restarted  
6 jumped or restarted and the source range intermediate range went decreased  
7 in value and it went back offscale back down to normal. The source  
8 range came back down to some level lower more than normal value, did  
9 you in fact look at those particular numbers at that time and did that  
10 in fact, did that satisfy you at all or as far as the dilution of the  
11 boron in the primary coolant system?  
12

13 KUNDER: It satisfied me that whatever was causing the apparent reactivity  
14 increase and actually under those conditions the core would be critical  
15 at a very power level since we were to go up in power level to get one  
16 decade indication from the intermediate range. That would be very low  
17 power level but you would indeed be critical based on criticality  
18 conditions that you've experienced in the past. So the fact that it  
19 went down and the source range was back down in mid-range and apparently  
20 decreasing satisfied me that whatever had caused that excursion had  
21 turned around. And I sometimes confuse myself with what I've learned  
22 since that time with what I think I saw at the time. But at the time  
23 I'm pretty certain I did not recognize the real cause of the increase  
24 in the source range intermedite range accounts and believe that I  
25

1 recognized what we thought the phenomenon was when I talked to John  
2 Flint a little later in the morning. He pointed out that it was probably  
3 due to the fact that at that time we had perceived that we did in fact,  
4 uncover the core and he felt that was due to the extra leakage that had  
5 tremendously extra leakage that occurred due to uncovering the core and  
6 losing the moderating effect of the water.  
7

8 HUNTER: Ok George let me ask you, have you since determined why you  
9 had a lower than normal boron concentration?  
10

11 KUNDER: Oh yeah, well, its per, its been . . .  
12

13 HUNTER: What, what's your perception, why you would of gotten a 400  
14 and a 700 and a 400 parts per million boron concentration?  
15

16 KUNDER: The explanation that I've, I've heard and I guess I have  
17 subscribed to, is the fact that as we were indeed boiling in the reactor  
18 coolant system, we were pretty much in a mixed phase, kind of flow for  
19 a period of time and that meant it became worse and worse as time  
20 developed and as we continued to letdown from the reactor coolant  
21 system, we were apparently getting steam into the sample lines which  
22 condensed and left the boron behind in the RCS of course and that  
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24  
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1 gradual increase in steam phase that was being circulated through the  
2 core with time caused a lower boron concentration to be in the fluid  
3 entering the sample line.  
4

5 HUNTER: Do you still believe the samples to be valid that the operator  
6 took, that the technician took, he actually read 400, 700 parts per  
7 million. I know Mr. Dubiel indicated that he had two samples taken on  
8 that second time and he split the samples and had two different gentlemen  
9 take the samples, and I noticed on the reactivity calculation the  
10 number is actually 407 and 402 divided by 2 or an average number of  
11 404.5 parts per million. They actually used that average number for the  
12 calculation. Ok, so you would, it would be. . .  
13

14 KUNDER: If it makes sense. . . .  
15

16 HUNTER: . . . Be dense steam. At at that, at that time of day, in the  
17 morning of the twenty-eighth that in fact had not, the voiding, the two  
18 phase steam water mixture hadn't entered your mind at that, that particular  
19 time?  
20

21 KUNDER: No it didn't.  
22  
23  
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25

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1 HUNTER: Ok. You touched on something that I'd like to pursue also, at  
2 six thirty approximately you had talked with Mr. Dubiel and you had in  
3 fact indicated that the possibility was, to enter the containment  
4 existed and that you had asked him to pursue that particular activity,  
5 by getting the appropriate samples and, as I, like we followed through,  
6 Bubba Marshall ended up asking for an RWP and actually asking to go  
7 into containment. What was your reasoning for asking to . . . reasoning  
8 for making an entry at that time? What did you want to do or what did  
9 you have in mind?

10  
11 KUNDER: Well I don't think, I had intended to make an entry at that  
12 moment because we had pressure in the reactor building and we wouldn't  
13 have sent anybody in there but I wanted to make all preparations for  
14 that entry such that when the, conditions in the reactor building  
15 permitted that is, the radiation level, the O<sub>2</sub> and hydrogen samples  
16 that we typically take per one of the HP procedures and that the tem-  
17 perature and steam conditions that most probably existed in there  
18 through the, through the . . . rupture of the drain tank rupture disk.  
19 Once those condition were . . . enough to permit entry, we wanted to  
20 have all that information ready so we could send a team in to inspect  
21 the damage and determine how much water was on the floor and things of  
22 that nature. We of course never, I don't think the thought entered my  
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24  
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1 mind after that because we continued to evolve into you know, progres-  
2 sively more serious proceived situation and I don't think we really  
3 pursued sending a guy in.  
4

5 RESNER: This is Resner speaking. Mr. Creswell has now joined us,  
6 that's James Creswell, C-R-E-S-W-E-L-L. Mr. Creswell is a Reactor  
7 Inspector with Region III of the U. S. Nuclear Regulatory Commission.  
8

9 HUNTER: Ok George, continue again, . . . was Dick aware that the  
10 intention was just to prepare to to make an entry later? Not to make  
11 an, make an entry fairly quickly? Did you, didn't you discuss that  
12 that, yeah this was in preparation for an entry at at some time later?  
13

14 KUNDER: I'm I'm only presuming it was. I I don't think we may have, I  
15 may have indicated to him that . . . it was desirable to send somebody  
16 in as soon as we can. . .without really specifying a time, I guess in  
17 my own mind my intent was as soon as it's safe to send a guy in there  
18 we would attempt to do so. We have done this very same thing in the  
19 past, following a trip or unusual circumstance we we prepare to go into  
20 the reactor building to inspect for any leakage, with you know, in  
21 hopes of identifying anything that may be unsafe or that needs corrective  
22 action, prior to presuming normal operations and startup activities. I  
23 don't think this, that somebody, had somebody come and asked at that  
24 moment if they could go into the reactor building, I'm sure it would  
25



1 have been denied because of the fact we had pressure in the building  
2 and we weren't sure what the airborne contamination levels were and in  
3 my own mind I expected to see significant airborne levels which would  
4 prevent entry with without anything other than full PC's and Scott Air  
5 Pack and full protective clothing.  
6

7 HUNTER: Ok, George, along the same line did at some time later or did  
8 the events that occurred fairly quickly after that, did some time later  
9 Dick Dubiel get the sample and get the word back to you or was the  
10 sample never was never taken.  
11

12 KUNDER: I have heard since that time that sample was attempted to be  
13 drawn on HPR 227, the location which I'm now aware. And they were  
14 unable to draw a sample of anything other than water. We just had  
15 apparently enough condensation that occurred in the sample lines that  
16 you couldn't draw mean per sample. And I don't think I recall ever  
17 speaking to Dick or anyone else in following that event about going  
18 into the reactor building. I don't think we discussed it at all. The  
19 reason that I got Dick started on that evolution is typically it takes  
20 anywhere from one to two hours except for an emergency entrance. It  
21 takes that long to you know take care of all the administrative checks  
22 and sampling and RWPs prior to making the actual entry. So I felt we  
23 were you know some period of time away from actually having to send a  
24 person in.  
25

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1 HUNTER: Ok.

2  
3 KUNDER: It would be more of a team rather than a person.

4  
5 HUNTER: Right. Ok, George. Change the subject again. When you came  
6 in they had a trip. They had an emergency injection initiation for low  
7 pressure. They were sitting at certain at a pressure of 1200 pounds by  
8 the time you got there. The pressurizer level was up. Did you at any  
9 time look at the BWST level so that you're aware of the actual level of  
10 the BWST as point of determining your plant status when you came in?

11  
12 KUNDER: I recall that I went around to the back panel and I can't  
13 remember for sure. I might have.

14  
15 HUNTER: You didn't note that or write it down anywhere? Or tell  
16 anybody to write it down?

17  
18 KUNDER: No.

19  
20 HUNTER: That type information?

21  
22 KUNDER: I do recall in Unit 2 the BWST level was maintained normally  
23 somewhere around 55 to 56 feet. And the level indicator if I had  
24 looked at it I may not I don't think I could have distinguished between  
25

1 a few thousand gallons cause the tank holds about 450,000 gallons. So  
2 slight level change would not have meant too much to me because I would  
3 not have had the reading prior to the injections to make a difference  
4 in calculation. I think I might have looked at that level. I think I  
5 may have gone around there and just recall something like that but I  
6 just can't be sure. I did ask the operators from behind the panel how  
7 long they had injection going because it seemed to me it was a long  
8 time. I felt that they probably filled the system up with solid. That  
9 was my perception of the plant status after I had a chance to confirm  
10 what they were telling me about pressurizer level and pressure.  
11

12 HUNTER: George, let me, Hunter speaking, make sure that I understand  
13 that when you looked at the status that you felt like the operators had  
14 in fact, safety injection of, emergency injection on adequate amount of  
15 time to actually fill the system up and that they had that it was solid  
16 at that time?  
17

18 KUNDER: Yeah, based on my observations that was the only conclusion  
19 that I could reach but they maintained that they didn't have high  
20 pressure injection on for that long and I think I asked them for the  
21 amount of time that they thought it was on. They couldn't be sure.  
22  
23  
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1 HUNTER: George, the...Hunter speaking, the indication of the words  
2 that they gave to you, did they, did you discuss the initiation turning  
3 off the pumps, throttling the high pressure injection and going back to  
4 normal makeup and then establishing letdown, you indicated that when  
5 you got there the letdown was on and but did you discuss the sequence  
6 of events to get where they were when you came on into the Control  
7 Room?

8  
9 KUNDER: I don't believe I discussed the details of the high pressure  
10 injection evolution and subsequent throttling at all.

11  
12 HUNTER: And who were you leaving those details to when you came in  
13 were you leaving those to the shift supervisor or Ken Bryan or Bill  
14 Zewe who probably were there at that time when you came in?

15  
16 KUNDER: I'm not sure what you mean who I was leaving with.

17  
18 HUNTER: Were they actually the ones that were actually controlling the  
19 plant?

20  
21 KUNDER: Yes, the shift foreman when I first arrived was in charge of  
22 the panel operations if you will. Fred Scheimann was operating at the  
23 console sort of as an overseer for the operators. He, too, appeared to  
24 be trying to figure out what..

25  
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1 HUNTER: Did Fred and you have some discussions at that time? Did he  
2 ask for your help or advise?  
3

4 KUNDER: I can't recall any specific requests. I think I asked questions  
5 of he and the operators to try and understand what had transpired and  
6 what they were seeing. But I don't request...don't recall any specific  
7 requests for assistance of any type.  
8

9 HUNTER: Ok.  
10

11 KUNDER: I think probably presumed do whatever I could to assist them.  
12

13 HUNTER: Some general questions George, concerning...were you familiar  
14 with the Licensee Event Reports which occurred in 1978 for instance  
15 there was some report...License Event Reports that actually that speci-  
16 fically addresses the initiation of safe emergency injection on Unit  
17 trips as looking back on your routing system or training or retraining.  
18 Were you familiar with the any special reports or Licensee Event Reports  
19 that had been written up concerning unit trips, low pressurizer level,  
20 ES, emergency safeguard system actuation on Unit 2?  
21

22 KUNDER: Yes, I was familiar with the I believe two or three incidents  
23 where safety injection was involved. The one specifically I recall the  
24 events from a somewhat distant perspective which were involved with the  
25

1 I think it was April 23rd trip from 30 percent power or the secondary  
2 side safety valves lifted and continued to flow down the system pressure  
3 and cause a rather significant reduction in RCS temperature pressure.  
4 I wasn't in Unit 2 at the time but I was aware of the scenario and the  
5 fact that pressurizer level had gone low and safety injection was  
6 initiated to restore the pressurizer level and you know the coolant  
7 inventory. There was another trip that had occurred and I believe it  
8 was due to loss of feed. But I can't recall offhand precisely how.  
9 That occurred early November and I think there was another incident  
10 that had occurred in December and I'm pretty certain both of those  
11 involved safety injection due to transient performance which reduced  
12 pressure sufficiently to bring off safety injection. And both those  
13 instances the pressurizer level did go by the low but was restored to  
14 normal level conditions and safety injection was secured.

15  
16 CRESWELL: George, I've seen some information associated with a trip,  
17 reactor trip that occurred on November 3, 1978. Reactor power was  
18 around 90% when the loss of feedwater condition occurred. Could you  
19 elaborate on the recollections of what was involved in that trip. Are  
20 you saying during that trip there was a substantial cooldown in reactor  
21 coolant system?

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1 KUNDER: I don't recall the transient performance in sufficient detail.  
2 I'd have to review the trip report to be able to comment with some  
3 degree of intelligence at this point.  
4

5 CRESWELL: You don't remember that anything significant came out on the  
6 review of the event?  
7

8 KUNDER: I don't recall the specific recommendations offhand.  
9

10 CRESWELL: In other words it would have been anything of real signifi-  
11 cance or you could have recollected what had happened?  
12

13 KUNDER: Let me think. I believe in that situation we did have a very  
14 low pressurizer level. I believe it I'm not mistaken we uncovered the  
15 heaters and there was some question as to whether or not we did go  
16 below zero and get above \_\_\_\_\_ coolant system from the pressurizer.  
17

18 CRESWELL: I see.  
19

20 KUNDER: I think that was the same event that caused high concentra-  
21 tions of sodium in the system due to the fact that the DHV AA and B  
22 valves opened as a result of the safety injection that lead to a rather  
23 lengthy shutdown after that transient occurred.  
24  
25

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1 CRESWELL: What was the nature of the lengthy shutdown what necessitated  
2 the lengthy shutdown?  
3

4 KUNDER: I believe it was probably a ten or two week shutdown and that  
5 was due principally to the need to clean up the reactor coolant system.  
6

7 CRESWELL: That's to remove the sodium...  
8

9 KUNDER: Remove the sodium....demineralizers. And offhand I can't  
10 think of any other significant findings as a result of that. I do  
11 recall that the logic for the opening of the DHV AA and B valves was  
12 modified such that you had to have the safety injection plus a low  
13 moderately low level in the BWST concurrent with the safety injection  
14 in order for those valves to open.  
15

16 CRESWELL: George, a general question in the same area. What type of  
17 system of formal management mechanism if there's a full mechanism would  
18 did in fact make you familiar with these particular events realizing  
19 your own Unit 1 possibly you ended up on Unit 2. Was there some formal  
20 routing or training that was used to familiarize you with previous  
21 events on Unit 2 or Unit 1 either one?  
22  
23  
24  
25

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1 KUNDER: Yeah, I think the formality of informing myself and Unit 1  
2 personnel would have come No. 1 through the training program the requali-  
3 fication program where in a portion of that program deals with operating  
4 experience in other units and plants.  
5

6 CRESWELL: Are you saying George that that is the way you did get the  
7 information?  
8

9 KUNDER: No, I don't think that I got the information through that  
10 mechanism. I don't think that the timing was such that all the operators  
11 were briefed immediately. I became aware I believe through either a  
12 copy of the trip report that I received or one that I reviewed when I  
13 took over in Unit 2 shortly thereafter. My transition to Unit 2 began  
14 when I became aware that I was going to Unit 2 I of course took an  
15 interest in starting to figure out what was going on over there and I  
16 think it was about the tail end of that outage. And I was formally  
17 involved with Unit 2 activities beginning of December.  
18

19 RESNER: At this time we'll break the tape. It is now 11:24 p.m.  
20

21 RESNER: This is a continuation of the interview of Mr. George A. Kunder.  
22 The time now is 11:25 a.m.  
23  
24  
25

896 128

1 CRESWELL: This is Jim Creswell speaking again. George, going back to  
2 the November 3rd, reactor trip the one we're talking about loss of  
3 feedwater. Do you recollect whether any changes were made to the  
4 emergency feedwater system regarding level setpoints or anything in the  
5 control system that would affect the flow of auxiliary feedwater to the  
6 reactor coolant system I'm sorry to the steam generator?  
7

8 KUNDER: No, I'm not aware of any changes.  
9

10 CRESWELL: I understand that there's presently a thirty inch level  
11 setpoint for the emergency feedwater system. As far as you know that's  
12 always been 30 inches?  
13

14 KUNDER: The nominal figure is 30 inches, that's the same number that's  
15 exists in Unit 1's setpoint upon loss of the normal feed pumps and  
16 that's the number that's utilized out to B&W simulator. Yes.  
17

18 HUNTER: George, I want to clarify something. When you came in basically  
19 did obtaining status of the plant discussing with the operators during  
20 the period of time apparently from five o'clock or so until six o'clock  
21 up until seven o'clock was Bill Zewe and the shift foreman Fred Scheimann,  
22 and I believe Ken Bryan was there and then later on Mike Ross came in  
23  
24  
25

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1 also but were those fellows the did you leave the operation of the  
2 plant to those fellows or did you get specifically involved in any  
3 operations at that time?  
4

5 KUNDER: The operation responsibility for operation and direction of the  
6 plant was in the hands of Bill Zewe and Fred Scheimann, the shift  
7 foreman. And that's purely because I'm not licensed in the Unit and I  
8 don't I wouldn't be able to direct specific operations very easily with  
9 that kind of knowledge. In a broad sense I would imagine...I can't  
10 recall specific instances of this but I think in a broad sense I may  
11 have made recommendations or participated in understanding what moves  
12 they were going to make and passive concurrence. I agreed with what  
13 they were doing.  
14

15 CRESWELL: Jim Creswell, again. Regarding to your recommendations and  
16 so forth some of the other interviews would indicate that at one time  
17 you studied a draft of Net Hodge's suction heads the requirements for  
18 the reactor coolant pumps versus the pressure in reactor coolant system.  
19 Do you recollect that?  
20

21 KUNDER: Yes.  
22

23 CRESWELL: Ok. What did you find when you're going through this process  
24 review?  
25

1 KUNDER: I again want to confirm that the reasons that it was desirable  
2 to shut the pumps off were valid and I recall observing the pressure  
3 and recall pretty sure I looked at the temperature and I can't remember  
4 if I looked at the cold leg temperature or hot leg temperature. I  
5 might have even looked at TI. I just can't see it in my mind anymore  
6 but I took the two temperature in pressure relationship and went to the  
7 curve that was attached to the procedure laying on the operator desk  
8 and I picked the point out and verified that that point was it was at  
9 or just slightly below the upper MPSH curve for four pump operation.  
10 And that...just looking at that that data in my own mind I verified for  
11 myself that yeah it was ok to stop the pump.

12  
13 CRESWELL: It was Ok to stop it...

14  
15 KUNDER: to take two pumps off because we were getting in a region that  
16 was not permitted by the B&W amendments and precautions from which  
17 those curves are derived.

18  
19 CRESWELL: If I recollect properly that graph also has minimum pressure  
20 limits plotted on it.

21  
22 KUNDER: It does.

23 896 131  
24  
25

1 CRESWELL: What did they look like I mean what did the pressure temperature  
2 relationship look like compared to the minimum pressure limit?  
3

4 KUNDER: I can't remember focusing to be honest with you so I can't say  
5 but recalling the curve \_\_\_\_\_ along side of that as well. I at that  
6 moment I don't think in my own mind I was focusing on anything other  
7 than rationale for tripping two pumps.  
8

9 CRESWELL: Ok, you mentioned it was procedure laying on the operator's  
10 desk there? What was the title of that procedure, do you recall?  
11

12 KUNDER: No, the procedure was opened to the page which showed the  
13 graph knowing the ways the graph are drawn up and inserted in various  
14 of our operating procedures. Their all the same. And I didn't really  
15 look to see if it was in the shutdown procedure or I would presume it  
16 was in the not the shutdown but rather the cooldown procedure I presume  
17 it was that but that's only presumption.  
18

19 CRESWELL: That it may have been...  
20

21 KUNDER: It may have been another one which gave us the same curve.  
22 The same curve does appear I would estimate six or seven other procedure.  
23 If it's laid out the way it is in Unit 1. I have not gone through and  
24 read all the Unit 2 procedures to confirm that.  
25

1 CRESWELL: Do you recall making any notes on that graph?  
2

3 KUNDER: I don't recall doing so, no.  
4

5 CRESWELL: George along the same line in Unit 2 that minimum pressure  
6 temperature curve series of curves saturation in temperature pressure  
7 curves fall into a number procedures. One procedures that it falls in  
8 concerns is specifically concerns natural convection or going to natural  
9 convection and there are some words in that particular procedure that  
10 discuss going to natural convection. You were present in the control  
11 room when they shut off the second two pumps the last two pumps that  
12 were operating. Did you see the procedure for natural convection did  
13 you in fact have that available or did you see someone using that  
14 procedure?  
15

16 KUNDER: I don't ever recall....  
17

18 CRESWELL: I'm under the assumption that if you shutoff the last two  
19 pumps that the next step is natural convection and did you discuss that  
20 issue with Fred Scheimann or Bill Zewe concerning natural convection or  
21 was the concentration on shutting the pumps to prevent damage to the  
22 pumps and the discussion that you had during that time frame what were  
23 you keying on?  
24  
25

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1 KUNDER: I think we were keying on protecting the pumps and not violating  
2 the MPSH curve and in my own mind I fully expected natural circulation  
3 to occur. At that juncture still was not aware that the reason for the  
4 reduction in flow on the loop with the pumps running. I didn't tie that  
5 reason to the fact that we had steam in the loops but rather it was  
6 presumed that we were losing suction because we didn't have the condi-  
7 tions getting cavitation of the pump suction and that was the reason  
8 for the reduced flow.  
9

10 HUNTER: George, Hunter speaking again, after shutting off the two  
11 pumps then the B loop did you recall or did you recall discussing the  
12 parameters in the B loop at that time, temperature cold, hot, with the  
13 shift supervisor?  
14

15 KUNDER: No, I don't recall discussing that and I don't think I focused  
16 on those parameters at all if I had looked at them I don't think I  
17 really was trying to you know access what...  
18

19 HUNTER: Another general question...are you familiar with the require-  
20 ments of the procedures which states utilization of natural convection  
21 of these steam generators or decay heat removal. Are you familiar with  
22 that procedure?  
23  
24  
25

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1 KUNDER: Yeah.

2  
3 HUNTER: Are you familiar with the requirements of the procedure as far  
4 as prerequisites for natural convections? And I'm not looking for  
5 details I'm just...

6  
7 KUNDER: I'm generally familiar with it, yes.

8  
9 HUNTER: Are there any highlights of that procedure that stand out in  
10 your mind today as far as what would be required to insure natural  
11 convection?

12  
13 KUNDER: Yeah, I guess the one thing that sticks out in my mind is you  
14 ...limitation in there on the temperature differential between the  
15 pressurizer in the loop to assure that you do indeed keep the hot leg  
16 candy cane top of the generators sub-cool so that you don't form a  
17 steam bubble in there. And you basically guarantee the you know solid  
18 water in the loops by keeping enough pressure in the system or if the  
19 pressure is decreasing in the system for instance if you were to lose  
20 pressurizer heaters or something like that you would have to cool the  
21 generators and keep a good lead on that cooling so that you don't get  
22 into the condition where you'd form a boiling the loop. That is some-  
23 thing that would I think have taken time presuming we were going into  
24 natural circulation and my thought process was that thing. I auto-



1 matically assumed that natural circulation would be inherent and automatic  
2 at that point. Because I didn't recognize that we had steam and loops  
3 already and the implementation of that procedure would be to go to the  
4 computer go to the console, check temperatures and start making methodical  
5 checks that you would have to make but it would be sort of a followup  
6 kind of action not an immediate very concentrated concern on the panel.  
7 I did not at least I didn't approach it that way.  
8

9 HUNTER: Hunter speaking again. Would our presumption be that after  
10 the last two pumps were secured that that the fellows or you did in  
11 fact start looking for natural circulation?  
12

13 KUNDER: I didn't begin looking to confirm the parameters that would be  
14 necessary to assure natural circulation. I think at that moment I  
15 assumed that natural circulation was inherent and would be automatic  
16 and that checking to assure we had natural circulation would follow  
17 events occurred in the revelation that we had the high activity the  
18 intermediate range indication and things like that were I guess taking  
19 up my attention span to the point that I didn't really concentrate on  
20 whether or not we indeed had natural circulation by a methodical check  
21 on the primaries.  
22

23 896 136  
24  
25

1 HUNTER: I've got one more general question I guess we're going to run  
2 out of time as far as you wanted to \_\_\_\_\_ pretty quick. During this  
3 time frame now we're down where the pumps are off. We're sitting  
4 natural convection should be going. It isn't because we found out that  
5 the hot legs flashed the steam right away and locked everything up.  
6 One question that would like to discuss and that would be decay heat.  
7 Did during the time between when the last two pumps operated was six  
8 twenty or whatever. During the time that you came in and until the six  
9 twenty with Bill Zewe on the conference call or with Fred Scheimann or  
10 the Control Room operators, did you fellows discuss decay heat? The  
11 "requirements to maintain the reactor coolant" and were you actually  
12 removing heat from the reactor.

13  
14 KUNDER: I don't think I recall discussing that at all or even considering  
15 it, you know, with any great amount of deliberation.

16  
17 HUNTER: If you didn't consider it would we assume that you consider  
18 decay heat was being removed?

19  
20 KUNDER: Yes.

21  
22 HUNTER: Would you explain what you would assume to be the normal  
23 method at that time what your assumption would be as far as removal of  
24 decay heat at that time?

1 KUNDER: Well the mode of decay removal is through the steam generators  
2 to the secondary side steaming into the condenser initially.  
3

4 HUNTER: With the reactor coolant pumps on the A pumps also then earlier  
5 the B pumps.  
6

7 KUNDER: All four pumps initially when I came in were running and  
8 circulating coolant and removing the decay heat through that fashion.  
9 And without again doing a without being able to focus in all indica-  
10 tions and really calmly analyze methodically analyze let's put it that  
11 way what the indications were telling me. I just assumed that things  
12 were working as they would on any particular shutdown except for the  
13 fact that the level was high and pressure was low.  
14

15 HUNTER: Are we almost through with the tape?  
16

17 RESNER: Mr. Creswell will be leaving the interview.  
18

19 MARTIN: This is Tim Martin speaking. George, when you arrived we had  
20 all four reactor coolant pumps operating. And we had both steam gener-  
21 ators on the line. Shortly after securing the reactor coolant pumps in  
22 the B loop we isolated the B steam generator, do you remember the basis  
23 for that decision?  
24  
25

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1 KUNDER: I recall that Bill Zewe or someone got word that we...had an  
2 alarm...I'm not sure the...how...they were aware that they were seeing  
3 radioactivity out of one of the generators or out of the B generator.  
4 I don't recall if they saw the vacuum pump exhaust monitor going up and  
5 then through sampling or through local monitoring of the steam lines  
6 concluded that the B generator was the one that had the apparent tube  
7 leak or not. The conclusion was made that the B generator had a tube  
8 leak and the crews isolated that generator. It's very difficult for me  
9 at this point without looking at the course of the curves and so forth  
10 to remember exactly when in sequence that was done. But that's my  
11 recollection.

12  
13 MARTIN: Martin again. George, then you're saying that at least at one  
14 time the B steam generator was isolated based upon some radiation level  
15 or contamination limits that the shift became aware of.

16  
17 KUNDER: That's correct.

18  
19 MARTIN: After we had secured reactor coolant pumps in both loops and  
20 it's approximately six, six fifteen, you were involved in a conference  
21 call with among other people Mr. Miller. During that time there was a  
22 discussion of the status of the EMOB, electromatic relief valve, block  
23 valve, do you remember that?

24 896 139  
25

1 KUNDER: Yeah, I seem to recollect that on the last interview. And I  
2 seem to recall that Lee Rogers asked me if the EM valve was open. I  
3 think in my last interview by the way when I was listening to the tapes  
4 I think I may have said that the... may have referred to the block  
5 valve. I can't really remember which but I think he probably said  
6 asked me excuse me what the position of the EM valve was if it was  
7 closed. And coming out of the shift supervisor's office and asked the  
8 operators at the console. I didn't go up to the console and look for  
9 myself. I asked them if it was closed and they indicated that it was  
10 and I came back in and told Lee Rogers that it was closed. And I  
11 believe we were referring to the EN valve rather than the block valve.  
12

13 MARTIN: So when you asked the operators you may have asked them what  
14 the status of the EMOB was versus the block valve. Do you have knowledge  
15 of when the block valve itself was shut?  
16

17 KUNDER: I don't. Other than through my subsequent review of the  
18 information, you know, after the event was pretty much terminated.  
19

20 MARTIN: George, isolating in on the EMOB much later in the event  
21 around noon we had been at 2000, 2100 pounds pressure and had made a  
22 decision to try to have the core flood tanks inject. Do you remember  
23 the mechanism utilized in dropping pressure to the point where the core  
24 flood tanks would come on the line?  
25

1 KUNDER: Yeah. we...the block valve was opened. And the EM valve was  
2 apparently deliberately failed open in order to vent off the steam or  
3 water that was in the pressurizer and attempt to blow down the RCS to  
4 reduce pressure. Up until that time they had been cycling the block  
5 valve with apparently the EM valve open. So that is the mechanism they  
6 used.

7  
8 MARTIN: George, at any time during the extended event was the pressu-  
9 rizer vent valve utilized?

10  
11 KUNDER: I'm not aware of it ever being utilized during that period of  
12 time.

13  
14 HUNTER: George, you mentioned that the block valve was cycled with the  
15 EMOB opened. Do you recall whether the EMOB at that time they had  
16 actually taken the position to switch and actually open the EMOB and  
17 maintained it open or was it in the same condition that it was before  
18 the block valve was closed earlier?

19  
20 KUNDER: I did not know ho they were doing it. I assumed that they it  
21 opened through a switch in the console.

22  
23 HUNTER: Okay.

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24  
25

1 MARTIN: Once Miller arrived and Rogers arrived which is approximately  
2 seven, seven fifteen in that time frame. We have reports that there  
3 was another attempt to start reactor coolant pumps. To your knowledge  
4 did that occur?  
5

6 KUNDER: I can't be sure. I recall one attempt to start the reactor  
7 coolant pump and that was successful. We started a pump and I think it  
8 occurred before the time that Gary came in if the pump was attempted to  
9 be started later on I wasn't directly aware of it.  
10

11 MARTIN: George, referring to the earlier start of the reactor coolant  
12 pump before Mr. Miller arrived computer printouts would indicate that  
13 one was started that it was run for approximately nineteen minutes.  
14 During this period of time there's also some discussion or indication  
15 that the B steam generator was unisolated and allowed to steam. Are  
16 you aware of this occurring?  
17

18 KUNDER: No, I know the B steam generator was again through hearing the  
19 operator's conversations was isolated in two occasions. Earlier  
20 apparently just after the trip occurred because it was thought that the  
21 and I even think it was about the time that I came in. It was secured  
22 because it was believed that perhaps we had a steam leak in the B  
23 generator that was contributing to the building pressure. And that  
24 conclusion was arrived at because of the fact that the B steam generator  
25

1 pressure was lower by some 100 or 200 pounds pressure than the A generator.  
2 And I think I recall Bill Zewe being involved in that and I didn't pay  
3 real close attention to the efforts in the secondary side. That was my  
4 perception of the first time it was isolated. And a little bit later  
5 subsequent to that event the believe it was concluded that since the  
6 pressure didn't decrease in the building that and that the generator  
7 level and pressure was fairly well maintained in the B generator that  
8 maybe we didn't have the leak and the decision was made by Bill or I'm  
9 not sure exactly who, it wasn't myself I know that. The decision was  
10 made to try and place it back into service because maybe they were  
11 wrong and that was done. And then it was subsequently isolated the  
12 second time due to the apparent indications of tube leakage in the B  
13 generator. The timing of that is very fuzzy in my mind so I'm not sure  
14 I can answer your question very clearly.

15  
16 RESNER: You referred to Bill. Bill who?

17  
18 KUNDER: Bill Zewe.

19  
20 RESNER: Thank you.

21 896 143  
22  
23  
24  
25



1        MARTIN: George, early in the event when you arrived I believe we were  
2        steaming through the turbine bypasses to the condenser. Were you  
3        involved in decisions to shift to atmospheric dumps and back to the  
4        turbine bypass and if so can you provide us any indication of the basis  
5        for those shifts and tactics or where this team was to be put?  
6

7        KUNDER: I was not directly involved in the decision to do that. I was  
8        aware that the operators and Bill Zewe were very concerned about the  
9        high level in the hotwell. And the impact of that high level might be  
10       that we could induce water hammer or some other type of damage through  
11       continuing to bypass steam into condenser. As it turns out from the  
12       Unit 2 design the bypass lines go into the condenser and exhaust steam  
13       beneath the two bundle and just above the normal water level in the  
14       hotwell. And with the hotwell level very high that line would have  
15       been either close to or actually fully submerged. The decision was  
16       made pretty much by the crew. I'm just guessing that Bill made the  
17       decision to go out the atmospheric dump valves and as I recall the  
18       manner in which they did that was to trip some of the circulating water  
19       pumps rather than break vacuum. I think later on in the morning. I  
20       can't recall exactly when vacuum was lost because of the loss of the  
21       adequate amount of steam needed to seal the turbine shaft and the Unit  
22       1 aux boilers were attempted to be started by the operators in Unit 1  
23       but they had problems with the boilers and they couldn't get them up to  
24  
25

1 pressure and as a result we lost vacuum in the condenser as well. So  
2 for a period of time we were removing heat through the atmospheric dump  
3 valves except for the one that was isolated from the B generator.  
4

5 MARTIN: Alright, George, subsequent to this we returned to the turbine  
6 bypasses, do you remember the basis for that decision?  
7

8 KUNDER: Yeah, I recollect that that move was made I believe closer to  
9 noon. And that was done after we were able to re-establish sealing  
10 steam to the turbine and establish vacuum in the condenser. And as I  
11 recall I'm pretty sure this was the time it was late in the morning.  
12 At that point in time the knowledge of the accident was at the state  
13 level, the upper levels and someone offsite and onsite was able to  
14 observe the steam being exhausted to the atmospheric dump valve. I was  
15 never outside the Control Room to see that but Gary Miller had gotten  
16 orders over the phone to close those valves because it was believed  
17 that they were a source of the radiation leakage released to the envir-  
18 onment. And through I believe readings with dose rate meters and  
19 perhaps other indications that I just wasn't specifically aware of it  
20 was concluded pretty firmly that there was very little if zero contami-  
21 nation in that steam coming from the A generator and I guess Gary was  
22 ordered to close those valves, just close them period. I believe he  
23  
24  
25

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1 delayed long enough that we were able to finally get established and  
2 then re-establish heat removal to the condenser. That was my recollec-  
3 tion of that event.  
4

5 MARTIN: Early in the event sequence we were feeding the steam generators  
6 using the emergency feed pumps. This was after we had found and corrected  
7 the problem with the twelve valves. At some point in the event we  
8 shifted our feed from the emergency feed system to the condensate pumps  
9 can you clarify or give us a feeling for where that might have occurred  
10 either time wise or connected to some event?  
11

12 KUNDER: No. I'm sorry. I didn't remember making that switchoff. I  
13 wasn't following the exhaust operations that closely apparently at the  
14 time.  
15

16 MARTIN: George, Tim Martin again. Between the time approximately  
17 seven o'clock shortly after the site emergency had been announced to  
18 ten o'clock when we had returned to 2000, 2100 pounds cycling the EMOB  
19 block valve to maintain pressure we don't have a heck of a lot of  
20 information of what went on and try to figure out what events might  
21 have occurred during that period of time that allowed pressure to  
22 essentially...it looks drift aimlessly. Obviously it had some direction.  
23 Someone was making decisions and I'm trying to find out what went on  
24 during that period of time.  
25

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1 KUNDER: I don't understand that, it seemed like that was only about  
2 five minute time span there. Do you wish me to try and go through...  
3 my activities.  
4

5 MARTIN: As best you can during that period the beginning of the site  
6 emergency until we have repressurized and are operating on the EMOB  
7 block valve. If you can remember anything that might have occurred  
8 during that period it would help.  
9

10 KUNDER: Ok, my main responsibility at the time we declared site emergency  
11 was to try and assist Joe Logan and afterwards Gary Miller and starting  
12 the communications offsite I had previously asked for a number of  
13 people to be called in which I believe we discussed in my previous  
14 interview. And I assigned two of my engineers to make the phone calls  
15 that were required by the emergency plan.  
16

17 MARTIN: George, Tim Martin again. I would like to focus in on the  
18 operational aspect if you have any knowledge of it.  
19

20 KUNDER: I see what you say. I guess I bounce back and forth so I  
21 can't give it very consistent accounting of the operations that occurred  
22 over approximately two or three hour period. Although I do know once  
23 the emergency plan activities notifications were fairly well in gear  
24 which probably involved my time for about an hour or so, I'd say around  
25

1 8 o'clock we consulted as a group with Gary Miller in the shift supervisor's  
2 office and variously out in the Control Room and I think the key members  
3 of that group were Mike Ross, Miller and Lee Rogers and I think Jim  
4 Seelinger had arrived in the Unit 2 Control Room and Bill Zewe. And we  
5 discussed our tried to discuss our strategy for the time period to  
6 follow. I believe we were all concerned that indications in the core  
7 were...indications in the reactor coolant system showed that we had  
8 very high temperatures on the hotlegs. As a matter of fact the hotleg  
9 temperature indications was pegged at 620 degrees. At that moment I  
10 was not aware that we had wide range temperature indication and Ivan  
11 Porter, who's my lead IC engineer was in the process of trying to  
12 review some of those indications and I was also unaware that Unit 2 had  
13 the incore temperature indications or if I was aware of it it was not  
14 very...I wasn't very clearly aware of it. And he was trying to get  
15 that kind of information. And he was pretty much feeding that information  
16 to Gary for the most part. So it's apparent that we had high temperatures  
17 and I was concerned as well as the rest of the group that the high  
18 pressure injection may not be doing an adequate job getting enough  
19 water to the core to keep it cool and we I think we became of the frame  
20 of mind that we did have a vapor binding effect in the core. We had  
21 recognized that after all the scenario transpired at that point we were  
22 indeed without a lot of water in the core in the reactor coolant system  
23 and we had to charge a lot of water into the thing and try and keep it  
24 cool and at that point we were not certain that we had a clear blow  
25

1 path through the core. I indicated before that I personally was very  
2 concerned about the potential for continued feeding the water into the  
3 core and subsequent steaming of that water leaving behind boron, high  
4 boron concentration to get to the point of crystallization. And I was  
5 very deeply concerned that you know we really didn't have things under  
6 control as yet and we still had a lot of work to do plan our strategy  
7 and Gary Miller pretty much led the way on getting the group together  
8 and discussing alternatives. I can't recall the specific discussions.  
9 I just recall my.....

10  
11 RESNER: This is a continuation of the interview of Mr. George A.  
12 Kunder. The tape cut us short and we--George was in the middle of  
13 answering a question. If you would please continue. After he finishes  
14 answering that particular question, due to his time scheduled we will  
15 continue this part of the interview at a later date, George?

16  
17 KUNDER: O.K., thank you. I believe I was discussing the process of  
18 determining our strategy with respect to the operation of the reactor  
19 and recovery.

20  
21 MARTIN: That's correct.  
22  
23  
24  
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1 KUNDER: O.K. I believe, as I indicated on the previous date, somewhere  
2 around 45 minutes to an hour after declaring the site emergency and  
3 getting the emergency plan fairly well underway we--we being Gary  
4 Miller, Jim Seelinger and Mike Ross, Lee Rogers, and myself--met generally  
5 as a small group to discuss strategy and our perceptions about where we  
6 were and where we thought we should be going. Because it was pretty  
7 clear based on the hot leg temperatures existant in the core at that  
8 time that we were into a very serious problem, that we did not yet have  
9 the cooling of the reactor well under control. I think the general  
10 perception at the time was that we intuitively thought that we had the  
11 core covered. I think by that time we felt that we were getting water  
12 into the core, but there was no indication that hit you in the head and  
13 said "Yeah, you are covered." So, that concern was under consideration.  
14 I also, I know, was personally concerned about the potential for concen-  
15 trating boric acid in the core through the process of just cooling the  
16 core by steaming. And we were somewhat in a boiling pot mode, or so we  
17 thought, at that point. I recall specifically expressing that concern  
18 to the group. We were also concerned and discussed the fact that we  
19 had been using high pressure injection to get water into the reactor  
20 for, perhaps, an hour or an hour and a half, at that point. I don't  
21 recall seeing any real clear or substantial changes in RCS parameters,  
22 such as pressure and temperatures. Temperatures were still high and the  
23 pressure was still low. We were fairly well convinced in our own minds  
24 that we had a bubble of steam in the top of the reactor and in the hot  
25

1 legs. We were trying to consider ways in which we could vent off steam  
2 to effect a better cooling, or ways that we could assure ourselves that  
3 high pressure injection water was indeed flowing preferentially into  
4 the reactor versus some other sneak path. At that point, we were  
5 somewhat concerned that maybe there was some sort of a sneak path  
6 existing, which could bypass some of the flow around the reactor, such  
7 as perhaps leakage around the plenum assembly and out into a hot leg  
8 and right out the pressurizer vent or the pressurizer EM valve--let me  
9 think--no, I guess that was closed. But at any rate, we were concerned  
10 that we weren't getting--we may not be getting enough cooling to the  
11 core. So, all those concerns, put together, were the subject of our  
12 discussions. And we were also afraid that since these parameters weren't  
13 changing very readily that we may end up being in this mode for a  
14 considerable period of time and then run out of water from the BWST,  
15 and then the next choice would be to go on reactor building recirculation  
16 type of cooling. I think we all felt that that was very undesirable,  
17 from the standpoint of drawing whatever contaminants that you can  
18 potentially pick up in the reactor building in through the decay mode  
19 system and then through the makeup purification system and into the  
20 reactor again. Long term, we were hoping to avoid that, but that was  
21 not a real major consideration, I don't think. We were concerned about  
22 running out of water in the BWST ultimately, and having to go to another  
23 mode of cooling. We finally, I think mutually, came to agreement that  
24 we should try and raise pressure in the system. My memory really fails  
25



1 me now, I can't remember now if the electromatic valve was...I think at  
2 some point we opened the valve. I can't remember if we opened it prior  
3 to pressurizing up to the 2,000 pound point where we cycled pressure,  
4 or not. It's just not clear in my mind, I guess I can review the curve  
5 but as I sit here now it's just not clear in my mind anymore. But we  
6 did decide to raise pressure. We must have had the valve open because I  
7 think I recall we closed it. I believe we probably had it open because  
8 we were figuring, ... yeah, it's starting to come back a little bit. I  
9 think we had the valve open because of the concern for getting flow  
10 through the core, not just putting water into it and having the water  
11 flash to steam and leave all the boron behind. We were trying to come  
12 up with a way of getting water through the core, guaranteeing we're  
13 getting flow through the core and sweeping it in that fashion. I  
14 believe that's the rationale that was used to keep that valve open.  
15 Later in the morning, we mutually agreed that it might best to pressurize  
16 up and then continue that venting, because you would tend to, of course,  
17 achieve the higher saturation temperature effect, that would hopefully  
18 minimize boiling and any of those effects in the core. So, at that  
19 juncture we closed the valve, left it closed, allowed pressure to come  
20 up in the system, and then continued to vent out the pressurizer, which  
21 was the only place we could see that it was possible to get a flow  
22 through the system. And that's what we did. I guess that takes us up  
23 to the point that you are interested in.

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1 HUNTER: One question, during this time did you guys, fellows discuss  
2 restarting the reactor cooling pump? Do you recall any discussions,  
3 realizing that it was started, that it was off and you're sitting... At  
4 this point you were getting ready to go down to core flood, or depressurize.  
5 In this time frame while the pressure was up, do you recall any discussion  
6 as far as restarting the reactor coolant pump? Consideration of restarting..  
7

8 KUNDER: I vaguely recall, various times throughout the day, we may  
9 have discussed that, I just can't recall specific discussion any more  
10 in my mind, to start the pump. I seem to recall, in discussing this  
11 thing after the fact, many days after the fact, that there was a reluc-  
12 tance on the part of either B&W or others to try and run the pump for  
13 fear of failing seals, and that sort of thing, but that's all very  
14 vague and it's purely speculative at this point.  
15

16 HUNTER: Thank you George. I have no further questions, we'll continue  
17 this again at a later time.  
18

19 RESNER: The time now is 12:15 p.m. and we picked up this portion of  
20 the tape at 12:04 p.m.  
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