

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

1 In the Matter of:

2 IE TMI INVESTIGATION INTERVIEW

3 of Mr. George A. Kunder
4 Unit 2 Superintendent
5 Technical Support
6
7
8

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

13 April 25, 1979
14 (Date of Interview)

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16 (Date Transcript Typed)

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18 (Tape Number(s))

19
20
21 NRC PERSONNEL:

22 Dorwin R. Hunter
23 Donald C. Kirkpatrick
24 Owen C. Shackleton
25

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1 SHACKLETON: This is an interview of Mr. George A. Kunder. Mr. Kunder is
2 presently the Unit 2 Superintendent, Technical Support, Three Mile Island
3 with the Metropolitan Edison Company, the time is 5:10 p.m., April 25,
4 1979. Present to conduct this interview is Mr. Dorwin R. Hunter, Mr.
5 Hunter is an Inspection Specialist, Performance Appraisal Branch, I&E
6 Reactor Construction Inspection with the U.S. Nuclear Regulatory Commission.
7 Also present is Mr. Donald C. Kirkpatrick. Mr. Kirkpatrick is a Nuclear
8 Engineer with the Inspection and Enforcement Headquarters in Bethesda, MD.
9 My name is Owen C Shackleton, I am the Investigator in Region V with the
10 U.S. Nuclear Regulatory Commission. This interview is being conducted in
11 Trailer #203 at the Three Mile Island site just outside the south gate.
12 Just prior to the beginning of this interview on tape, I presented to
13 Mr. Kunder a two page Advisement Document outlining the purpose and scope
14 of this investigation in the authority of the U.S. Nuclear Regulatory
15 Commission to conduct such an investigation and his rights to refuse to be
16 interviewed or to provide any type of statement. On page 2 of this document,
17 Mr. Kunder in writing answered in the affirmative to the following questions.
18 Mr. Kunder do you understand the document that I just described?

19
20 KUNDER: Yes, I do.

21
22 SHACKLETON: And do we have your permission to tape this interview?

23
24 KUNDER: That's affirmative.
25

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1 SHACKLETON: As I understand you'll like a copy of this tape and the trans-
2 cript?

3
4 KUNDER: I would appreciate that.

5
6 SHACKLETON: Very fine, they will be provided to you. Mr. Kunder to assist
7 those persons who will be listening to this tape and learning what trans-
8 pired at Three Mile Island during those first days of the incident, would
9 you please provide your background and training concerning you work in the
10 nuclear industry.

11
12 KUNDER: I graduated from Penn State University with a B.S. in Mechanical
13 Engineering in 1968. I joined Metropolitan Edison Company as a Station
14 Engineer at Tyts Generating Station, which is a small fossil plant in
15 Reading that provided me my initial training in the utility industry, I was
16 assigned there for one year. Assigned to Iller Generating Station in
17 Reading for approximately six months and then I was assigned to the TMI
18 Project Management Group, which was at that time, responsible for the
19 overall control of the actual management of the TMI construction project.
20 I was with that group for approximately two years until around April 1972,
21 where then, I performed reviews of requirement outlines and specifications
22 for Materials Procurement, did some System Design Reviews in the area of my
23 cognizance, I participated in setting up some of the meterological stations
24 that we currently use on and offsite and performed at various junior tech-
25 nical activities in the Reading office. I was assigned then, around April

1 1972, to come out to Three Mile Island and was assigned to the Engineering
2 group responsible for writing procedures for both operations, for surveillance
3 and emergency procedures. I was assigned cognizance on certain of the
4 Unit 1 systems and was later assigned, just under a year, to work for the
5 Unit 1 Supervisor of Operations as his Engineering Assistant, if you will.
6 From that time til approximately September 1975 I functioned in that capacity
7 and during the process of the startup and testing of Unit 1, I trained for
8 my Reactor Operating License, spent time down at the B&W Simulator in
9 Lynchburg, trained up at the Penn State Triggar Reactor and of course,
10 trained on Unit 1 through my activities in the startup and test program, so
11 I got both practical experience and nuclear technical experience in that
12 fashion. I did receive a Reactors Operator License along with one of the
13 first groups of Operators to be licensed on Unit 1. Then I went into a
14 training program to receive a Senior Reactor Operators License, I can't
15 recall the exact date, but it was approximately prior to my term which
16 ended around 1975 in September. At that time, I was promoted to the Super-
17 visor of Operations in Unit 1 and was responsible for supervising the
18 Operations Department consisting of the Control Room operators and auxiliary
19 operators in Unit 1. I was responsible in this position through the period
20 of the latter part of the first cycle of operations, Unit 1, through the
21 first refueling outage and just prior to the second refueling outage that
22 was in about December 1977 when I was promoted to Unit 1 Superintendent,
23 Technical Support. I functioned in that position until December of 1978
24 when the Unit 1 Superintendent resigned and had transferred to another B&W
25 plant and the Unit 2 Superintendent, Technical Support, Jim Seelinger, was

1 promoted to the Unit 1 Superintendent, and I was asked to and elected to
2 move over into Unit 2 as the Unit 2 Superintendent, Technical Support,
3 principally to gain additional experience and broaden my background in the
4 industry by learning another Unit, which is of course Unit 2, so I've been
5 functioning in that position since December 1978, which pretty much brings
6 up to the present.

7
8 SHACKLETON: Thank you very much, now I'll turn the interview over to
9 Mr. Hunter.

10
11 HUNTER: Okay, George. The information that I would like to start with is
12 the morning of the incident, can you recall when you came onsite, approxi-
13 mately?

14
15 KUNDER: I came onsite approximately 10 minutes of 5 and I arrived that by
16 sort of correlating when I left my house which was somewhere around 4:30
17 and I don't live too far, I came in and dropped off my briefcase in my
18 office and I had noted that the Unit 1 atmospheric relief valves were
19 relieving and wasn't quite certain why and I called the control room in
20 Unit 1 and indicated over the page that the Unit 1 atmosphere dump valves
21 were relieving, just to be sure that they were indeed aware of that, then I
22 proceeded over to Unit 2 control room.

23
24 HUNTER: Why did you come in?
25

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1 KUNDER: I was called by Scott Wilkerson, he was a nuclear engineer on duty
2 at the time in Unit 1 and when the trip of Unit 2 occurred he had gone over
3 to Unit 2 apparently and was asked to call people out, I don't know who
4 asked him to call people out, but I was called and I was told that Joe
5 Logan was also called, he's the Unit Superintendent.

6
7 HUNTER: What was the trip, when did Unit 1 tripped?

8
9 KUNDER: Unit 1 was not tripped, Unit 1 was in a, I believe, a hot shutdown
10 position at the time.

11
12 HUNTER: When Unit 2 tripped then he was...

13
14 KUNDER: He was in Unit 1 and he went over to Unit 2.

15
16 HUNTER: Unit 1 was in hot shutdown after refueling.

17
18 KUNDER: Yes, he was shift to begin the physics test program, as a matter
19 of fact.

20
21 HUNTER: Okay, when Unit 2 tripped, then he called you?

22
23 KUNDER: That's correct. I was home in bed, he asked me to come right in
24 because they had a trip in Unit 2, no further detail, so I did get up right
25 away, got dressed and went right in.

1 HUNTER: You know Scott, did he sound like there was a problem?

2
3 KUNDER: I don't recall any particular urgency in his voice. He did indicate
4 that Bill Zewe who is the Shift-Supervisor, wanted me in, needed some help.
5 So I just proceeded in. That's the tone I recall.

6
7 HUNTER: On the Unit trip, or routine trip would you normally be called in?

8
9 KUNDER: I would have, I at the time was responsible for the duty section,
10 that was my week for the duty and normally the Shift-Supervisor calls the
11 Duty Section Head or least the Superintendent of the Unit, informs him of
12 the problem, he will ask for assistance in whatever area he feels he needs
13 in order to, depends on the nature of the trip, if it was a turbine trip
14 he'd try to get the engineers associated with a turbine generators, that
15 typically the routine that we go through, you don't wait till day-shift for
16 instance to start looking. You call people out...

17
18 HUNTER: You were the Duty Engineer or Duty Superintendent at that time.
19 When you got to the site and you had in fact made it to Unit 2, what was
20 you understanding at that time, what did you find, how did you find Unit 2?

21
22 KUNDER: I found the Unit 1 Shift-Supervisor, Ken Bryan, was in the control
23 room, Fred Shiemann who was the Unit 2 Shift-Foreman at the time and I'm
24 pretty sure there was two operators in the control room were the only
25 people that I recall. I think Scott Wilkerson was in there, but I can't

1 remember just where he was when we came out of the Shift-Supervisor office
2 or not. At any rate, I came over to the console and inquired what had
3 happened and they indicated that they had a trip. The thing that seemed to
4 be of immediate concern to them was the pressurizer level. Ken Bryan or
5 someone indicated that they had ruptured the drain tank rupture disk. I
6 wasn't that familiar with all the instrumentation in Unit 2 since I only
7 begun my Senior Reactor Operator Cross-License training program and my
8 experience on the panel is very small. So I wasn't quite sure what I was
9 seeing and I pretty much had to ask the Foreman what his problems were and
10 at that point in time the pressurizer level seem to be the main point of
11 concern and the pressurizer level was high or pegged at the time. I recalled
12 that the high-pressure injection had been secured at that point, looking
13 back I was completely unaware this situation, the emergency feedwater
14 system and I was really unaware that til later in the morning or later in
15 the day, to be honest with you.

16 HUNTER: How did you find out about that?

17
18 KUNDER: I think, I had found out about it from the GPU engineers that were
19 looking into this scenario. I recalled the fact it was later much later in
20 the day if even that day, I learned about it when I was, I knew the emergency
21 feedwater pumps had started through my subsequent review of the sequence of
22 the events by now. The pressure came up that discharge the pumps but I was
23 unaware that the valves failed to open or that we weren't getting flow, and
24 I later learned through that group that it was apparent that the BFV 12 A&B
25

1 valves were shut at the time. The only thing that was apparent was Bill
2 Zewe had come into the Control Room and I don't recall how long after I got
3 there, it was a few minutes maybe five minutes or so and he had been down
4 trying to secure the water going into the condenser, apparently what had
5 happened on the trip was that the condenser level instrumentation indicated
6 a low-level which called for the hot-well makeup valves from the condensate
7 storage tanks to open and the condenser hot-well filled up and he was
8 trying to secure that problem for fear of it causing problems with the
9 bypass steam being flooded, causing water hammer and that sort of thing.
10 Bill had come into the control room from trying to get that process secured.
11 That was pretty much my immediate impression.

12
13 HUNTER: You indicated high-pressure injection, you were discussing with
14 the Foreman, I assumed that Fred Shiemann who was the foreman on shift that
15 morning. What was the condition of high-pressure injection at that time?

16
17 KUNDER: When I came in I didn't see it but I understood that the high-
18 pressure injection was secured. Someone mentioned that the letdown was
19 occurring they were trying to reduce the level in the pressurizer. I can't
20 remember if I looked at the high-pressure injection valves, I do know where
21 they are in the panel, to ascertain that for myself or not, I just can't
22 quite remember.

23
24 HUNTER: What about the flows, high-pressure injection flows, did you look
25 at the flows?

1 KUNDER: No, I think they're on the back panel and I know I didn't see
2 those.

3
4 HUNTER: Okay. So the rupture disc on the reactor coolant drain tank had
5 blown high pressure injection was minimum or was _____.

6
7 KUNDER: It was apparently secured.

8
9 HUNTER: Pressurizer level was up, letdown was going...

10
11 KUNDER: Right.

12
13 HUNTER: Excess. The amount of letdown, trying to get the pressurizer
14 level down. Any other keying items that you looked at, Bill had just come
15 up from...

16
17 KUNDER: I did locate the reactor building pressure recorder and I noted
18 that the pressure was up around 2 pounds, 2.2 pounds, in the building. So
19 that made sense to me. I believed that the fact that the rupture disc had
20 blown.

21
22 HUNTER: What would that indicate to you, or did it, what did that indicate
23 to you?

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25

1 KUNDER: Well, it indicated that we did have a pressure rise in the contain-
2 ment which likely had come from the reactor coolant drain tank, rupture
3 disc blowing because I wasn't aware at the time what pressure the rupture
4 disc blew. I'm familiar with the Unit 1 system and our drain tank in Unit
5 1 is much smaller in size. The pressure rating for the rupture disc is 55
6 pounds and I later recognized that Unit 2 rupture disc blew about 200
7 pounds pressure. But any rate, there's a lot energy released through the
8 relief valve and if it blew it's apparent that we either had leakage or
9 something continued to expel steam into the drain tank and cause it to
10 blow. But at that time it wasn't clear to me what had really occurred...in
11 terms of...

12 HUNTER: Besides the pressurizer level being high, did Fred tell you, you
13 know, indicate to you that he had any other problems, did Bill say or
14 indicate or Ken Bryant even?

15
16 KUNDER: No. One conversation I recall with Ken Bryan was that he was
17 looking at the computer temperature for the relief valve discharge line
18 and, I'm judging ten, fifteen minutes after I got there he had noted that
19 the temperature of the discharge relief valves in the pressurizer had come
20 down from what it had previously been earlier, prior to my getting there
21 and he seemed satisfied that the relief valves were not blowing steam
22 anymore or at least it had decreased. That was my perception of how it
23 seemed.
24
25

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1 HUNTER: Okay.

2
3 KUNDER: And beyond that, what I tried to do, I was trying to figure out
4 for myself what they had had and I was looking at the pressurizer level and
5 they told me that all three channels behaved the same way and it seemed
6 inconsistent with what I've been experienced to on a trip of that nature.
7 And, I recall that I found a uncompensated pressurizer level indicator on
8 the panel 5 or something like that. It's, and when you look at that level
9 and corrolated it using the uncompensated, the uncompensated pressurizer
10 level chart that's posted on that console, it appeared to agree with what
11 they were saying on the LT 1, 2, and 3.

12
13 HUNTER: So that gave you four levels that were consistent.

14
15 KUNDER: Yeah, but I thought too, at the same time, the uncompensated level
16 probably comes off the same transmitter. Because really in the B&W plants,
17 at least in Unit 1, you have three transmitters. You don't have a fourth
18 transmitter. You get Dp which comes out in the computer. You get the, of
19 course, the compensated level which is on the recorder charts and also in
20 the computer and you can get the uncompensated level which was on this one
21 indicator. So that, that really didn't help me out really. Just told me
22 that everything agreed and that it appeared as if the pressurizer was
23 seeing or the instruments were probably seeing a high level, but there was
24 that element of doubt in my mind and I think in the mind of the operator,
25 my perception of that.

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1 HUNTER: Okay.

2
3 KUNDER: It just didn't seem consistent.

4
5 HUNTER: Did you recall looking at pressurizer pressure?

6
7 KUNDER: I did, I can't recall exactly when, probably wasn't too long after
8 I had gotten there. My perception of that was that I had thought that we
9 took the system solid and we expelled the steam in the pressurizer and that
10 the pressure ended up low because we did not have an adequate bubble at
11 that point. And, that was, that's how I perceived that condition and the
12 fact that they were letting down and trying to reduce the level to get it
13 in range and heaters, you know, trying to build the bubble back up to get
14 pressure back up. It seemed to be what was going on, to me.

15
16 HUNTER: At that time, do you recall getting a pressurizer liquid or steam
17 space or surge line temperature?

18
19 KUNDER: No.

20
21 HUNTER: Did you check to see what the temperature in the pressurizer was?

22
23 KUNDER: No. And, I'm not sure that I would have, I doubt if I would have
24 recognized an alarm of that nature because I'm still not that familiar
25 with the layout of the control room and all the instrumentation. That, I

1 must admit, was one of the most frustrating parts of performing. I just
2 didn't have enough expertise in Unit 2 to interpret everything they were
3 saying because I wasn't able to recognize everything as an operator would.
4 Perhaps if I had had my training program through and had really qualified
5 in the unit...

6
7 HUNTER: What's the status of your training program right now?

8
9 KUNDER: I began an in house cross license program which first consists of
10 going through what's called a Category For Operators Training Program. The
11 first part of its pretty much of it is self-study effort. The area that I
12 have studied so far was the Secondary Plant System, turbine generator, the
13 auxiliaries for turbine generator, condensate feedwater system and the main
14 steam system. I hadn't had my first oral on the system. The program is
15 split up into six cycles and it's generally intended that you can go through
16 it an excellerated pace in about perhaps 5 to 6 months. Normally, the
17 program is designed to take an auxiliary operator and train him in about 9
18 month program on a, you know, a more of a routined pace. I'd gotten through
19 the answering all the questionnaires and doing some of the exams on the
20 first cycle which I had been submitting to the training department and I
21 had not had the first oral exam so I hadn't, I didn't have a good feel as
22 to how much in depth I really, you know, knew that first cycle, even. So,
23 I was really only beginning the program unfortunately.
24
25

1 HUNTER: The, you can go to 4, 5, or 6. That would get you 4 from Secondary
2 5 into the primary and 6th into the license.

3
4 KUNDER: Yeah, it would be, you got into Cycle 2, you got into decay heat
5 removal, makeup purification systems and then you start getting more experi-
6 ence on the console. The design of the oral exams are pretty much to get
7 you, really challenged on the console and to verify that you got the depth
8 to see all the alarms and understand what they're telling you and know
9 where all the controls and so forth are.

10
11 HUNTER: After the Category 6 and all is that an RO license as a result of
12 your training or an SRO.

13
14 KUNDER: No, it would, the SRO licenses is what I was going for, the Cate-
15 gory 4 Training Program was one of the vehicles to get you into material,
16 to get you through learning the plant, okay? It was an organized lesson
17 plan, if you will and the part that would pretty much give me the depth and
18 qualification for the SRO portion of the exam would be in a large part, you
19 know, the emergency plan training, knowledge of the administrative proce-
20 dures and controls, knowledge of 10 CFR 20, and a lot of the more admini-
21 strative oriented parts of the job and a lot of that I had and the program
22 did cover a review of all those areas.

23 HUNTER: Okay.

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1 KUNDER: Okay? So I was really going for an SRO cross license. Just
2 merely utilize the elements of the CRO training program to ...

3
4 HUNTER: What did you project you'd get through with that?

5
6 KUNDER: Well, I was hoping I could get through it by the end of the summer
7 or I was really hoping to get through it by mid-summer but I found that my
8 commitments, I mean, the normal parts of my job prevented me from really
9 devoting the time to the study, you know, to get through the accelerated
10 program. I was going to study at my own pace and typically my training
11 program involved a pretty significant commitment and time on my part and I
12 only really got to start studying some of this stuff in earnest when I got
13 down to the simulator the week prior to this event. I was able to spend
14 some time in the evenings, you know, do some of the review that I just
15 hadn't had the opportunity to do prior to this thing. But with the startup
16 of the plant over our engineering workload was tending to wind down and I
17 was expecting to be able to devote a greater share of my time in the training
18 program which is going to do two things. They get me cross license, but
19 the real intent, of course, is to get...

20
21 HUNTER: Cross license you might explain that...

22
23 KUNDER: License in the Unit 1...

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25

1 HUNTER: SRO?

2
3 KUNDER: Yes, that's right. I was required to have that license as a
4 supervisor of operations in Unit 1 when I held that position. I wanted to
5 get the cross license mainly for the benefit of the learning experience in
6 Unit 2. To do my job most effectively in managing the engineering depart-
7 ment which is my prime job and also in my function as the chairman of the
8 Unit 2 plant operations review committee an interfacing with the licensee
9 matters with the commission. It, I've always felt that the experience of
10 the licensing process prepares you technically and operationally to do a
11 much more effective job. So I placed value on the license for that purpose
12 and, of course, when I took the job I had been asked if I had any problems
13 in going for my Senior Reactor Operators License and of course I didn't, my
14 question was does the Company have any problem if I do make that kind of
15 commitment and spend some of the time its going to take to get the license.
16 Thats the program I embarked on.

17 HUNTER: You worked directly for Gary Miller?

18
19 KUNDER: No, I worked directly from Joe Logan, Unit 2 Superintendent who in
20 turn works for Gary Miller.

21
22 HUNTER: Excuse me, I'm sorry, that's what I was after, you work for Joe Logan
23 who is the Unit 2 Superintendent.
24
25

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1 SHACKLETON: We'll end our interview at this point to change the tape. The
2 time is now 5:39 p.m., April 25, 1979.

3
4 SHACKLETON: This is a continuation of the interview of Mr. George A. Kunder,
5 time is now 8:33 p.m. April 25, 1979. We discontinued the last meeting
6 inasmuch as Mr. Kunder had another meeting attend and now is back to continue
7 our interview. Continue
8 on please.

9
10 KUNDER: One of the things that I recalled also that I had done when I got
11 into the control room and again the timing was I think within about 5 or 10
12 minutes of arriving and trying to get an understanding of what was going
13 on, since pressurizer level was higher or pegged and we had reportedly
14 ruptured the drain tank rupture disk I was concerned because of the unusual
15 situation, I did ask Scott Wilkerson to call out additional people, and I
16 specifically asked for Dick Dubiel, my lead engineers, Dick Seeklets and
17 I'm pretty sure I asked him to recall Joe Logan because I wasn't absolutely
18 certain, although I thought he had said that he had called Joe I wasn't
19 certain that he had. I believe I had asked, because of the fact that the
20 guys were pretty busy with the plant at hand, I had asked them to call out
21 the oncoming Shift-Supervisor and Foreman so we can get additional supervi-
22 sion and experience in there, because we were dealing with something that
23 to me was out of the ordinary in terms of the transient response. Of
24 course at this time there was no indication of any radioactivity or anything
25 unusual with respect to radiation. That I could observe. He did make

1 those calls, I don't know who he reached but I know Dick Dubiel had come in
2 a little later on and my lead engineers did come in and reported to the
3 Control Room. I do recall, Ivan Porter at least, Ron Warren, Dick Bensil
4 and offhand I can't think of anybody else that reported. Dick Seeklets
5 later came in, perhaps jumping ahead a little bit, but those people were
6 onhand just prior to the time we announced the site emergency. I think
7 that helped.

8
9 HUNTER: George, you indicated out of the ordinary, lets key on that for
10 awhile, okay lets key on your here and you've looked at the drain tank and
11 determined that its ruptured, or somebody told you, you look at. What else
12 was really out of the ordinary, you've seen other trips at this plant and
13 also you've seen them at Unit 1.

14
15 KUNDER: I don't think I ever seen a trip in progress in Unit 2, I've seen
16 the I don't want to say aftermath, but I've seen the results of previous
17 trips, through the reviewing the reactor trip reports and that sort of
18 thing, I've never seen a situation either in this plant nor in Unit 1 nor
19 the simulator where the pressurizer level was pegged and we had a low
20 pressure in the RCS and in that sense and the fact that we did apparently
21 blow a rupture disk in the drain tank and had 2.2 lbs or so in the reactor
22 building that was the nature of the unusual situation that I was referring
23 to.
24
25

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1 HUNTER: Rupture disk blown, couple of pounds in the containment, pressurizer
2 level up, pegged or high offscale?

3
4 KUNDER: Yeah, it appeared right up against the top of the chart in a
5 straight line.

6
7 HUNTER: And also low pressure, how about giving us your feelings at that
8 time?

9
10 KUNDER: The pressure appeared to be, it was about in the range of 1100 lbs
11 and sort of leveling off and my perception in not having gone through the
12 whole thing from the initiating event or not having experienced the whole
13 scenario through the initiating event was that somehow the plant was
14 taken solid and we lost the steam bubble to the extent that we didn't have
15 adequate pressure control, pressure was low, we had a solid system, we
16 didn't have an adequate steam bubble to get the pressure back up and pres-
17 surizer heaters, I'm not sure, I didn't, I didn't know if they were on or
18 not, I just presumed they were and they were letting down and trying to get
19 the level on scale and the pressurizer level instrumentation and trying to
20 reestablish the bubble and get the pressure up. I think it took me a
21 little while to really understand what was going on with pressure, I don't
22 think I perceived that initially but I do recall, that I had gotten a call
23 from Gary Miller who was made aware of this thing, I was the one that
24 communicated with Gary Miller and I'm pretty sure I gave him the key para-
25 meters, pressurizer level was pegged and that pressure was low and he

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1 decided he best get a call, conference call set up between he and Jack Herbein
2 and Lee Rogers of B&W and try and get some sort of resolution to the problem,
3 you know, understand what was going on and make them aware of the problem.
4

5 HUNTER: I'm still, I'm still, we're still pretty earlier in the program
6 timewise.

7
8 KUNDER: It was around, I'm guessing, around 6:15 or 6:20 or so when that
9 first phone call was made.

10
11 KIRKPATRICK: Was that prior to the time that the primary coolant pump, the
12 last batch of the primary coolant pumps were tripped.

13
14 KUNDER: Yes, pretty sure it was, that phone call, yeah.

15
16 KIRKPATRICK: You said, you gave to Gary Miller the main parameters which
17 were, I take it, which were pressure and level and temperature.

18
19 KUNDER: Levels, and I guess we keyed on level because that appear to be
20 the big concern at that point, the fact that the level was high.

21
22 KIRKPATRICK: And he was discussing these parameters with the B&W people.

23
24 KUNDER: No, when I told him what the parameters were and that we were in
25 on a condition that I just wasn't sure what was going on and whether we

1 should believe the indication or not. He decided to set up the conference
2 call between Herbein and myself and Lee Rogers, and he broke off the line
3 and proceeded to set that call up.

4
5 KIRKPATRICK: By indication did you mean level indication?

6
7 HUNTER: Pressurizer level?

8
9 KUNDER: Pressurizer level yeah.

10
11 HUNTER: When you, how long did it take you to get the conference call, to
12 get it established?

13
14 KUNDER: I'd estimate about 15 minutes.

15
16 HUNTER: And that included Jack Herbein, Lee Rogers, Gary Miller, yourself?

17
18 KUNDER: Yes, that was it.

19
20 HUNTER: That was the first conference call.

21
22 KUNDER: There was only, there was two calls made, the first one was myself
23 and Gary Miller when he called in, and the second one was after he had
24 initiated the conference call. At the conclusion of that call Lee Rogers
25 and Gary proceeded into the plant and I'm not sure what happened to Jack
Herbein.

1 HUNTER: What was the general discussion in the conference call.

2
3 KUNDER: Well, again the general discussion evolved around what the plant
4 parameters were, what was the pressurizer level, RC pressure and Jack and
5 Lee and Gary were trying to ascertain what we had, I think we did talk to an
6 extent about whether the pressurizer level indication was real. I seem to
7 recall, I was asked by, I think it was Lee Rogers, that if the electromatic
8 block valve was closed and I talked to someone in the control room, and I
9 just asked was the electromatic block valve closed and they said yes and
10 came back in and said yes the operator said it was closed. Of course, I
11 told them what the pressure was and I told them the pressurizer level and
12 we seem to all agree that the pressurizer level indication should be believed
13 and so we continue to believe the level indication that it was high. That
14 was pretty much based on the fact that all three level indicators performed
15 similarly they were all high and it just wasn't consistent that they'd all
16 be the same and there be some sort of a common known failure because they
17 are separate transmitters lines off the pressurizer and separate transmitters,
18 there's no, it's a totally independent channels both electrolly and mechani-
19 cally, so whatever was happening they were seeing a high level. I seem to
20 recall mentioning probably towards the end of the conversation that we had
21 had problems with the steam generator, particular the B generator, I wasn't
22 following the secondary side that closely and I was never really clear in
23 my own mind what had been done to the B generator and again I was unaware
24 of the fact at that point that we were without feed for the first 8 or so
25 minutes which is what I got out of all the curves and soforth that we
extrapolated after the fact. But, early ...

1 HUNTER: You were unaware of that fact, that meant that on the conference
2 call, Gary Miller was unaware of that fact?

3
4 KUNDER: Yeah. I would've have said that to him. They were unaware that
5 the BFV 12 A & B valves had to be opened by the operator manually.

6
7 HUNTER: They were not aware of that at that time.

8
9 KUNDER: That's right, I'm sure they didn't talk to anybody else, so they
10 wouldn't have that understanding at that point. But I did indicate to them
11 that, Bill Zewe and whoever was operating on the secondary side, had noted
12 that the steam generator pressures differed and that the B generators
13 pressure was lower, I seem to recall about 300 lbs lower than the A generator
14 pressure. They thought at first that they may have had a steam leak on the
15 B side and as a result they followed the procedure to isolate the B generator
16 and attempt to see if that had an effect as it was believed that may be
17 contributing to the pressure in the reactor building and I understand that
18 was done, I did not verify with any valve lineman or anything like that,
19 cause I didn't really participate in that side of it, the operation. I
20 believe it was a little later on when that thought was dismissed and I
21 believe that's when Mike Ross came into the Control Room that they, ...I'm
22 trying to think of the parameters that they looked at to determine that it
23 was probably not a leak in the B steam generator and offhand I can't think
24 of what it is now, but there was a relationship between the reactor building
25 pressure and we figured B is probably isn't leaking steam so they did cut

1 it in. And they did cut it in before the level had dropped very far. I
2 think it was the level hadn't change if I'm not mistaken and

3
4 HUNTER: That was the first time?

5
6 KUNDER: That was, yeah, that was the first time the generator was isolated
7 and I think that was the parameters they were looking at, same generator
8 levels but I'm little fuzzy.

9
10 KIRKPATRICK: The water was staying in the steam generator so they on that
11 basis they eliminated that that is the cause of the pressure in the contain-
12 ment..?

13
14 KUNDER: Yeah.

15
16 HUNTER: Also this was before the reactor coolant pumps were tripped.

17
18 KUNDER: I'm pretty sure that's true. Yeah. Okay. But I recall noting
19 that to Jack Herbein and Miller, so that really occurred before our conver-
20 sation. Now that conversation lasted, I'm judging another 15 or 20 minutes
21 I would think, cause it seemed that I was on the phone an awful lot.

22
23 HUNTER: In the meantime, I'm presuming that others came in, you indicated
24 as your going along you wrapped up the phone call and then there's a group
25 of you available for the plant, to help out with the problem?

1 KUNDER: I'm trying to put the, when we knocked off the reactor cooling
2 pump in a little bit of perspective. Seems to me that we knock off the
3 first set of coolant pumps prior to ending the conversation with Herbein,
4 Rogers and Miller. And the reasons they knocked off the first set of
5 pumps, was they were afraid they were getting into the pump NTSH curve
6 limitations were just about being violated they were afraid of losing
7 suction, cavitating the pump, so they decided to secure one set of pumps.
8 I recall looking at the curves myself to verify that the pressure and
9 temperature conditions were justifiable to allow securing the RC pump. I
10 remember the pressure was down around 950 to 1000 lbs in that region and
11 the saturation temperature was, I'm sorry, the TC was up in the region of
12 540° or something like that. But at any rate, the point was on the curve
13 in fact slightly below.

14
15 HUNTER: Were you reading the curve on the phone?

16
17 KUNDER: No I had come away from the phone. I'm having trouble fixing in
18 my own mind when we secured the first set of pumps, it was either just
19 prior to the conversation or during the conversation when I had come out to
20 the Control Room just take a look at pressures and temperatures again and I
21 looked at the procedure.

22
23 HUNTER: B-loop pumps at this point, the first set.
24
25

893 301

1 KUNDER: I had thought yeah, I think it was the B loop pumps, because I
2 recalled the flow went down in the B-loop pumps. I believe that they
3 secured the B-loops so that we could still have adequate spray flow and the
4 A-loop gives you more pressure and you get better spray flow, gives you
5 better pressurizer spray control. But at any rate, we finally ended the
6 conversation and Gary and Lee Rogers said they were coming. Joe Logan I
7 think was the first Senior person to come into the Control Room. Best to
8 my recollection we had already secured one set of pumps by the time Joe came
9 in and it was about the same time frame that when, it was either about the
10 time he came in or shortly thereafter that we secured the second set of
11 pumps, because the flow was starting to degrade on the console flow indicator.
12 I seem to recall that it was the flow in the A-loop, two pumps running was
13 up above 60% on the indicator and the flow was degrading and had degraded
14 somewhere I think in the region around 30% so it was clear to me that flow
15 was decreasing and that it was thought we were cavitating. So, the Shift-
16 supervisor secured that set of pumps expecting to go on natural circulation
17 because the pressure was low and we didn't want run into cavitation problems
18 with the pumps. I guess prior to that point I started to get into a dif-
19 ferent thought process, I had a, Bubba Marshall had come into the control
20 room, and Scott Wilkerson was still there and I had asked to have a shutdown
21 margin calculation performed and I wanted to get the boron concentration
22 from the system. I had asked Bubba Marshall to call the lab and get a
23 boron pretty quick. Again I was sort of concern where this water was
24 coming from but at that point I still felt, it still appeared to me that
25 somehow we other water in the system and I didn't know where it had come

1 from. Cause the operators had indicated to me that they didn't have high-
2 pressure injection on for that long that it would have filled the system up
3 and we would have gone solid. I didn't understand that. I had a, let me
4 think. Dick Dubiel had arrived and I told him that I had asked for that
5 boron sample and asked if he'd go down and coordinate and make sure we get
6 the boron sample, get the results of them and I guess it was an interim
7 period of perhaps 15-20 minutes or 30 minutes before Dick got back to me.
8 This was probably close to, when I asked Dick to go down and check on
9 getting the sample I believe it was around between 6:00 and 6:15 that sort
10 of thing, so it would have taken them a certain period of time and by that
11 technicians may have been getting a sample cause that had been asked for a
12 little bit earlier. Dick had called up to me, and I believe it was around
13 6:35 or so maybe 6:40 and he called up the result, and he said the first, I
14 think he said the first two samples indicated 700 ppm boron and he said the
15 next sample he didn't think that was right so they had another sample that
16 was 400 or something, I don't recall the exact numbers but that change all
17 of a sudden really frightened me, because I thought I hope that's a bad
18 sample analysis because I couldn't at that point I started to think my God,
19 maybe were getting demineral water in through some flowpath, I just don't
20 understand.

21 KIRKPATRICK: This was really only a few minutes after the second set of
22 pumps were cut off, probably around 6:30?
23
24
25

893 303

1 KUNDER: It was too far from that time frame. I didn't know what initial
2 boron was I walked over to the status board and it was a little over a 1000
3 ppms that was the boron concentration that we should have been at at that
4 point in time, then the thought went through my mind, Oh my God, were
5 deboring the system and I told them you got to get another sample and tell
6 me what's wrong, at that point I asked Bubba Bubba Marshall. that is to
7 start looking at the Unit 2 system and see if there's anyway possible we
8 could be getting demineralized water into the system. Then again the
9 primary side I just was not familiar enough with over in Unit 2 and although
10 the basic B&W system is the same, the interconnections and rad waste system
11 are totally different between Unit 1 and Unit 2 and I had very little feel
12 for the various system the configurations and so forth and how we could be
13 getting demineralized water so I went through my head, maybe we had deminera-
14 lized water in BWST and somehow we may have this in our sample analysis,
15 but nonetheless Bill Zewe initiated emergency boration at that as a precau-
16 tion. At that point, I knew something was really, really wrong and at some
17 point in time in that same timeframe I was alerted or I even noticed or
18 somebody mentioned that the NIs were kind of high, I went over and looked at
19 source ranges instrumentation and the source ranges were reading in the
20 range of about 10^5 counts, intermediate range had come on scale and it was
21 about half a decade to almost a decade on scale. The only thing that was
22 going through mind at that point, is that the reactor had gone critical
23 again. I didn't understand what was really happening, I think I understand
24 now, we think we understood after the fact we seen, but at that point in
25 time I thought my God we've been deboring the system, somehow that's how

1 we've been getting all the water in the system and we taken the reactor
2 critical, so I started to urge, we got to get high-pressure injection back
3 on, we got to get some borated water, what we thought was borated water
4 back into the system and Mike Ross was in the Control Room at the time. I
5 remember him commenting to me George we got to do something because, there
6 was a, the guys just set there at console and I guess Joe Logan just weren't
7 sure of what the next step was and all I could think of was get that damn
8 high-pressure injection on, that was the only thing I could think of.
9 There was nothing else to do except to get some borated water into the
10 system until we understand what was going on. And so we did initiate high-
11 pressure injection and I seem to recall I even yelled it out, get it on, I
12 don't care, we got to get that thing initiated and now. So that was done,
13 immediately after we asked for it and continued thereafter. Dick called up
14 very shortly thereafter and I heard him screaming over the page George Kunder,
15 George Kunder, line one and I answered. Dick said, George the sample line
16 had just went up up to 600 mR/hr, and at that point I realize oh my god
17 were failing fuel and I yelled at Joe, I said Joe were failing fuel, Dick
18 gots 600 mR/hr at the sample lines and that was right around 6:45 in that
19 region and I said hey were into site emergency, its the real thing and site
20 emergency was declared. I turned around and told Ron Warren and Dick
21 Bensil and who had been in the Control Room, .. oh I think just before that
22 Ivan Porter who's my lead I&C engineer had come into the Control Room and I
23 briefed him on what had happended, on what the plant was doing and I seem
24 to recall, I may have mentioned something about failed fuel, we were getting
25 high activity in the system and that was all pretty much around the same

1 time frame, but I do recall telling Ron Warren who had been in there and
2 Dick Bensil to get on the phone and start making the phones calls and we
3 went into the emergency procedures and began the emergency response and I
4 don't know, at that time I really started to just starting reacting to the
5 condition and really getting it clear in mind, we were in a real emergency
6 situation and we got to initiate the emergency plan and you know from that
7 point on I was, I don't know how to put it, just keyed up to carry out
8 those emergency plans and keeping the plant in a safe condition. Bill Zewe
9 as I recall pretty much directed his attention to the console and it was
10 around the same time frame that Gary Miller came in, I think he came in, he
11 definately came in after the site emergency was declared, Joe Logan was the
12 Senior guy at the time the site emergency was declared and Gary came in I
13 would estimate 15 minutes or so after the site emergency was initiated and
14 Gary took charge of the emergency as Emergency Director and the emergency
15 teams were formulated. I basically was responsible at that point to work
16 for Joe Logan, carry out any technical activities he needed, make sure
17 communications was established with the State, that was my first concern,
18 to get hold of the Civil Defense and I did put two engineers on it, because
19 through previous emergency drills it just takes a long time to make all the
20 phone calls. The first one of course is to the Civil Defense Duty Officer
21 and maintenance times that goes to get them notified so they could notify
22 the Bureau of Radiological Health and get that part of the plan moving.

23 SHACKLETON: At this time we'll end this tape, its 9:02 p.m., April 24,
24 1979 and we come on other tape.
25

893 306

1 SHACKLETON: This is a continuation of the interview of Mr. George A. Kunder.
2 Time is now 9:05 p.m., April 25, 1979.

3
4 KIRKPATRICK: George you were, you had just commented that you had starting
5 making the appropriate calls, Joe Logan was the Senior man on site at that
6 time. Does that make him the Site Emergency Director? And shortly, then,
7 Gary Miller came in. At that time does he assume the ...?

8
9 KUNDER: He did. Gary first appraised himself of the plant conditions and
10 what we had and Gary, I thought, very forcefully took over as the Emergency
11 Director. He announced it, and he indicated that he, myself, Logan, I
12 think he said Ross, and I know he said Debiel were the guys that talked to
13 him, to try and establish good clear communications paths with the people
14 in the Control Room. And there was the... communications were being estab-
15 lished by someone else between the control room and the emergency control
16 station. In otherwords, between ECC and ECS. I was pretty much making
17 sure that the calls were being made to the offsite people and we got some-
18 one... I can't remember who it was anymore... to keep the emergency status
19 board and I wanted to make darn sure that we go the information from the
20 callers, Ron Warren and Dick Bensei, out to the emergency board. That
21 worked fairly well. We had clearly identified who was called at what time.
22 In fact, there was a photograph made of that, so we wouldn't lose that
23 information. That part of the drill got started fairly well.

24
25 893 307

1 KIRKPATRICK: Step back a minute, I want to keep the emergency in mind, I
2 want to ask you earlier about the conference call between yourself and Jack
3 Herbein and Gary. Did you keep a log of that or is there a record of your
4 call ...?

5
6 KUNDER: No. I did not keep a record, Jack or someone on their end may
7 have kept some notes.

8
9 KIRKPATRICK: We're down to the point where the emergency has been declared
10 now. If my sequence is correct, the emergency occurred, you saw radiation
11 increase when Mr. Debiel was down in the lab.

12
13 KUNDER: Dick saw the increase down there. When he told me what his problem
14 was, it was within seconds that the alarms in the back panels of the RMS
15 starting coming in. At this time in my training, I'm not familiar with
16 which alarms go to which area, but I saw the alert and the alarm lights
17 coming in and they all started coming in very, very quickly. I knew that
18 there was probably a dome monitor in each unit. I was not aware that there
19 was other monitors in the reactor building. I'm not sure what they did,
20 but the alarms for the area monitors or the atmospheric monitors in the
21 Auxiliary Building or fuel handling building were apparently going off. A
22 lot of alarms were coming in.

23 KIRKPATRICK: Were you aware they started the reactor coolant pump at that
24 time, or do you recall that?
25

893 308

1 KUNDER: I was aware that the coolant pump was attempted to be started. I
2 thought it was only started one time. But I learned a little later that
3 they had tried to start one and it didn't work out, but I observed when
4 they started the--let me think, I think it was the 2B pump, if I'm not
5 mistaken. There was one control switch in the far right. They started the
6 pump, the indicating light was red. I looked at the flow indicator, it
7 read zero. And I seem to recall Mike Ross and Zewe wondering if it was
8 really running. They called for someone to go down to the switchgear and
9 check to see if the breaker was closed. And you know they said it was, and
10 they recognized it probably was running, but you know it was just pumping
11 steam up. There was just no water in the pump and that is why we didn't
12 see the flow indication. About this same time: the way, the intermediate
13 range counts dropped off.

14 KIRKPATRICK: Did that give you any kinda--did somebody report that to you,
15 for instance, or were you watching your intermediate range?
16

17 KUNDER: I wasn't watching. I looked at it just after it went down, just
18 to verify that it was going down?
19

20 KIRKPATRICK: What does that mean to you? At the time, I mean?
21

22 KUNDER: At the time I was sort of relieved, but I still didn't fully
23 understand what we were seeing. I think it was later on when John Kenna,
24 of B&W, had been in the control room that he mentioned that probably was
25

1 due to the fact that we had the core uncovered, and that the the neutron
2 leakage output to the out-of-core detectors was greater, and we were seeing
3 the higher count rate. And that all correlated. You know, after the fact
4 you start thinking about this, and then it fowls up your memory a little
5 bit, because you know--I wasn't--you almost think you recognized it at the
6 time but I don't think I really did. I did not recognize why the counts
7 went down.

8
9 KIRKPATRICK: During the period the pump was off, somebody...

10
11 KUNDER: Excuse me. I think probably what's going through my mind is the
12 high pressure injection was having some effect, but I just can't recall
13 exactly.

14
15 KIRKPATRICK: During the time you had the high pressure injection going in
16 at the normal rate, 200 and some gallons per leg.

17
18 KUNDER: 250.

19
20 KIRKPATRICK: 250, ok. So you felt that would be boron water? Cooling
21 water?

22
23 KUNDER: Right, it would be 2270 ppm.

24
25 893 310

1 KIRKPATRICK: At the time (this is Kirkpatrick) from the time you got very
2 concerned that there was a serious problem and told them to turn on the
3 high pressure injection, all during this period you had it going essentially
4 at 250 gallons a minute, is that right?

5
6 KUNDER: That's right. I didn't see the meters. They initiated high
7 pressure injection. You know I wasn't really part of the operation from
8 the console, so I didn't verify it. It was my understanding.

9
10 KIRKPATRICK: But that was, you told them to initiate, and it was your
11 understanding that they did?

12
13 KUNDER: Yes sir.

14
15 KIRKPATRICK: Do you understand how they initiated it? Was it by the
16 normal, just by switching two makeup pumps? Or was it by actuation?

17
18 KUNDER: I don't, I didn't seem them do it. I mean I didn't see them press
19 any particular buttons. I believe they initiated it with the manual high
20 pressure injection push button.

21
22 KIRKPATRICK: I see. Okay.

23
24 KUNDER: I'm trying to be very detailed about it. I didn't go back and
25 look. I didn't verify the pumps were on myself. By that time we had Joe

1 Logan in there, Bill Zewe, Mike Ross. They were the licensed people, and
2 you know I didn't try and track the console to see all that stuff. I was
3 sort of standing back by the operator's desk, and trying to get an overview
4 of what was all going on.

5
6 KIRKPATRICK: Sometimes that's a good place to be. An overview rather than
7 being right in the middle of the program. During this time now, somewhere
8 along the line, somebody decided the power operated relief valves, either
9 lifting or open. It was indicating closed as I understand it, and by
10 looking back at the other interviews. But, it was during this time that
11 somebody closed it. Were you aware that it was closed during that time or
12 was that--

13
14 KUNDER: No.

15
16 KIRKPATRICK: Okay.

17
18 KUNDER: All the activities in the PM valves, I wasn't aware what was going
19 on there. Because that's part of the console, first of all, that's one
20 part that I wasn't that familiar with. Okay. There was, it was sprayed
21 valve, vent valve and a couple of other controls, switches and indicating
22 lights, and the way they are laid out, they are all sort of together. So I
23 wouldn't have known exactly what I was looking at, unless I had gone up
24 there and really picked out the appropriate indicators.

25
893 312

1 KIRKPATRICK: Looking at the events from the time you got in, early 4
2 something, 4:30 or whatever time you have, and looking down, did you ever,
3 did it ever strike you that you may have had a loss of coolant accident
4 going on all this time?

5
6 KUNDER: No, I think my first indication that we probably had a loss of
7 coolant situation, although I didn't perceive it as a loss of coolant
8 accident in the normal sense, it was when we started the pump and didn't
9 get flow and the temperatures in the hot leg were going off scale or they
10 had gone off scale. And it was apparent that we were vapor bound, it was
11 the only thing I could think of. Somehow, we were vapor bound in the core,
12 and I guess that perception became more and more reaffirmed in my own mind
13 as we went along. And this is after we had the high pressure injection
14 initiated.

15
16 KIRKPATRICK: Right. Did you have that feeling, apparently not, when you
17 took the first two pumps off?

18
19 KUNDER: No.

20
21 KIRKPATRICK: And the next two?

22
23 KUNDER: No. I didn't have that feeling at all. I thought that we had
24 gone into natural circulation. Again, I never perceived that we'd had a
25 bubble in the core or in the head, and looking back, it is what it appears
to me that occurred, of course.

1 KIRKPATRICK: But basically, well, what was that feeling with, I'm really
2 trying to make sure that we understand when looking at the situation that
3 night, that morning, the pressure was down, the pressurizer level was still
4 up, and I don't want to lead you--but was the pressurizer level the thing
5 that, being full, even though the pressure was down, was that enough to
6 lead you to think that you didn't have a loss of coolant?

7
8 KLUNDER: Well, I don't think it lead me, I never even questioned that we
9 had a loss of coolant accident. Again, my perception when I first came in
10 was that we were filled up in the system and had lost a bubble and for some
11 reason we weren't regaining pressure control. And they said that, I guess
12 makeup, I don't know if I ever really asked or if anybody really told me
13 that makeup was secured. But they did indicate the high pressure injection
14 was secured and of course I identified with that in the way we do it. You
15 know we have had other trips where, you know, following the trip, the
16 pressure gets down low enough to start high pressure injection and then
17 when the water level in the pressurizer came back up into normal range,
18 they gradually bypassed high pressure injection so they could throttle back
19 on the high pressure injection valves, so that they wouldn't take the
20 system solid and

21 KIRKPATRICK: What did you feel right then when you walked in and you saw
22 the pressurizer full?
23
24
25

893 314

1 KUNDER: Well, I was confused.

2
3 KIRKPATRICK: Okay now, it looked solid?

4
5 KUNDER: Yeah, well, it look like it was full. To me, it appeared that the
6 level had gone up and bubbled around a little bit, close to the flow indica-
7 tion. It was full and the operators were keying on that and trying to let
8 it down and couldn't get the level down. My problem was I didn't have
9 enough of a feel for the overall picture because I couldn't pick out all
10 the parameters that quickly. My familiarity with the panel is sort of
11 limited.

12
13 KIRKPATRICK: What are Mike Ross's license conditions?

14
15 KUNDER: He's cross licensed. He's one and two both.

16
17 KIRKPATRICK: Its a long day. I think I even asked him that to make sure.
18 Mike was there all the time?

19
20 KUNDER: No, he came in, he was in, Mike was in, it must have been 45
21 minutes I would say, to an hour after I got in there. Somewhere in that
22 time frame.

23
24 KIRKPATRICK: Right. I think he actually came in after the pumps were shut
25 off, is that right? He came in during that time, right? We covered the

1 nuclear instrumentation and discussed the boron samples, which I was inter-
2 ested in, and we'll key on those as far as time. Natural circulation we
3 keyed on, that's important. Okay. The site emergency, you keyed on the
4 temperatures, high Th, and then the site emergency was declared and Gary
5 Miller was here, I assume right away. Did you recall them initiating the
6 general emergency?

7
8 KUNDER: Yeah. The general emergency was initiated about 7--I didn't note
9 the time when they initiated, but based on the log or the status board
10 about 7:24, approximately. I do know that when the general emergency was
11 declared, I immediately went in and told Ron Warren and Dick Bensei that it
12 was a general emergency, recall everybody. By that time, I understood that
13 they had reached just about everybody. In the case of the NRC, I do remem-
14 ber that they could only get the girl who was going to ring the duty officer.
15 Okay? And I don't know what their conversations were specifically. I know
16 Ron had questioned me, you know, the Civil Defense guy wanted to know a
17 little more information. I said, just tell him it's a site emergency and
18 tell him to make the notifications. Because I didn't want to get into a
19 lot of detail with him, because I think that would have just confused the
20 issue and I wanted him to get off the phone and start making the calls.
21 But anyway, a general emergency was declared, and we immediately went
22 through and started making calls again.

23
24 KIRKPATRICK: And you were specifically working in that area, making the
25 calls, making sure that was all done?

893 316

1 KUNDER: Right.

2
3 KIRKPATRICK: That's finished, you've made all the calls. I guess I don't
4 know how long it took to make all the calls, but...

5
6 KUNDER: Well, what happened, yeah, I guess the calls were made, the second
7 round of calls after the general emergency was declared, they began immedi-
8 ately after it was declared and they continued on. They were probably
9 making phone calls for another 20 to 35 minutes, or something like that. I
10 remember that one call came in on the 944-6017 number, which is the one
11 that they used to tell like the DER to call back on. That's a direct
12 outside line. At least someone answered it and said it was Gerusky. And I
13 got on the phone with Gerusky. He had just got into the office. I told
14 him what we had. We had a general, at that point it was a general emergency.
15 It seemed it was about 15 minutes after the general emergency was announced.
16 I told him that the conditions we had, high radiation, and I am trying to
17 remember if I mentioned that the calculations showed that radiation level
18 in Goldsboro would be 10R, and I was thinking that in line with the dome
19 monitoring was what confirmed that we had a general emergency. And I can't
20 remember if I told them that or not, but at any rate

21 KIRKPATRICK: Go back to the radiation level, where?

22
23 KUNDER: In Goldsboro. After we initiated the site emergency, it took 15
24 minutes or so til the calculators were able to use the isopleths, and using
25

1 the source term from the reactor building dome monitor. They apparently
2 did a calculation and the resultant was that we would be seeing 10R at
3 Goldsboro. I believe that was a whole body dose. And I had thought at the
4 time that was one of the things that led Gary to declare that it was a
5 general emergency. I was not aware of what the radiation levels were in
6 the dome monitor, okay? And I thought initially we just, you know, we had
7 the site emergency because we had more than 1 radiation level in the plant
8 and that was pretty clear. But at any rate, I can't remember if I told him
9 that fact or not. But I do know that there was a team dispatched to go
10 over to Goldsboro, and the intent was to get a State Police helicopter in.
11 Someone else made the initial request and apparently made it in a separate
12 call to the State police. At least I thought that had occurred. I am not
13 sure if it really did. But a little later into the event I had talked to
14 the State police sergeant, and he wanted to confirm just what we needed.
15 And I told him, I didn't really communicate with Gary, but I told him what
16 I thought exactly we needed was a State trooper at the North gate to direct
17 traffic, a State trooper at the South gate, and by that time I was aware
18 that we would be diverting all the people that would be coming into work up
19 to the observation center. So, I am pretty sure I asked him for a guide at
20 the observation center. I said I wanted a helicopter to come in so that we
21 can send some offsite monitoring teams out. I thought the best place for
22 that guy is to come right on site and I told him I would notify security
23 that the helicopter was coming in and we'll have the radiation monitoring
24 team meet you up at the North end of the site. I knew the helicopter had
25 come in here once before, and you know, they can land up there without any

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1 problem. So I told him I need to have that done right away. Whether or
2 not the helicopter was enroute, I'm not sure. The helicopter did come in
3 pretty short order, as I recall, and I had told Dick Dubiel to reconfirm
4 that I had talked to the State police and that they are sending a helicopter
5 down and I called the security sergeant. I don't know who it was, but you
6 know I told them that the helicopter should be landing on the site to pick
7 up the radiation emergency teams. Dick took care making arrangements with
8 ECS to get the emergency team out and meet them and that's all I got involved
9 in that.

10
11 KIRKPATRICK: Okay.

12
13 KUNDER: I left the phone off the hook so that we could talk to Gerusky,
14 and I was trying to get Dick Dubiel free so that he could come in and give
15 him a better assessment of what radiologically we were seeing because I did
16 not have a good enough handle on that myself. From time to time he did
17 talk to him and I really can't remember how long or just when, but I tried
18 to get him on the phone occasionally to just make sure, hey, we are still
19 here, and just brief him on any changes. I think I probably gave him the
20 wind speed direction at least one time.

21
22 KIRKPATRICK: Did you remain in the emergency center there?

23
24 KUNDER: I was in the emergency center the whole--yeah, I remained in there
25 til later in the afternoon when I got called up with Gary Miller to the

1 Governor's office. So my function pretty much through the whole morning
2 was I would say two things: I tried to handle communications for Joe and
3 Gary, and certain amounts of coordination. I think I had called Security
4 to make sure the muster was being taken, to find out if they had a muster
5 yet, sort of the peripheral communications, and also all the offsite commu-
6 nications. Don Haverkamp called back and I had, I think I had--I'm not
7 sure how I had set it up with Don now. He either called back on the one
8 line and I answered it out in the control room and held that open, or he
9 called in and I told him I would call him back at a number, and I just
10 can't remember what I did there. But at any rate, I did have Don on the
11 phone and this was probably 8 to 9 o'clock, in that time frame. I briefed
12 him on what we had and I held the line open and I recall that he had people
13 in the office that were either on the box or they were there and he was
14 keeping them briefed. Basically, the I&E group who had set up a command
15 center. So I did talk to Don on several occasions on the phone, and it was
16 pretty much with respect to telling him where we were with the plant.
17 Trying to give him the scenario as I understood it from the initiating
18 event. I was aware at that time that we tripped because of loss of feed,
19 tripped a turbine, that tripped the reactor. Again, I still wasn't aware
20 that what happened to the feedwater emergency system and indicated that, I
21 am pretty sure in that point in time, that I was aware that we had essentially
22 a let down from the RCS and we had pressure having gone so low was, had
23 formed a steam bubble and exchanged the water from the head of the reactor
24 up into the pressurizer. That was the way I understood the real problem
25 that we were into at that point. That was the first part of my responsi-

1 bilities that morning, aiding in that respect in the emergency plan. The
2 other area was when Gary got together with, basically myself, Logan, Lee
3 Rodgers and Mike Ross, we discussed pretty much as a team what our next
4 move was with the plant. This was sometime after 8 o'clock. It was 8:30
5 or 9 o'clock that we pretty much left the emergency to the people that were
6 running it, you know. Gary _____. We were still concerned about the
7 reactor core. I recall we did reaffirm our main concern was the health and
8 protection of the public. We sort of reiterated that as a group, and made
9 sure that we had done everything for the plant. You know, the emergency
10 plan was implemented. We addressed the core, we were still injecting high
11 pressure injection, BWST was coming down, we still had our hot leg tempera-
12 tures pegged. I hadn't realized that in Unit 2, we had a wide range hot
13 leg temperature which goes to 800 degrees. I found out a little bit later
14 in the morning that they indeed were very high. They were at or above 700
15 degrees. I remember praying that we somehow would get a real break in the
16 system because we knew we had a bubble in there. Somehow we were vapor
17 locked. There was no way--we recognized we probably had a, the pressurizer
18 was indeed full of water, and we had vapor in the head of the reactor and
19 up in the loops. We were trying to get as much water in there as we could.
20 The pressure was still low. I guess it was still around 1,000 pounds, and
21 we wanted to try and get the pressure up and at that point in time as I
22 recall, we had the electromatic relief valve open and the RCV2 was open
23 because we felt, you know that was the only way we were getting any kind of
24 cooling. Inject high pressure injection and vent off through the pressurizer.
25 After, at one point, we all felt the best thing we could do was to try and

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1 get the pressure in the system up by closing the RCV2, the E.M. isolation
2 valve. And that was done. That was sometime, I estimate, around 9:30 or
3 something like that.

4
5 KIRKPATRICK: Excuse me, would you clarify that again? You said the pressure
6 was still down but you were charging water in, but you think it was going
7 out the relief valve? Is that correct?

8
9 KUNDER: Yeah, we had, at that point the philosophy as I recall was that we
10 wanted to get the flow through the core, using high pressure injection, and
11 by having the electromatic relief valve and the pressurizer open. We were
12 hoping to get some sort of flow through the core and out that path. The
13 thing is the pressure never rose. Pressure just wasn't going up. We felt
14 that the best thing that we could do to get the pressure back up was close
15 the relief valve and hold pressure at a high value and then continue the
16 venting through the pressurizer. We just sort of felt that we were going
17 to try and collapse that steam bubble that was in there. Get enough water
18 in there to make sure that the core was indeed flooded. We intuitively
19 felt that the core was flooded, but you couldn't prove it. There was no
20 indications that said, yes, indeed, you were indeed covered. Okay? We
21 felt that we were but one of the things that really bothered us badly was
22 the fact that the hot leg temperatures were still very high. And we felt
23 that we still had steam in there. I recall one of my big concerns became
24 that, my God, we are going to put water in the pot and if we're boiling
25 off, we are concentrating boric acid, and I was extremely concerned that we

1 might be crystallizing boron and get to the point where we don't have
2 enough room for water. Okay? We end up having a slush of boron in the
3 core, and what would happen then? So that's something that really worried
4 me. And I felt by trying to get the pressure up and trying to press the
5 bubble, maybe we can do a more effective job of circulating water through
6 the core by using the high pressure injection.

7
8 KIRKPATRICK: We'll cut the tape at this time. It's 9:34, April 25, 1979,
9 and we will resume on another side.

10
11 SHACKLETON: This is a continuation of the interview of Mr. George A.
12 Kunder. The time is now 9:36 p.m., April 25, 1979. Please continue.

13
14 KIRKPATRICK: George, at the end of your last tape, you were commenting on
15 boiling and--possible boiling of the coolant concentration of the boric
16 acid diffuser. Would you go into that in a little more detail.

17
18 KUNDER: Okay. We had been injecting high pressure injection all along.
19 Our temperatures in the hot legs were still--they were pegged on the panel
20 instruments and by that time I was aware that the temperatures were up
21 above or at 700 degrees F. It was my perception that we were somehow vapor
22 locked, that we had a steam bubble at the top of the core and somewhere in
23 the legs, had no way of knowing exactly where. We were concerned that we
24 were not getting adequate cooling. We were fairly confident, intuitively,
25 that we had the core covered, but one of my specific concerns was, if we

1 are not getting good water circulation, then the cooling mechanism was--we
2 were getting--had the core covered, but it was continually boiling off and
3 we were steaming. And that would or could lead to concentrating the boric
4 acid to the extent, I was afraid, we might be getting a slush of boric acid
5 in the core and ultimately lose the cooling that we had at that time. So,
6 as I recall, the logic for making the decision to close the pressurizer
7 E.M. valve and get pressure up was to try and collapse that bubble. Okay.
8 And see if we can get the level in the system up and try and make a run for
9 filling the loops and getting the natural circulation cooling or something
10 like that. The concept was that we may be able to get more effective
11 cooling using the high pressure injection through that mode. So, we all
12 agreed that the we ought to go that way. I can't recall now whether Lee
13 Rodgers had communicated with Lynchburg to determine if that was the way to
14 go in that particular item, but at any rate, we did do that. The pressure
15 did come up and we seem to be about over a half hour to maybe an hour-and-
16 a-half time period. The pressure got up to above 2,000 lbs, and it was
17 decided by, I guess Gary Miller that we try to hold the temperature between
18 the 2,000 and 2,200 lb band by cycling RCB2, which is the EM block valve.
19 That was done and we were in that mode for a considerable period of time,
20 probably an hour or longer. And they were cycling that valve, which is a
21 motor-operated gate valve, about every couple minutes to maintain that
22 pressure band. I believe the decision was made to widen the band to decrease
23 the amount of cycling on the valve, and based on our experience in Unit 1,
24 that valve doesn't perform very reliably through continued cycling. We
25 were afraid of maybe developing packing leaks or at some point in time the

1 motor might fail, or something like that. So we wanted to just limit the
2 number of times the valve cycled. We recognized that we hadn't really made
3 much progress by increasing pressure, in the sense that we were still
4 injecting from the BWST and we only had so long to operate in that mode
5 before we would be out of boric acid in the BWST, and our problem was what
6 are we going to do next? We still didn't have indications that confirmed
7 we had circulation in the core. Again, we still intuitively felt that the
8 core was covered and we were getting some cooling, but there was no clear
9 evidence that we were getting circulation and my concern for that crystal-
10 lization still sort of existed at that point.

11
12 KIRKPATRICK: This is Kirkpatrick. At this time were you taking any core
13 temperatures or getting core temperature readouts?

14
15 KUNDER: I personally wasn't. Ivan Porter had been, throughout much of
16 this time period, looking at the hot leg temperatures. He had, as I
17 recalled, hooked up a digital volt meter to the hot leg temperature that
18 goes into the RPS on the RPS channels in the control room.

19
20 KIRKPATRICK: Up in the hot legs themselves?

21
22 KUNDER: Yes, and he used the output of that and correlated it to the
23 calibration curve for that RTD and was able to determine temperature. It
24 did agree fairly well with the wide range temperatures, and it was sometime
25 during the morning, I'm pretty sure, that he or someone else had looked at

1 the in-core thermocouples. Unit 1 do not have in-core thermocouples, and I
2 was unaware that Unit 2 had them installed. I think Unit 1 probably has
3 the in-core thermocouples but they're just not hooked up, as I recall. But
4 Unit 2 had them hooked up, and I was really unaware of the information that
5 you can get from them, but he had been looking at that and I recall after-
6 wards that they saw very, very high temperatures. They ranged from some
7 value close to what the, I guess, I'm just guessing now, they had some
8 question marks, I know, which meant that it was out of the range of the
9 computer or got a bad signal, but they had high temperatures--up in the
10 2000° range or something like that. I did not see the numbers, I'm saying
11 that's based on data that I've seen since this event occurred.

12
13 KIRKPATRICK: Do you know if any of these temperatures were in the periphery
14 or do you know the character aspect, you can't characterize it that well?

15
16 KUNDER: I can't characterize it that well, and I believed that Gary Miller
17 had specific conversation with Ivan or the people that was getting the data
18 for him, but I didn't participate in that directly.

19
20 KIRKPATRICK: The decision then was made to depressurize I presume ...?

21
22 KUNDER: Yeah, we talked about that for some length. We felt that probably
23 the one way we can assure that we got water going into the core was to get
24 down in pressure low enough to get the core floodtanks going into the core,
25 and also our thought was at that point, we try to make a run through for

1 getting on decay heat removal, which means we got to get down to pressure
2 of around 320-325 lbs. We finally agreed that we'll allow--and the other
3 concern of course was we were afraid we were going to damage the block
4 valve--at least the motor, operating on it from cycling it so frequently.
5 So, we decided we would open the block valve, allow the system to depres-
6 surize, and try to get core flood initiated into the core. And that was
7 done, and this was somewhere around in the region of 12 or 1:00 something
8 like that. And the pressure did come down, and it came down fairly rapidly
9 at first and tapered off. It did come below the 600 lbs and allowed some
10 water to start to dribble in.

11
12 KIRKPATRICK: Were you still running the HPCI at this time?

13
14 KUNDER: Yes, we never stopped running high-pressure injection to my knowledge,
15 and Gary Miller made it pretty clear that he didn't want high-pressure
16 injection isolated or stopped for any reason, just to make sure that nobody
17 got the wrong impression out at the console. I think that the flow rate
18 was cut back somewhat to conserve water. I think that it was probably cut,
19 I think I recall that it was cut back to no less than 300 gpm total input
20 to the core. That's a recollection, I never really confirmed that.

21
22 KIRKPATRICK: And you started... you got down... and then... you... the
23 core flood tank really wouldn't dump, apparently.
24
25

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1 KUNDER: Well, we did move water into the core. It wasn't as much as I was
2 hoping for, I was hoping we could get the pressure down a lot faster and
3 really empty the tanks. That didn't occur, we emptied probably 10 to 20%,
4 and a little bit more, from the core flood tanks and the pressure was down
5 around, oh it sort of bottom out around 450 maybe as low as 440 lbs in the
6 RCS. It was about that time that Gary had indicated to me that he was
7 required to go up with Jack Herbein to the Governor's office, and I didn't
8 like that at all. We were in a situation where I felt we needed the exper-
9 tise. He asked me to go along because he didn't have all the details of
10 where we were at, and what had happened clearly down on paper or clearly in
11 his mind. He wanted someone technical to back him up, and at that time I
12 did have a lot of the details and the thought processes and what we did. I
13 did in preparation for going up to the Governor's office, I did try to get
14 information from the... all the logs we had gotten zerox's of the sequence
15 of events. I had to go over to Unit 1 to get some of that, because the
16 nuclear engineers, Mike Bensen, was trying to get that information and
17 retain it so it wouldn't get lost. I had to get that from him, so I had to
18 make a trip over to Unit 1 control room prior to going uptown with Gary. I
19 spent probably 10 or 15 minutes trying to gather information and get copies
20 of the printouts in the Unit 2 control room, marking down the status of the
21 plant (pressure, temperatures and so forth), and I made a few notes. Then
22 I went over to Unit 1, got a xerox copy of the sequence of events, and the
23 alarm printout and I got a copy of the communications log that was being
24 kept with the on and off-site monitors. The ECS by the way had been removed
25 to the Unit 2 control room earlier in the day because of higher radiation

1 levels or higher airborne levels in the Unit 1 control access area. Later
2 on, we had again, high airborne in Unit 2 control room. It wasn't too
3 high, but it was enough that we had to don respirators and it was decided
4 to move the ECS over to Unit 1, so that had transpired before 12:00 noon.
5 So, I went over to get that information and then I met Gary at the service
6 building exit, and we both got into the car and went out to the North
7 Bridge, and there we met Jack Herbein. We stayed in that same car and went
8 up to the Governor's office.

9
10 KIRKPATRICK: How long was you gone from the time?

11
12 KUNDER: That was--we were gone roughly an hour and a half. At first I
13 thought we had left around 1:30, but after reviewing some of the sequence
14 of events and some of the plant parameters, I recalled when I left the
15 plant the pressure was about 450 lbs. And I had forgotten that the pressur-
16 izer level for the first time through the morning had come on scale. It
17 looked like we were starting to get some method of circulation cooling, but
18 then the pressurizer level went up again and they had lost it. That was
19 about the time that I left and that was, after looking back at it again, it
20 was somewhere around 2 or 2:30 in the afternoon. We were offsite for ...
21 went out to the Governors, went up to Bill Scranton's office actually, and
22 we had talked briefly to Herman Kneecamp who was already up there and had
23 spoken to the officials and went inside. I went into an office adjacent to
24 Bill Scranton's office and called back to the plant to establish some
25 communication with them and to see if anything had changed in our absence,

1 and I held the line for I guess it was 10 or 15 minutes. Meanwhile, Gary
2 and Jack went in and had their conversation with Bill Scranton. I guess we
3 were probably there for at least half an hour, probably 45 minutes, maybe a
4 little bit longer. I do recall when we came back, we tried to pick a route
5 where we didn't have too much traffic, because it was around 4:30 to 5:00,
6 somewhere in that time frame. We got back to the plant, and I believe it
7 was when we got back a decision was made to take the pressure back up, and
8 again attempt to get the loop--at least one loop--filled, and see if we can
9 start a pump. I don't think it was too long after we got back to the plant
10 that that became our goal, and Jack Herbein had ordered that we take the
11 plant, try to take the plant solid, and I guess we were skeptical of our
12 ability to really do that. Any rate we did charge it max flow rate, as I
13 recall. This is a little fuzzy, I'm not really sure what the flow rates
14 were at that point. But we did attempt to charge the system, to get the
15 pressure up, and hopefully fill the loops. The decision was made to try to
16 start the one reactor coolant pump. Lee Rodgers had been on the phone with
17 Lynchburg, I guess, during most of the day. He was checking out with
18 Lynchburg whether it was okay to start the pump. At any rate the pump was
19 started. Initially the pressure was up around 2000 lbs, somewhere close,
20 and pressure initially dropped fairly radically and they secured the pump.
21 I wasn't up at the console really observing this. I really have a hard
22 time recalling what specifically I was doing, but I was on the periphery
23 following the operation on the console. It was apparent that the decreasing
24 pressure was due to the cooling that was occurring when we started to pump
25 and Joe Chwastyk was the Shift Supervisor on at the time. And it was just

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1 a matter of getting the pressure back up and making a second attempt, which
2 was done. I helped to participate in that operation. They put me back
3 behind the panel to close the automatic isolation valve or the valves DHV
4 8 A & B. This is the outlet of the sodium hydroxide storage tank,s because
5 the first time that they had a pressure drop I believe they had high-
6 pressure injection, which was no problem, except it initiated a lot of
7 other equipment, opened those valves. It was not desired to inject sodium
8 hydroxide into the sytem at that point. I'm not sure what all else occurred
9 when you intiated high-pressure injection over in Unit 2, but I was there
10 to close those valves, and they did make another shot at starting the pump
11 and expecting the pressure to come down. They were going to try and keep
12 it on this time and see how far down it came, and if it leveled off, fine.
13 I don't recall if they established a limit on the pressure drop, but it did
14 come down to somewhere in the range of 1500 lbs, perhaps maybe a little bit
15 lower. But, when we ran the pump at that point, the hot leg temperatures
16 came down into range very close to the cold leg temperatures and shortly
17 thereafter I believe we got flow established in the B loop as well. Of
18 course, at that point we knew then we had flow in the system and, by the
19 way, the one valve, DHV 5 I believe it was, did open. I immediately closed
20 it.

21 HUNTER: The sodium hydroxide valve?

22
23 KUNDER: Yes.

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25

1 HUNTER: The 8A or 8B valve?

2
3 KUNDER: The one valve, I just, I hit them both closed just to make sure
4 they did stay closed or go closed again. I recall assigning Don Berry to
5 take notes to make sure we were keeping a record of what was going on. He
6 was doing this also behind the console with me.

7
8 KIRKPATRICK: When would he have started taking notes, during the day or
9 ...?

10
11 KUNDER: No, I don't think. It was too early in the day, I just rec...
12 periodically, I recognized that notes were not being taken, because it was
13 a lot activity, and I just seem to recall just prior to that event that I
14 asked them to keep good notes on everything that transpired so that we had
15 a record. Its awful hard for the operators to keep a log on ..

16
17 KIRKPATRICK: I notice that, realizing that things were going on ... trying
18 to build a log now, really. After you had the pump on again, did you feel
19 like things were... that you had things fairly stable, then, far as cooling
20 flow and ..?

21
22 KUNDER: I think we felt that way. We felt at least we made a major mile-
23 stone. And we reestablished flow and it was stable flow, and we had control
24 of pressure, the pressurizer level was still rather high, but it was on
25 scale and TH came into close proximity to TC on the A loop, and it was very

1 shortly thereafter that same thing occur on the B loop. And for the first
2 time, I think we all felt pretty relieved.

3
4 KIRKPATRICK: Was the pressurizer level on scale, you said down to indicate...?

5
6 KUNDER: It was on scale and as I recall somewhere around 300 ...

7
8 KIRKPATRICK: Was that from the pressurizer heaters and actual steam bubble
9 on the pressurizer, or was it just there?

10
11 KUNDER: Well, we, I think we felt we had steam bubble. I know earlier in
12 the day the pressurizer heaters were not very effective. We apparently had
13 lost a number of them due, presumably to the moisture conditions in the
14 reactor building. But from the time we stopped venting from the pressurizer,
15 the pressure had come down and presumably some of the condensation, some of
16 the moisture, permitted the heaters to dry out sufficiently, so we could
17 reset them and we were getting a little bit more performance out of the
18 heaters.

19
20 KIRKPATRICK: Okay. We've been through the complete event, and I think we
21 got your position through the whole event, and we can keep that and take
22 points for the radiological people to talk with you on the health physics
23 aspects of that. If we need more details we've got ... pick areas to talk
24 specifics to you. I'm saying that we will be talking with you again, I'm
25 sure. We will schedule you in again next week, or whatever. Don, do you
have any questions?

1 HUNTER: No I believe I don't have any at this time.

2
3 KIRKPATRICK: It's getting late and there's no sense going on. I'm finished
4 for now, and I appreciate your time. Do you have any comments that you
5 like to put forth? As I say to everybody, is there any area that we need
6 specifically to make sure we do get involved in, that we don't overlook
7 anything, because again we're coming in trying to rebuild this thing.. We
8 have a fairly decent sequence, and we're putting everything together, but
9 it's going to be. We don't want to overlook anything, because we're here
10 to find out why you were presented with what you were presented with.

11
12 KUNDER: A feeling that sort of pervaded the control room was that, and it
13 bothered me, was that we didn't have the ability to control what we had, we
14 didn't have the ability to vent off the system. Like I said, I was at one
15 point just praying that we didn't blow a reactor cooling pump seal, or
16 something we could blow off the top. That way, we could vent off the steam
17 and assure that we were getting flow through the reactor. It was more than
18 a frustrating feeling. It was sort of a futile feeling, that we weren't
19 able to get flow through the system at that point in time. Of course, we
20 were thinking of all kinds of design changes that we'd love to see to allow
21 us to go for that situation. I've got some recommendations, probably more
22 generic recommendations, that I've already taped and given to Gary Miller
23 and he's compiling those recommendations along with those of other people
24 in the plant to present to Senior Management, and so forth. No. I don't
25 think I've any other comment.

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1 KIRKPATRICK: Thank you. Think about--think about what we can talk about
2 again. If something comes to mind, make sure you jot it down, 'cause when
3 we do talk about these areas at the time the block valve was closed, oh
4 yes, by the way, that's when the source range did something whatever you,
5 ... recall somebody saying something. Try to think along that line and
6 don't hesitate to jot something down, and we'll try to make sure that we
7 cover all the aspects of this thing, that we feel and you feel are necessary
8 for us to be covered to make sure we get the answers. We are not ever
9 going to have this chance again. And we didn't expect to have it this
10 time, but since it is here, we're going to try to find out what happened.

11
12 KUNDER: Now, I certainly want to see that.

13
14 SHACKLETON: Okay, thank you very much Mr. Kunder, the time is now 10:03
15 p.m. April 25, 1979, and we'll end this interview.

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