

THIRD MEETING OF THE

PRESIDENT'S COMMISSION ON THE
ACCIDENT AT THREE MILE ISLAND

NEW EXECUTIVE OFFICE BUILDING
ROOM 2008
WASHINGTON, D.C.

THURSDAY, MAY 31, 1979
MORNING SESSION

ATTENDEES

COMMISSIONERS

John G. Kemeny, Chairman
Bruce Babbitt
Patrick E. Haggerty
Carolyn Lewis
Cora B. Marrett
Lloyd McBride
Harry McPherson
Russell Peterson
Thomas Pigford
Theodore Taylor
Anne Trunk

STAFF

John Fabrikant
Barbara Jorgenson
Bruce Lundin
Ronald B. Natalie

APPEARANCES BEFORE THE COMMISSION

Gary Miller, Station Manager, TMI-I and TMI-II, Met Ed
Richard Dubiel, Supervisor of Radiation Protection and
Chemistry, Met Ed
George A. Kunder, Superintendent, Technical Support, TMI-II,
Met Ed
Michael Ross, Supervisor of Operations, TMI-II, Met Ed
Joseph Logan, Superintendent, TMI-II, Met Ed
James S. Floyd, Supervisor of Operations, TMI-II, Met Ed

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P R O C E E D I N G S

CHAIRMAN KEMENY: Will the meeting please come to order.

Yesterday afternoon in our hearings we heard first from the top management of the companies involved, and then we started probing in chronological order, starting with an event that took place two days before the accident, and then interviewed the individuals who were actually in charge of the control room at the time the accident happened.

This morning we're going to go on to talk to the individuals involved in the emergency team that set off to take control later in the morning. And will Chief Counsel please call the next set of witnesses.

MR. NATALIE: Would Mr. Miller, Mr. Dubiel, Mr. Kunder, and Mr. Ross please come forward to be sworn.
WHEREUPON

GARY MILLER, RICHARD DUBIEL,
GEORGE A. KUNDER, and MICHAEL ROSS
were duly sworn and
testified as follows:

MR. MILLER: Mr. Chairman, if I could, I'll introduce the members of my panel and describe their function to you.

CHAIRMAN KEMENY: Yes, Mr. Miller, incidentally, I understand we have received written testimony from you. May I say that that will be made part of the record of this

meeting, and I understand you will also make an opening statement. Is that correct?

MR. MILLER: Yes, sir.

CHAIRMAN KEMENY: I would appreciate if you would introduce your colleagues and then be ready to hear your statement.

MR. MILLER: On my far left, Mr. Richard Dubiel. He's the Three Mile Island Chemistry and Health Physics Supervisor for both units.

On my left, Mr. George Kunder. He's the Technical Superintendent for Three Mile Island Unit 2.

On my right, Mr. Ross. His normal function would be the Unit 1 Operations Supervisor.

I'll briefly read a summary of my testimony and then be open to questions.

I am employed by Metropolitan Edison Company as the Station Manager for the Nuclear Generating Units at Three Mile Island, Middletown, Pennsylvania. In this position I am responsible for the operation and maintenance of Units 1 and 2 at Three Mile Island. To accomplish these organizational objectives, I have reporting to me directly Unit Superintendents, Maintenance, and Administrative Superintendents. I report directly to Jack Herbein, Vice President, Generation, Metropolitan Edison.

I will not attempt in this summary to present a

detailed event sequence or an analysis of the events at TMI 2 in those early hours of March twenty-eighth. I will attempt to present the actions and logic as I proceeded through the events of that day. The times I give are approximate and are the best recollection I had within approximately two weeks of the accident.

Shortly after 0400 the morning of the twenty-eighth, I was informed that the reactor and turbine at Unit 2 had tripped. Unit 1 at this time was in the hot shutdown condition and not operating. Unit 1 had just completed a successful refueling. At 0515, I called the Unit 2 Control Room to determine the status of the plant and to discuss the events which had occurred to that point in time. George Kunder, the Unit 2 Superintendent, answered the phone, and informed me that the recovery procedures were underway and that the plant was stable at that time. Following some discussion of plant parameters, two of the plant parameters disturbed me: one, a low pressure, I believe approximately 1100 psi; two, pressurizer level at essentially the high point, 395 inches, in other words, almost solid. At that time, I informed Mr. Kunder that I wanted a conference call between my boss and the B&W representative to discuss the plant conditions further. That call, to the best of my recollection, took place around 6:00 to 6:10 in the morning, it was initiated. During this call again, we discussed the

plant conditions, and I believe at that time the pumps had just been turned off. We discussed whether the electromatic was thought to be shut, and whether there was any radiation indication. There was no indication of radiation. The electromatic relief valve was thought to be shut. It was also believed that possibly the rupture disc on the reactor coolant drain tank possibly ruptured, and that there was some water in the Reactor Building sump. It was decided at this time that I should go directly to the site in lieu of a previously scheduled meeting which I was to attend in New Jersey that day.

During my preparations to proceed to the site, which I might say included other phone calls to personnel that were going with me to New Jersey, so it took me some matter of minutes, I received a call from the Unit, stating that there were radiation indications inside the plant. To my recollection, this was around 6:45.

I immediately went to the site. I entranced through the South Gate. I got to the Control Room around 7:05, took immediate steps to identify and evaluate the situation. The Shift Supervisor, Mr. Zewe, had declared a site emergency. I formally assumed and announced that I was in charge of the Control Room, and I appointed senior personnel that were available already in the Control Room to direct implementation of the emergency plan, set up

monitoring of radiation levels, establish communications, and to ensure that the Unit operation was kept in a stable condition. I formed essentially a team of senior people, called them my think tank, or my emergency command team; I met with them continually throughout the day in a room, the Shift Supervisor's office, as we've had it called, inside the Control Room but removed from the control panels, so as not to interfere with the operators.

Following these discussions where we discussed the plant's status, made recommendations, I made decisions, and those decisions were implemented in the Control Room. At around 24 after seven, based on the status of the plant and the information available to me and mainly, as I remember it, the reactor building radiation monitor, I declared a general emergency and initiated the implementation of the steps thereby required in our emergency plan.

At approximately 8:00 I asked Jim Seelinger, the Unit 1 Superintendent, to come over to the Unit 2 Control Room to help participate in some of the discussions of the group I discussed previous. This was due to the fact Jim had been in Unit 2 the year previous and had a license and had experience in Unit 2.

The high pressure injection was still on. The hot leg was essentially on the indicator pegged high. Cold leg was almost pegged low. The Bravo steam generator was

isolated, and I believe at approximately a 95 per cent level, and the A steam generator downcomer was approximately 510 degrees. We attempted to start reactor coolant pumps. We got the 100 amp indication and we considered that we were cavitating and that we were not pumping water. Looking at the temperatures we had and the pressures in the steam generators, we considered there was some natural, some limited amount of natural circulation occurring. We decided firmly that high pressure injection would be continued.

During this same period, at a meeting of this group, I formalized the goals and objectives for that day, and stated them throughout the day to help maintain our priorities, and in my mind they were to protect the public and to assure the Emergency Plan and Procedures were carried out; to maintain the core covered with water and to cool and stabilize it; to protect people and minimize plant damage.

We considered at this time the Unit was essentially stable in that we had high pressure injection on; we were attempting to pump and hopefully maybe get water to the point where we could run reactor coolant pumps or begin to cool down the plant. I did direct some readings be taken on a thermocouple, which is a part of the incore detector. Those readings were given back to me during the initiation of the Emergency Plan by the Instrument Engineer. The readings were given to me varied from no reading, some reading, 200

degrees, and a couple high readings, with the discussion that they might be unreliable and probably were.

We charged the plant for approximately three hours and pressure cycled somewhere around two thousand pounds with high pressure injection somewhere in the area of four to six hundred gallon a minute. Plant parameters remained essentially the same. The borated water storage tank, which is our water source, was essentially going into the core and out through the pressurizer to the floor of the building, and the level on that tank was coming down to the degree it was beginning to concern us, although not overly concerned at that time. If we had lost the BWST, we would have had to go into another mode where you would have taken water either from an alternate source or from the reactor building itself, which is another operation and would have been, could have been done, but would have required more operations with the things that were already going on.

Another concern we had was we were using the upstream isolation valve for the electromatic valve, and it's a gate valve, a design valve, it's not designed to throttle, and our concern was that it might fail open or shut if we used it excessively.

During the same period we lost auxiliary steam, which we need to maintain a vacuum in the condenser. As a result, we could not steam the steam generator, which is one of our

heat sinks, into the condenser, so we kept the B Steam Generator isolated because we suspected a primary leak into it, and we steamed the Alpha Steam Generator to the atmosphere. Prior to that steaming we took a water sample and placed a man on the roof with a radiation monitor to ensure we were not releasing radioactive steam.

In another meeting of the senior group, which I fully detailed the members of that group in my testimony, we discussed the indications we had, and we wanted to be totally sure the core was covered. After a long discussion we decided to lower pressure and attempt to use the core flood tanks which go into the reactor vessel through separate nozzles and which have a level indicator on them, to give ourselves this added assurance the core was covered. We also saw this as another step towards the decay heat mode or the start of reactor coolant pumps which we considered to be a more assured condition of stability and safety.

During the afternoon I was requested by management to cease steaming the Alpha Steam Generator. Since we had regained some vacuum, we were able to eventually direct flow back internally to the condenser. At this time plant pressure was about 440 pounds; core flood tanks came down about a foot to a foot and a half, which gave us in our minds assurance that the core was not, was being covered, or we would have seen a larger level decrease in those tanks. At this time I was

requested to go to the Lieutenant Governor's office and participate in a briefing. I left the plant somewhere around 2:30 and returned around 1600. When I returned, the Unit parameters were essentially the same, and I might say that during the maneuver to core flood, we had seen some indication of the alpha loop beginning to cool off some, by the indications we had.

From the beginning of the incident, I continuously monitored the execution of the Emergency Plan. We had promptly made all notifications to offsite agencies and had all offsite and onsite teams out taking readings from early in the incident.

Early in the accident, open phone lines were established between the plant and both, in both Control Rooms, and this included the Pennsylvania Bureau of Radiological Health, and with the NRC Region One.

In the early phases, releases on the order of one MR per hour offsite were given to me, and the highest I heard that day was seven to 14 later in the day. As the day progressed, readings offsite of two to three, to 10 to 20 occurred. The readings were affected by wind conditions, and the wind that day was very slow, and essentially died many times or circled, so that the worst radiation exposure was occurring on the site.

Early in the evening following discussions with my

group plus discussions with management, we again decided to take the Unit up higher in pressure, and this was with the concurrence of Engineering in our company and with B&W; plus B&W had told me I needed 400 gallons a minute to assure core cooling. We began preparations to charge solid and again start a reactor coolant pump. When these preparations were made, I directed the Control Room to start the One Alpha Reactor Coolant Pump, we received flow indications, pressure dropped from about two thousand to 13 hundred and 20 pounds, and temperatures stabilized in all loops, as best I remember, around 380 degrees. The Unit appeared stable with the necessary flow and cooling to maintain core parameters.

It should be noted that although this emergency lasted for an extended period, the atmosphere within the Unit remained calm and professional. The response of all the Met-Ed personnel was excellent, and the courage of the operators and healthy physics and maintenance personnel was evident throughout the day. There not, during the entire time, a period of panic or unsureness within that Control Room.

I believe we minimized the exposure of the public and of our own people, and placed the plant in a stable condition from a situation none of us had been schooled in and few of us, including myself, believed we would experience.

Thank you.

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CHAIRMAN KEMENY: Professor Pigford.

COMMISSIONER PIGFORD: Mr. Miller, I'm referring to a document which is titled "TMI Station, March 28, 1979 Incident, Statement by G.P. Miller, Station Manager." Can you tell us what date this document was written?

MR. MILLER: It was written about August fourteenth, fifteenth, or sixt--April fourteenth, fifteenth, or sixteenth, about two weeks after the accident. Some of the notes were made prior to that, but it was essentially written that weekend.

COMMISSIONER PIGFORD: Are there any things in that document which you would now want to change, or--

MR. MILLER: No, I tried to write that document without being influenced by all the analysis that occurred subsequent to the accident, which is hard to do, but I tried to leave the thoughts in there as they were that day.

COMMISSIONER PIGFORD: Yes One of the strong points you make in this document, I found on three instances, is that you had personally directed that the high pressure injection water be kept on. Correct?

MR. MILLER: Yes, sir.

COMMISSIONER PIGFORD: When did you give that directive?

MR. MILLER: At around the time frame of eight to eight-thirty in the morning. There was discussion in my

senior group relative to whether we should or should not continue high pressure injection. And in fact at one point, some members of the group had the opinion to cut, to throttle it back more. I at that time told Mr. Ross that it would be kept on unless I personally approved it, and I did that just because I knew that was a mode of pushing water through the core.

COMMISSIONER PIGFORD: You did not give that any such directive at the 0515 telephone conversation?

MR. MILLER: No, sir.

COMMISSIONER PIGFORD: And what time did you actually arrive at the plant?

MR. MILLER: About five after seven.

COMMISSIONER PIGFORD: Yes. Did your directive require a certain minimum amount of high pressure water to be kept going into the reactor?

MR. MILLER: I don't believe I gave Mike a number.

MR. ROSS: No, I never received a number. We were told in the range of 400 to 500 gallons a minute.

COMMISSIONER PIGFORD: How many different pumps does that correspond to?

MR. ROSS: You can do that with one makeup pump.

COMMISSIONER PIGFORD: Is one makeup pump with water flowing at that rate sufficient to keep the core cool and covered if the reactor coolant circulating pumps are not

running?

MR. MILLER: In the analysis, I believe that it is that we could have a single failure and run one makeup pump on the conditionants and have enough core coolant.

COMMISSIONER PIGFORD: Does it mean, then, because evidently the, it's now concluded that during a portion of the incident, the core became uncovered--does it mean that during that time, whenever that occurred, the high pressure injection flow was at a rate less than that from one pump?

MR. MILLER: I don't personally know the exact period where we pinpointed the core became uncovered. I understand it to be at some point after we secured the reactor coolant pumps. At that time the Shift Supervisor, Mr. Zewe, has testified and told me that he had full high pressure injection, and one of the reasons for that was they had seen an upscale nuclear indication and the boron sample, and they had instinctively gone to two pumps, and I thought a thousand gallon a minute. That's my understanding at that time.

CHAIRMAN KEMENY: I'm sorry. What time frame are you in now?

MR. MILLER: I'm talking somewhere at a six o'clock time frame in the morning. That's something that I found subsequently, though, I might say. I didn't pursue that that morning in those exact terms.

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COMMISSIONER PIGFORD: Was there some time in which the high pressure injection flow was less than that from one pump?

MR. MILLER: Are you asking me from four in the morning on, or--

COMMISSIONER PIGFORD: Any time.

MR. MILLER: I didn't that day have personal knowledge of the exact flow rates from four to seven. I don't believe we had less than one pump's from seven on. Mike?

MR. ROSS: To my knowledge, we never had less than one pump from seven o'clock on.

COMMISSIONER PIGFORD: Yes, now, have you read your company's sequence of events in terms of what happened prior to seven o'clock?

MR. MILLER: Yes, sir.

COMMISSIONER PIGFORD: During that period, prior to seven o'clock, was the high pressure injection flow ever less than that from one pump?

MR. MILLER: I believe that in that period it's possible that the high pressure injection flow was throttled to a lower value, was not lower than one pump, but might have been lower than the total capability of one pump, but that indication is only available on an instant readout. In other words, there's no recorder that I know of of high pressure

flow, so I'm going on what the operators have said, when I say that, before I got to the plant.

COMMISSIONER PIGFORD: From your analysis now, your own understanding, if the high pressure injection flow had been kept at the rate equivalent to one pump unthrottled, would there have been any loss of water uncovering the core?

MR. MILLER: I don't know the answer to that personally. In the analysis, it should not be capable of occurring. I don't--I think it might--it would matter--if you kept the one pump on from the very beginning of the scenario and never throttled back, I believe we're designed to survive that. If you throttle back at any time, you change the assumptions that go into that. On that basis, I think we could survive it, but I've not looked at calculations.

COMMISSIONER PIGFORD: By throttling back, you mean reducing the flow to a level less than that from one pump wide open?

MR. MILLER: Yeah, and I'm nominally picking 500 gallon a minute, which is one pump wide open in my mind.

COMMISSIONER PIGFORD: In your statement, you state that at 0515 A.M., you telephoned the Control Room 2 to find out the status of the Unit to review recovery actions, and you were informed about the turbine and reactor trip, and that recovery was in progress in accordance with designated procedures.

Now evidently at this time already the pressurizer level had given a great deal of problem. There already was a ruptured disc in the reactor coolant drain tank. Did you know about that at that time?

MR. MILLER: During that call, that--I don't remember specifically, but that may have been discussed. I knew about it by six o'clock.

COMMISSIONER PIGFORD: Now what are the designated procedures that apply to this situation? Are there some emergency procedures that you're speaking of?

MR. MILLER: I was looking at specifically the turbine reactor and I knew there had been a safeguards initiation. I was looking basically at those three procedures being the ones that I was discussing. At the same time I was also, since both units were in a hot condition, concerned over the way we proceed that day from a trip condition, not from a safety point, but from a standpoint of both units shut down hot, we've got to make a choice of cooling one of them down because of the support services in that, so I was thinking of priorities as much as recovery at that point.

COMMISSIONER PIGFORD: Were you told by the person that you talked with about the seeming conflicting data, the problem with the pressurizer level seemingly conflicting with the pressure measurement itself?

MR. MILLER: I can't remember the way it was discussed

in context. I think it bothered both George and myself that the pressure was low and the pressurizer was high. From that trip it just--I would have expected the pressurizer to have gone the other way.

COMMISSIONER PIGFORD: Whom did you talk with?

MR. MILLER: George Kunder.

COMMISSIONER PIGFORD: And yet it was your understanding that things were proceeding according to designated procedures, then. Yet I got the feeling from the operators we talked with yesterday, Mr. Frederick and Mr. Zewe, that they felt they were out of the realm of anything that they had ever been given instructions on with regard to either training or emergency plans. And that's why I'm questioning your concept that things were going in accordance with designated procedures. Could you please explain?

MR. MILLER: I specifically asked George the question, were we using the procedures for the events that had occurred? And the answer I got was yes. Now when I heard that the pressurizer was high and the pressure was low, George couldn't explain that to me, and I, you know, if I could think now of a hundred questions I'd like to have asked, but I didn't think of those. The only reaction I had personally was to set up a call with the B&W guy and with my boss, who technically understands the plant very well, and I was trying to get a session going where we determined what we were doing.

So I was told that the procedures were being followed. I don't think I recognized the anomaly you're talking about as well as I do today. I recognized it instinctively, or I wouldn't have gone on and made a conference call and stayed in the area.

CHAIRMAN KEMENY: Professor Pigford, could I just ask a couple of questions to get the time sequence clear? You were talking to Mr. Kunder. That means Mr. Kunder must have gotten to the plant earlier than you. What time did you get there, Mr. Kunder?

MR. KUNDER: I arrived at the North Gate at about 4:45, and I believe I was into the Control Room in Unit 2 about 10 minutes or five minutes of five.

CHAIRMAN KEMENY: So you were there actually before five o'clock.

MR. KUNDER: That's correct.

CHAIRMAN KEMENY: Were you aware at the time that the high pressure injection system had been throttled way back?

MR. KUNDER: I thought that it had been, although I did not confirm by looking at the instrumentation that it was indeed throttled back or just what the condition was.

CHAIRMAN KEMENY: You were aware that this is not normal procedure under a reactor trip.

MR. KUNDER: Well, I can go into a little bit of

the detail on my perceptions as I arrived in the Control Room. My initial reaction was to question the operator and the Shift Foreman as to what he was experiencing. And it was evident to me that there was a great deal of concern being paid to the apparent high level in the pressurizer. And I later learned also that the pressure was low and that they thought that the drain tank rupture disc had ruptured as a result of apparently a lot of steam going into the drain tank. The reason for the high pressurizer level couldn't be explained by the operators, and they were trying to ascertain why that was occurring. Normally on previous incidents, if you had a transient induced safety injection, that is due to a trip and you had a rapid cooldown of the primary coolant, that would tend to reduce the pressure as a result of that. And that would actuate your engineered safeguards; the high pressure injection to 1640 pounds pressure in the RCS.

The response that I'm sure the operators have and myself have learned is to--the pressure would increase and the pressurizer level would increase and that would signal to the operator that would be symptoms of recovering the inventory and pressure in the RCS as a result of the injection of high pressure injection water.

In this case, apparently the operators had seen the pressurizer level come up and it came into the normal operating

range and indeed continued to rise, and it was my impression, based on some quick questions that I had asked the operators, that they had throttled back, and I thought that they perhaps had secured it, but I didn't confirm--

CHAIRMAN KEMENY: When--this is the last question-- when you talked on the phone with Mr. Miller a little later, did you report to him that the HPI had been throttled back?

MR. KUNDER: I can't remember.

CHAIRMAN KEMENY: Professor Pigford.

COMMISSIONER PIGFORD: Mr. Miller, after you gave your direction concerning keeping the high pressure injection pumps on, was there any time during which only one pump was on?

MR. MILLER: I can't personally answer that. Mike, can you tell?

MR. ROSS: Yes, there were times when there was one pump on.

COMMISSIONER PIGFORD: And apparently you did not-- apparently that was all right with you.

MR. MILLER: I was never asked that question, but had I been asked it, I believe it would have been all right with me if we had had a full flow with that one pump.

COMMISSIONER PIGFORD: Yes. When the reactor coolant pumps were first turned off, was there any unusual thing noticed at the time?

MR. MILLER: I was not there, but my understanding is that somewhere right after that, they received, when the last pump was turned off, they received some of the subscale nuclear instrumentation indication.

COMMISSIONER PIGFORD: Mr. Kunder, were you there at that time?

MR. KUNDER: Yes, I was.

COMMISSIONER PIGFORD: Would you please explain what you noticed?

MR. KUNDER: Okay. I was not right on the console. I was standing back, but I recall the operators securing the pumps and I did have a chance to go over and look at the source range indicator and also the intermediate range recorder. And I can't remember how many minutes or seconds there after they were securing the pumps I did this, but it was a short period of time, and I did note that the indications were rising. The intermediate range indication came on scale, and came up about one deca from 10 to the minus 11th amps to 10 to the minus 10th amps.

Also I believe shortly thereafter it was noted, and I observed also, that the console narrow range hot leg temperature indicators were rising and eventually they went off scale. I don't recall the precise timing, but that was the qualitative indications that I observed.

Also I recall observing the A loop flow. Just

prior to the pumps being secured, the flow had been decreasing, and I recall that the--again, this is qualitative--but the flow was registering about 60 per cent on the indicator, which is not necessarily 60 per cent flow, but it had been reducing, and at about, it reached approximately 30 per cent flow at the time that the pumps were secured, and of course it's my belief that those indications signalled to me that we were probably cavitating in the pump, and the pump just wasn't pumping as much water.

COMMISSIONER PIGFORD: Mr. Miller, were you there when it was attempted to restart the reactor coolant pumps?

MR. MILLER: Yes.

COMMISSIONER PIGFORD: And was there anything unusual noticed at that time?

MR. MILLER: I did not go up to the console, but the--I was told that we had the--we didn't have normal starting current, and that we settled back to about a hundred amperes, and we had no flow indication, which indicated to us that there was essentially not any water being pumped. Mike?

MR. ROSS: Yes, that's correct. That happened some time after seven o'clock.

MR. MILLER: We tried somewhere in the period of seven to eight o'clock on a few occasions to start a pump, and pump some water, but we couldn't get any indication of

water flow, so we--

COMMISSIONER PIGFORD: Was there any change in the pressure at that time?

MR. MILLER: Not due to the pump start. We had the same point--there was not, that I remember, any console indication of pressure change following the pump start.

COMMISSIONER PIGFORD: Mr. Ross?

MR. ROSS: I don't recall any right now.

COMMISSIONER PIGFORD: What about the attempted pump start? Was there any change in pressure at that time?

MR. MILLER: At that point in the morning?

COMMISSIONER PIGFORD: Yes.

MR. MILLER: Not to my memory, no. We were at that time increasing pressure because of the charging the plant with the makeup pump, so there could have been an increase occurring due to that.

COMMISSIONER PIGFORD: Was there any change in amount of radioactivity level accompanying the pump start?

MR. MILLER: Not that I could discern.

COMMISSIONER PIGFORD: Or the attempted pump start?

MR. MILLER: No, sir.

COMMISSIONER PIGFORD: And the role of the B&W man that you telephoned, Mr. Lee Rogers, is he a person assigned to this Unit by B&W?

MR. MILLER: Yes, sir, he's been assigned to the

Three Mile Island site since around 1973.

COMMISSIONER PIGFORD: And he was one of the people consulted in your conference call in the morning?

MR. MILLER: At six o'clock. And then subsequently I had him come in and I asked his participation in my group.

COMMISSIONER PIGFORD: And what was his advice concerning the situation at that time, in the conference call?

MR. MILLER: In the conference call, he helped us discuss one of the--I think his question in the conference call was, was the electromatic shut off, I remember correctly; his most important thrust initially was to try and get a reactor coolant pump back on, if I remember correctly. He concurred in the decisions that we made throughout the day that I presented to you. From there on I don't believe he ever failed to concur or had any objection to the course from there on.

COMMISSIONER PIGFORD: At that time were you aware of the tailpipe temperature readings that were taken at 19, that were taken at two intervals which were separated by 55 minutes?

MR. MILLER: I was not aware of those at that time. I believe that I was aware that the block valve had been shut somewhere around 6:30 in the morning, so I didn't discuss the tailpipe.

COMMISSIONER PIGFORD: The block valve had been shut prior to your conference call?

MR. MILLER: It was shut somewhere right either during it or after. I believe that the sequence of events has 6:22. We were on the phone at somewhere around six to 6:15. We asked the question. I don't know whether the question had any relation to them closing it either way because other people had come into the Control Room and started talking about it independently.

COMMISSIONER PIGFORD: At your earlier call to Mr. Kunder, were you made aware of these two readings on the tailpipe from the relief valve?

MR. MILLER: No, sir.

COMMISSIONER PIGFORD: Mr. Kunder, did you know about those at that time?

MR. KUNDER: I was aware that the Unit 1 Shift Supervisor, who had come over to Unit 2 to assist in the initial recovery effort, had been looking at the computer. And I recall one comment that he had made that the temperatures appeared to have come down. So it was his qualitative judgment that the valve was closed and we weren't letting any steam out. And I didn't question it or follow through any further at that point. I recall he gave me a number, but I--it was above 200 degrees, and I thought it was somewhere in the range of 220 or 230 degrees, but I can't recall precise

numbers.

COMMISSIONER PIGFORD: Who was it who gave you that?

MR. KUNDER: Kenneth Brian.

COMMISSIONER PIGFORD: And was that from one reading or more than one reading?

MR. KUNDER: Well, I believe that he had previously been looking at the temperature, and the reading that he quoted was the second or third reading that he observed. This would have been about five or 5:10, something like that.

COMMISSIONER PIGFORD: Were you at that time aware of your own emergency procedure, which indicates that a reading above 200 degrees Fahrenheit is a symptom of relief valve discharge?

MR. KUNDER: Yes, sir, I was.

COMMISSIONER PIGFORD: And you heard about a reading above 200.

MR. KUNDER: That's correct.

COMMISSIONER PIGFORD: What did you do with that information at that time?

MR. KUNDER: Well, in my own mind I had recognized that the plant had apparently gone through a high pressure transient, which of course caused the reactor to trip in the first place. And the BM valve would have naturally opened to try and limit the pressure rise. So knowing that information, the reading sounded consistent, and it appeared

to me that we were then out of the procedure, so to speak. It was not apparent to myself, and that we--

MR. MILLER: One thing I might say on that valve. On the turbine trip procedure, one of the symptoms of a turbine trip following that is that valve is supposed to open in a response to that trip. Additionally, the emergency procedure uses the 130 degree number in Unit 2. In Unit 1, I think to be--you know, we had relief valve leakage to some degree--one, two to three gallon a minute in the early part of Unit 1. As a result of that we had designed in Unit 2 the ability to accept some leakage to within the technical specification limits. We actually had a cooling system designed for that drain tank, so--the knowledge and--the management knowledge of that relief leaking was there; we knew we had 170, 180, or 190 degree readings going on at the time the plant was operating, but we also knew we were within the tech spec limit for leakage, and that we were within--we were able to cool the drain tanks. So I think we didn't go into the emergency procedure at that moment because we didn't think that abnormality existed. The operator didn't see a high enough temperature on that pipe to where he thought the valve had stuck open.

COMMISSIONER PIGFORD: Mr. Miller, your stated sequence of events states that there was one reading of 285 degrees at 4:25, 35 A.M., and then, 55 minutes later, a

reading of 283 degrees. If you had been told that information, then what would you have concluded?

MR. MILLER: I can't answer that honestly. I would like to say I'd conclude I'd shut the block valve. I don't know that I'd have said that. I might say that the operator visually--you know, the printout we're looking at was not the printout the operator looked at. He was looking at a digital printout which is not the same and does not record. So when he called it and got 230, it said that, well, that seems normal. Had he called it and got 285, I don't believe-- I believe he would have shut the block valve, personally. Because he had started around 350 or 380, and you'd have come down to 285, would have told him the valve was hanging open a lot more than the 230 told me.

COMMISSIONER PIGFORD: We've had some disparity in temperatures, which appeared also yesterday. Why does the GPU stated sequence of events mention 283 and 285, and you're telling us 230? I don't understand the reason for that.

MR. MILLER: I can't explain that to myself right now, but I can tell you that the engineer along with the operators that made up the annotated sequence of events took the computer printout sheets, which were backlogged and were not available to the operator; whereas the operator could have called it up visually on the visual tube and looked at it. And I'm taking the operator on his word that he called it up

and got the 230. I can't explain the disparity. It shouldn't exist.

COMMISSIONER PIGFORD: Is there any log record or recorded record of these readings and observations during this accident?

MR. MILLER: If there are they are in the company of GPU. I don't believe there are any of this 230 sir. There's two or three people that would testify to it separately but I don't believe we have it written down with a time on it that I've seen.

COMMISSIONER PIGFORD: Now Mr. Kunder apparently you weren't informed of the two readings that I've mentioned. Is that correct?

MR. KUNDER: Yeah, I don't recall the specific numbers but I do recall qualitatively Ken indicated that the reading had come down. And that satisfied me in my own mind that the relief line was cooling down and that was a safe sign.

COMMISSIONER PIGFORD: The few readings I've mentioned show that over 55 minutes it comes down only about two degrees Fahrenheit.

MR. KUNDER: Yeah, I was not aware of those.

COMMISSIONER PIGFORD: You were not aware of that.

MR. KUNDER: No. Qualitatively I just received the judgement of the shift foreman and I seem to recall him men-

tion the number that he had just called out of the computer at that moment.

COMMISSIONER PIGFORD: Mr. Ross, were you aware of that?

MR. ROSS: I was not aware of it.

COMMISSIONER PIGFORD: Yes. Who is the gentleman on your right?

MR. ROSS: Mr. Dubiel, or Mr. Blake.

COMMISSIONER PIGFORD: Mr Blake, what is your function there?

MR. BLAKE: Mr. Pigford my name is Ernest L. Blake and I am with the law firm of Shaw, Pitman, Potts, and Trowbridge in Washington. We're counsel to the operating companies, and that's the reason for my sitting here--

COMMISSIONER PIGFORD: Oh. Well, I'm not going to ask you if you were aware of the--

(Laughter)

Just one more question on this, Mr. Miller. When these procedures, emergency procedures, like the one relating to the temperature symptoms on the relief valve, when those are initiated, what is your participation in such--development of such procedures? Do you have a part in writing them?

MR. MILLER: I had a--initially in Unit 2, I was involved in the initial schedule for writing the procedures to the extent that I helped determine who would write them

and who would review them and who would independently review them, and then who would try them in the plant part of having a license. That particular procedure was probably written for us by B&W, submitted to us, put through our plant review committee, and signed probably by a guy at George's level, technical superintendent, and a guy at my level, as a superintendent.

COMMISSIONER PIGFORD: And do you have some method of keeping your staff refreshed on these procedures as to what they require and what they mean?

MR. MILLER: Yes, sir.

COMMISSIONER PIGFORD: How?

MR. MILLER: The people that most need refresh-- there's two ways in my mind. One, the operators through the training program go through a six-week cycle where they review procedures. Secondly, every year so many of them must be put before the plant review committee and reviewed for being current.

COMMISSIONER PIGFORD: Are you also responsible for any testing on this relief valve and the tailpipe, to demonstrate that this is a reliable procedure?

MR. MILLER: The emergency procedure itself?

COMMISSIONER PIGFORD: Yes.

MR. MILLER: The test program for the unit, the acceptance test program, would have been done under separate

documents which would have supported the installation and acceptance of--

COMMISSIONER PIGFORD: Are you in any way responsible for that?

MR. MILLER: Yes, I participate in the review group that approves the procedure that they use and the results that we obtain.

COMMISSIONER PIGFORD: And was that, the operation of that tailpipe thermocouple, demonstrated in that testing program?

MR. MILLER: I don't believe there's a test on it, but I would have to go look at records. If you're talking about the discharge temperature for the leaky--I don't understand the context of the question. In other words, we have done tests in both units where we've gotten typical type readings off that thermocouple, and I know that when it's up around above 130 or 140 degrees, there's some valve leakage occurring. I know that it can read as high as 350 to 390. That would have been the extent of the testing that I know about.

COMMISSIONER PIGFORD: Some person on your staff during the accident apparently raised the question, what the reading meant, and he wondered whether there was insulation surrounding the tailpipe at that point. Who was that?

MR. KUNDER: I think it's yesterday's hearing.

MR. MILLER: The operators raised that. I don't know which case.

COMMISSIONER PIGFORD: Yes. Did you know at that time whether there was insulation surrounding that thermocouple?

MR. MILLER: I didn't know at that time. I've subsequently been told that we've seen readings on that thermocouple as high as 350 to 390, but I have not gone far enough to look at documentation.

COMMISSIONER PIGFORD: Do the specifications require that the thermocouple and that part of the pipe be covered with insulation?

MR. MILLER: I don't believe they do.

COMMISSIONER PIGFORD: Then--

MR. MILLER: I'd have to--that area on the pressurizer is insulated, and I'm not sure exactly where the mirror insulation ends versus where the thermocouple position is exactly. Do you know, Mike?

MR. ROSS: I'm not sure.

COMMISSIONER PIGFORD: Then do you have any reason to believe that the reading of a temperature above 200 degrees Fahrenheit as indicated in the emergency procedure, would not be a meaningful indication that you were having continued flow through that tailpipe?

MR. MILLER: I think subsequent to a trip where I

would have expected that temperature to go to 350 to 380 within the time frame and that the number of things that were occurring, that a 230 reading would have left, would have not caused me to think the valve had stuck partially open. A 280 might have been different.

COMMISSIONER PIGFORD: Is it possible--

MR. MILLER: I would have expected it to go below 200. I don't know the exact time frame.

COMMISSIONER PIGFORD: It appears that one of the operators expected it to reach the temperature of the fluid itself, and if not that high, he then thought it was not giving a reliable reading. Do you know about that?

MR. MILLER: I know that some of the operators have thought that might get to the temperature of steam in the pressurizer, which could be 650, 660--

COMMISSIONER PIGFORD: Yes.

MR. MILLER: I don't have memory and I'm going basically on my experience. A lot of that was Unit 1 experience because we instrumented that line extensively in Unit 1, and I don't remember readings much higher than 400.

CHAIRMAN KEMENY: May I just ask a very simplistic kind of question. We heard yesterday from the two operators, from the shift foreman and the shift supervisor, that it was very clear to them fairly soon that they were experiencing something totally different from anything their previous

experience had shown them, and they had been through turbine and reactor trips before. What was your theory when you first heard about it as to why they were experiencing something totally different?

MR. MILLER: Quite honestly, sir, at six in the morning and at five in the morning when I called in and was inquiring, I didn't talk to Mr. Zewe. I really--the discussion didn't go to the fact that, boy, this is something different than I've ever seen before. It bothered all of us in that, you see, I set up another call for the same reason, and I wasn't looking at all of the indicators. If we had had that nice and full a discussion about, this is different than anything we've seen before, it might have helped, but I don't--I think we knew we were experiencing something different, but I think each time we made a decision, it was based on something we knew about, for instance: pressure was low, but they had opened the feed valves quickly in the steam generator, and they thought that might have been shrink. There was logic at that time for most of the actions, even though today you can look back and say, well, that wasn't the cause of that, or, that shouldn't have been that long.

CHAIRMAN KEMENY: Well, could I ask the same question of Mr. Kunder, in that case, since you were there. Was it clear to you from watching the operators that they were out of their depth and experiencing something they

had never seen before?

MR. KUNDER: I felt we were experiencing a very unusual situation, because I had never seen pressurizer level go high and peg in the high range, and at the same time, pressure being low. They have always performed consistently. If you had a transient induced low pressure situation, the pressurizer level would indeed drop, and as you made up with high pressure injection, the level and pressure recovered simultaneously and consistently. And when it recovered to such an extent that the operators knew they had sufficient pressure in the coolant system, concurrently with that, the pressurizer level was in the normal range, and they were able to throttle back and prevent, of course, the opposite effect, an overpressure situation, from developing. And all the training that we've had down at the simulator and any prior transients that I had ever observed, and most of mine were in Unit 1, I had never seen this behavior.

CHAIRMAN KEMENY: I mean, what I'm really after is, if I had been in your place--of course I can't imagine that--when I talked to Mr. Miller, I think the first thing I would have said, boy, there is something going on here we have never experienced before.

MR. KUNDER: The information was made available in the control room. I don't recall specifically and continually talking to, for instance, Gary Miller or other of the individuals in the control room, but I do know that the information was presented to them and there was no question of the levels of radiation that we were dealing with in the building.

MR. PETERSON: You had mentioned at that time --- (interrupted).

MR. MILLER: Mike, do you want to --- (interrupted).

MR. ROSS: Well, we now have some additional information that isn't finalized in that area. And basically our initial indications, I don't have it in front of me, are that we lost the condensate booster pumps due to the fact that we had water in the air lines on the condensate polishers. Condensate polisher valves being shut, or going shut caused a little pressure at the suction of the condensate boosters. And that triggered our whole sequence. At the beginning. Again this isn't finalized and this is new information that is being undergone right now.

MR. PETERSON: Was there someone in the vicinity of those condensate pumps at the time of the 4:00 a.m. incident?

MR. MILLER: Mr. Scheimann was in the vicinity of the condensate polisher system, or resin cleanup system, which is near that area. I don't know whether there was a noise level in that area, he would have noticed the condensate pump dropping off because the booster pumps and the other pumps make quite

a noise in that area. And the operator would have seen it in the control room first.

MR. PETERSON: Well, who found, eight minutes afterwards that the blocking valves downstream of the emergency pumps had been closed?

MR. MILLER: The control room operator on the control room panel in the control room found that. He found that by looking at his eleven which is flow control valve that had opened and looking at his level which was done and he didn't have flow. He didn't have indication of flow into the generator. That was discovered right on the control panel.

MR. PETERSON: I understood, I wasn't here yesterday so maybe you'll have to straighten me out. May I just ask a couple of questions about it? I understood that forty-two hours before the incident, they had run a test of the emergency . . . (interrupted).

CHAIRMAN KEMENY: Mr. Peterson, I think I ought to give you one crucial fact, and then I'll recognize you again. In yesterday's hearing we talked to the individuals who were involved in the test forty-two hours earlier and both the control room operators testified under oath and without qualification that he is absolutely certain that he personally reopened those two blocking valves forty-two hours before the accident.

MR. PETERSON: That's what I wanted to lead up, follow up on that. Now, if they had been reopened forty-two hours earlier, how might they have been closed in the interim and

by whom?

MR. MILLER: I really can't answer that honestly. They could have been closed possibly by air from a local switch or from the control room by air. We have at some frequency found a thousand or two thousand valves in that plant. We had at times found a valve or two out of position and when we find it we generally institute an investigation team and go out and try and research what happened. We did it in this case. We've done it twice, I know of, last year. It's an event you're susceptible to with the number of valves we have, and the best way to control it is administratively.

MR. PETERSON: You mean that the valves might have been closed because of some control room activity or some instrument panel, rather than somebody deliberately closing the valves?

MR. MILLER: I don't -- I've been at Three Mile Island since 1972 and I have every -- I've been involved in at least five investigations on valves, and never have we had someone close the valve even when we had a thousand construction workers, just close the valve to close it.

MR. PETERSON: Well, how do you close the valve when you're going to run the test? They close it forty-two hours before?

MR. MILLER: We close it from the control room.

CHAIRMAN KEMENY: Mr. Miller, on that, since the people we talked to yesterday couldn't answer this question, you said you have personally conducted something like five such investigations.

MR. MILLER: That's a number I'm thinking.

CHAIRMAN KEMENY: Yes, fine. I'm not trying to pin you on that. What were the conclusions in the cases where you managed to establish cause?

MR. MILLER: Either personnel or procedure in most cases.

CHAIRMAN KEMENY: That somebody accidentally closed --- (interrupted).

MR. MILLER: Or that a procedure had been written. Some of our procedures are quite lengthy, it had gotten maybe a change made and the review of that change had not been sufficient and the valve had been left out of position. That's the two cases I was involved in last year were both that.

MR. PETERSON: Do you have somebody working on instrumentation regularly on each shift?

MR. MILLER: We have shift maintenance and we have instrument people, but they're controlled out of the control room by that shift supervisor or shift foreman. And they don't work on any safety instrumentation without specific approval of the shift foreman.

MR. PETERSON: Was anybody still working at 4:00 a.m.? With the approval of the shift supervisor?

MR. MILLER: I don't believe so, but I'd have to go back and ask that question of the shift supervisor.

CHAIRMAN KEMENY: In one sense the answer has to be yes since Mr. Sheimann was working on the polisher --- (interrupted).

MR. MILLER: That would not be a safety instrument

though. I'd have to, o.k., but anybody that would be working I'd have felt confident were approved by the operations shift foreman or shift supervisor.

MR. PETERSON: One question related to this. Could the relief valve have been held open by some remote control mechanism?

MR. MILLER: I don't believe so.

MR. PETERSON: There's no means for holding that open by some instrumentation?

MR. MILLER: The way the lights are in the control room, if somebody had say, remotely put a jumper in sight, I believe the light would have shone power to the valve.

MR. KUNDER: The indicating light actually comes off the circuit in parallel with the solenoid operator for the valve. The valve operates by an operator pushing a plunger which operates a pilot valve and that allows a disc in the main valve to come unseated and relieved. And we would have seen the indication in the control room calling for the valve to be opened if that were the case.

MR. MILLER: Had there been a loss of power the valves failure mode was to fail closed.

MR. PETERSON: Reading the paper this morning about yesterday's hearing --- (interrupted).

MR. MILLER: Which I have not.

MR. PETERSON: I noticed that at least that report was, that some of the operators said yesterday that a number of

times valves had been closed much to their surprise. Now if this is the case, have you ever been concerned about maybe someone deliberately doing that?

MR. MILLER: Any time that a valve out of position is reported and it gets to my attention, the action taken is pretty firm and pretty deliberate. Now I can't guarantee that if the operators have always told me all the valves they've found out of position. I think that if you take the number of valves and the number of mispositions I've been involved with, it's minor, but you know, we like to go for zero. I have not found any that were deliberate, and never have suspected that.

MR. KUNDER: I might add that the one specific valve that was cited yesterday by Kevin Minairs was DHV 102B. We went and checked, and he was correct. The valve was out of what he thought was normal position. Normally during normal operation the lineup calls for the valve to be open. The valve had been closed as part of another surveillance test being performed by another group of operators at the time. And he discovered that as part of a shift and daily checklist of valve positions, critical valve positions, and the fact that that was out of position for another surveillance test was a valid reason to be in that position. And it was later returned to the proper position at the conclusion of the other surveillance test. So that was explained. Kevin was not apparently aware of that at the time.

CHAIRMAN KEMENY: There apparently is a regular daily

check as I understand, on valves. And I gather often auxiliary operators have a responsibility of doing that. That's why he was testifying to this. Are the valves numbered, the famous pair of valves number twelve on the daily check list?

MR. MILLER: I'd have to go back and look for that answer.

MR. KUNDER: I don't know that.

MR. MILLER: One of the operators did respond that he thought we could have a better turnover checklist. And I'd leave it at that. That's something that's obvious.

CHAIRMAN KEMENY: I'm just asking. I mean, you have a list, presumably a list, of daily checks if the valves are in correct position.

MR. MILLER: We can find out. I don't remember if it's on there.

CHAIRMAN KEMENY: Mr. Ross, do you happen to remember.

MR. ROSS: I don't remember for sure but I kind of -- do not that it --- (interrupted).

CHAIRMAN KEMENY: You do not think that number twelve is on there? O.k., that's something that staff should certainly follow up on. Because there is that mystery that forty-two hours.

MR. MILLER: We'll get that answered.

MR. PETERSON: Let's pursue my question a couple more, Mr. Chairman. Was the movie China Syndrome shown in Middletown prior to this incident?

MR. MILLER: It was shown in the area.

MR. PETERSON: And was that viewed by a number of you on the staff prior to that?

MR. MILLER: I think, I asked that question, I think I'm the only one that saw it in this group. Is that true?

MR. KUNDER: I didn't see it.

MR. DUBIEL: I have not seen it.

CHAIRMAN KEMENY: How many operators who were on at 4:00 am had seen it prior to the accident, they were asked that question.

MR. PETERSON: What did you think about it, Mr. Miller? Does that relate the incident which actually occurred?

MR. MILLER: I thought the movie was very well done. I don't think it related to the incident that occurred directly. It certainly, from my position at the plant, it made me think pretty deeply and I guess that morning when I walked into the control room, I thought about that. But I never felt the same as the movie portrayed it.

CHAIRMAN KEMENY: Which role in the movie did you feel you were playing? I'll withdraw that question. Professor Taylor?

PROFESSOR TAYLOR: We were told in testimony yesterday that a milli voltmeter had been put onto the terminals, I gather, one of the thermocouples and that that had recorded a voltage corresponding to about 2400 degrees farenheit. Were you made aware of that measurement at any time during the shift

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when you came on at seven o'clock?

MR. MILLER: Somewhere in the time frame of seven to eight-thirty was the initiation of the emergency plan and the direction of the group that I appointed. I requested that those readings be taken. I requested that from my own past experience in other plants, not these pipes. They're not recognized in the procedures for this plant for any indication, they're not even available in Unit I. I asked for them as a, I guess, an instinct to get another piece of information. And the instrument engineer verbally came back to me and gave me nothing to ten to two hundred and to high but he indicated he didn't believe them. And I passed by that at that point. Subsequently we have found that the technician that went down to the panel, to the penetration, actually wrote down a lot of readings. I found that two weeks afterward. And I think we have those readings now. I was only given a general discussion of those at the time.

MR. TAYLOR: But were you given any reading in this range of about two thousand degrees?

MR. MILLER: I was told one of them was high, I don't know the exact number, but I was given a reading in that range.

MR. TAYLOR: When would you estimate that measurement was recorded, in other words in real time when would you estimate that the temperature actually was, if that reading was correct, when would that have been?

MR. MILLER: My guess is seven-thirty in the morning.

MR. TAYLOR: Seven-thirty.

MR. MILLER: We -- I don't know whether we have that on the sheet we were trying to get or not. I do not know what the exact time was. It was somewhere before eight o'clock I feel.

MR. TAYLOR: What I'm trying to get at is whether that number was reported to you in this as a real measurement, or just as one of a lot of numbers, or did it focus your attention on at least the possibility that you had very high temperatures in the core?

MR. MILLER: It didn't focus it to the degree that it's been focused now. It focused my -- it was just another indicator, for instance we had the hot leg temperature detectors, we'd put a recorder on those at the same time and got seven-twenty, seven-thirty. It told me we were warm in the core, it didn't convince me what temperature we were at in the core.

MR. TAYLOR: Did you tend to discount the high number and say there must be something wrong with it? I realize that that was not a normal procedure, it was not a reading even on a meter, as it is normally hooked up.

MR. MILLER: I tended to discount it at that time, yes sir

MR. TAYLOR: Was that because you felt some inconsistency between that reading and other things that you knew about the state of the plant?

MR. MILLER: I think it was probably because of the -- the best I can explain it is, there were an awful lot of inputs

occurring to me, and I was -- the tone I took it in was it wasn't reliable. And I wanted something I could believe, and when we got the recorder at the same time on the hot leg RTD I felt that was reliable. I understood that was a qualified instrument, qualified for the environment of the building, and I put my faith in that for that reason, is the best logic I can come up with.

MR. TAYLOR: Now at the time, between seven and seven-thirty, I get the impression from your testimony before that at least one central question in your mind was what do we need to do to assure that we keep the core cool. Is that correct?

MR. MILLER: Yes sir.

MR. TAYLOR: Now, the number of four to five hundred gallons a minute as being a requirement for the high pressure, I gather for the high pressure induction system water flow rate as being adequate to cool the reactor has been mentioned this morning. Did you talk to anyone or think through anything in your own mind about whether that number might really be adequate or did you simply ask somebody, or were you told this number and then sort of generally accept it?

MR. MILLER: In the discussion of the group that I had assembled, I was under the impression that the B&W guy was attempting to get a calculation to see what the K heat would have been. We realized we would have to remove the K heat. We thought that one makeup pump is an accepted analysis. We also knew that we were getting some heat removal out of the

steam generator. And we didn't have a calculation that said that heat in and heat out were equal. We felt what the temperature indicators we had and using as many methods as we could that we could see it well enough to go on, and were hoping for a number later on from somebody.

MR. TAYLOR: Did you have an approximate number in mind, let's say between seven and eight o'clock when you came on, for the actual thermal power rate in the reactor at that time? Did you have some sense of what number you were dealing with?

MR. MILLER: When I took the situation in hand at ten after seven, my major thrust was to try and get all the parts of the emergency plan fully implemented, which is an hour of hard work. I depend on Mike Ross to put the right number on the core at that time until we can get back to that. That's really what I was thinking.

MR. TAYLOR: Well, Mr. Ross, did you have available to you a chart or a table or some easy quick reference way of noting the time since the reactor tripped and then the decay of power heat rate? Or did you have to calculate this or look it up somewhere?

MR. ROSS: We do have the ability to obtain that. We did not have that piece of information laying in front of us. I know approximately what it is.

MR. TAYLOR: So that's not a standard part of the set of quick reference information available to people in the control room, that is, what would the decay heat be x minutes

or hours after a trip, taking into account the previous operating history of the reactor? That's not a standard item of information, is that correct?

MR. ROSS: That's correct, sir. That is not a standard item. In fact, not even a standard item in cooling the core with a high pressure injection alone, so we really are caught in an area we hadn't been.

MR. TAYLOR: Now, on this matter of the adequacy of the cooling system, the ECCS, system for removing heat. Had you begun to suspect that there might be fuel damage at the time, let's say before eight o'clock?

MR. MILLER: I think all of us in the group knew there was "fuel damage." We believed the radiation indication in the building told us that.

MR. TAYLOR: Did the possibility enter your mind that the fuel damage might have been extensive enough to change the flow patterns of the water in the reactor enough to put in question how much water you needed to move through the reactor to cool it? Did that enter your mind at all as a question?

MR. MILLER: I think at that time, I don't believe in my mind I really believed the core had been totally uncovered, or uncovered to a substantial degree at that time.

MR. TAYLOR: Now, just about, a few minutes before you declared a general emergency, which I guess was what, seven fifteen?

MR. MILLER: About seven twenty-five.

MR. TAYLOR: There had been two pressure spikes noted in the vicinity of the drain track, one which has repeatedly been called about 5 psi and the other 11 psi. Had, did you know about those spikes at that time?

MR. MILLER: I'm not sure what spikes you're referring to in the drain. To my knowledge the drain tank pressure indicator is a thing you look at , there's no chart on drain tank pressure.

MR. TAYLOR: Well, these as I understand it, I may be wrong, as I understand it, it was the same recorder that then later, much later, about ten hours after the start of the accident, recorded the same as 28 psi.

MR. MILLER: I think you're talking about the reactor building pressure.

MR. TAYLOR: That's right.

MR. MILLER: Pressure within the big containment.

MR. TAYLOR: That's right. But I thought that was in the general vicinity of the drain tanks, but I may be wrong.

MR. MILLER: The indicator, maybe. The instrument itself is probably located external to the reactor.

MR. TAYLOR: But my question is whether you were aware that there had been pressure increases, spikes may be the wrong word, I don't know -- (interrupted).

MR. MILLER: No, spikes are the right word. I was not aware -- (interrupted).

MR. TAYLOR: You were not aware of those when you declared

the emergency?

MR. MILLER: No sir, I was not aware of those. And I -- (interrupted).

MR. TAYLOR: What then was the primary basis, primary reason, for your declaring the emergency at seven fifteen?

MR. MILLER: The emergency plan has specific criteria in it for general emergencies. One of those is the dome monitor the radiation monitor that is high in the building, being 8 ram or greater, and it passed the 8 ram about that time.

MR. TAYLOR: Now I understand that it, let me ask this as a question, is the radiation monitor, the sensitive part of that, behind some shielding?

MR. MILLER: Within the reactor building it's in a lead shield which attenuates by a factor of one hundred to one, I believe.

MR. KUNDER: I believe that's correct.

MR. TAYLOR: A hundred to one. Does that mean then that the, whatever it was, seven or eight R per hour reading, was the reading on the counter, or did that take into account the shielding?

MR. DUBIEL: If I may answer that, the reading 8 R per hour on the meter, the actual meter measurement, is not indicative of the actual dose rate outside of a lead shield.

MR. TAYLOR: So is this correct, that at least roughly speaking within a factor of two or three or something like that, that the actual implied reading outside the lead shield

around the counter, was something like a hundred times that, or somewhere around eight hundred R per hour?

MR. DUBIEL: That's correct.

MR. TAYLOR: Is that your understanding of it?

MR. MILLER: And the basis of that goes back to the analysis which has to do with the potential site, dose of the site boundary and so forth. That's the basis, if you go through the calculations.

MR. TAYLOR: Now, before you declared the emergency, did that, did you go through something like that mental arithmetic or ask someone, say what did that really mean, what did that 8 R per hour in the shielded radiation detector tell one about the dose rate, the radiation rate within containment generally, outside that shield.

MR. MILLER: Part of the emergency plan is to immediately get out, we call them isoplates, and diagrams and start to make a calculation of potential dose based on that reading. Dick, if you could --- (interrupted).

MR. DUBIEL: Yes, I think your question pertains to what the dose rate inside might be indicative of relative to the state of the reactor?

MR. TAYLOR: No, my question was, what I'm trying to get at is whether the reading of 8 R per hour more or less immediately suggested to you that you had something like a mean lethal dose of presumably gamma ray radiation implied within containment outside the pressure vessel in a period of a few

minutes. In other words, somewhere in the vicinity of eight thousand R per hour. Did you sense that you had very high lethal doses of radiation in terms of exposure for a few minutes at that time?

MR. DUBIEL: Yes. That morning, morning of the 28th there was no question that the radiation levels inside the reactor building in the vicinity of that monitor which was previously pointed out, up high in the building, it sees essentially fifty percent of the containment atmosphere, that which is above the operating floor, there were readings of eight thousand, excuse me, eight hundred R that passed through the 8 R reading on the monitor, and there's no question that those dose rates were well understood, what they meant, inside containment.

MR. TAYLOR: Mr. Miller, when would you say you became convinced that the core damage was really major? Major in the sense of involving more than a small percentage of the fuel in the core?

MR. MILLER: Thursday or Friday, I can't pin point it.

MR. TAYLOR: O.k., can you remember what was described to you as the basis for the conclusion that there was heavy core damage? Whenever this was, Thursday afternoon, Thursday evening or Friday morning or whenever?

MR. MILLER: I believed some of the calculations of what we were seeing by taking readings on the containment. That's what I remember.

MR. TAYLOR: Do you remember any core --- (interrupted).

MR. MILLER: Trying to take samples, the other thing and I can't remember when we took it was the reading on the reactor coolant sampled.

MR. DUBIEL: (Inaudible).

MR. MILLER: There was a sample taken approximately 1600 on the 29th, the day after the incident. A reactor coolant system sample. And that was analyzed on site after many orders of magnitude dilution, we were able to analyze it on site and the activity and understanding that we introduced a relatively large error by diluting it, by I believe about a factor of one million to one, in order to analyze it on our equipment. It indicated to me at that time that the, at least the order of magnitude that we were talking about was consistent with the FSAR indicated total gap activity that equilibrium forth released the noble gasses and iodines.

MR. TAYLOR: So at least at that stage this conclusion was primarily based on analysis of the water that had been in contact with the fuel and the conclusions concerning the state of the fuel that would lead to those relatively high concentration of at least some of the products, is that correct?

MR. DUBIEL: That's correct. But I think the difficulty really lie in the fact that when you get up into those orders of magnitude, the difference between twenty percent and sixty percent core damage could very easily be, that error could be

introduced just in our calculation or our analytical technique and I don't think that we were able, at least I know I was not able, to pin point whether we were talking about ten percent or ninety percent.

MR. TAYLOR: Yes, I understand.

MR. DUBIEL: But it was definitely beyond the one percent, I think there's the part we were at.

MR. TAYLOR: Now, about a little before two o'clock, according to the sequence of events, there was a larger pressure spike which has been reported as 28 psi. How did that come to your attention, Mr. Miller? That that had happened. Did you see this yourself, or did -- (interrupted).

MR. MILLER: At the time, I was not aware that we had the spike on the chart, or that the safe guard system had re-initiated. It does so happen that I heard a noise. And I did mention to Mike that I heard a noise. But I think that there are, the ventilation makes a noise that's similar. I heard a noise.

MR. TAYLOR: Could you characterize that noise. I mean was it a loud bang, or what?

MR. MILLER: A thud.

MR. TAYLOR: A thud?

MR. MILLER: It was a thud.

MR. TAYLOR: Did it occur to you when you heard that that it might have been an explosion?

MR. MILLER: No sir. It didn't at the time. I didn't

know what it was. I asked Mike what that was. And the operators apparently discussed the spike on the chart at that time, and looked at their other indications, and didn't conclude that that had -- (interrupted).

MR. TAYLOR: Who saw the spikes appear on the pressure trays? Did you, Mr. Ross?

MR. ROSS: Yes, I did.

MR. TAYLOR: Were you looking at it, and did, were you looking at it as it happened, did you see it appear?

MR. ROSS: No, I did not see it appear. I became aware of it when safe guard actuated on it's own.

MR. TAYLOR: I see. So you looked at this chart and saw that there had been a spike. How long after that spike was that, a matter of seconds or ---?

MR. ROSS: It's hard to say. I'd say it was within a minute, two minutes, within that area. We were in the control room at the time.

MR. TAYLOR: Now, was that observed by anyone else, specifically anyone from NRC who was then at the site? To the best of your knowledge, was there someone from NRC standing there looking at the recording at the same time?

MR. ROSS: I cannot honestly answer that. They were in the control room all day but I cannot say someone was there at that time.

MR. TAYLOR: So I get the impression then that although you heard a noise, there was no connection, is this correct, there was no connection yet made between that spike and any

other data that you had and the possibility of the formation of a rather large amount of hydrogen?

MR. ROSS: That's true. I did not.

MR. TAYLOR: When did you, -- yeah?

CHAIRMAN KEMENY: Mr. Ross, what is your mind was the explanation of that rather large spike?

MR. ROSS: Well, literally we were being pressed and we were kind of moving along through the events quite rapidly. We did talk about them in the control room and we kind of wrote it off at the time that possibly instrument malfunction of some sort, we did not have a firm conclusion. And part of our basis for that is that the spike was so and went away so quick. It was bang bang here and gone. I didn't associate it with hydrogen, because I had no reason to feel that we would have any hydrogen buildup for at least thirty days.

MR. TAYLOR: Now I understand that sometime Thursday evening, someone drew a connection between that explosion and the possible existence of hydrogen, and a possible hydrogen explosion. Who was that?

MR. MILLER: I don't personally know that. I think it was one of our consultants, and possibly could have been in concert with the NRC people looking at the charts. I believe, I at least know that one or two of our consultants that were aware of it then. We could get further definition on that. But I can't honestly remember who.

MR. TAYLOR: Can you tell us who those people were?

MR. MILLER: I discussed, and I don't remember exactly what time that was, a Mr. Lowe, who might have been involved in that.

MR. TAYLOR: I see.

MR. KUNDER: At the time we had a task force that was being assembled by the GPE Service Corporation consisting of their engineers and the consultant that Gary just mentioned, to begin to look into the details of the event, and I remember at that time I was not previously aware that the spike had occurred but I had asked them to look into the impact of long term hydrogen generation which at that time I suspected it would be a long term event based on analysis that had been performed in the final safety analysis report. It was either Thursday afternoon or sometime Friday that I was shown that spike. And they said did you know you had this? And I said no.

MR. TAYLOR: Now, during the course of the day on Wednesday what were you most concerned about so far as off site, possible off site hazards? Was it what had already been released in the way of radioactive material, or was it about the possibility of larger releases due to something else happening in the plant itself?

MR. MILLER: I guess to characterize that, our first and immediate concern was to teams out in the direction of the wind and get direct readings so that we could use real terms. And then we could assess where we were right then. Secondly, to put the core in a condition like we ended up with the pump

running, and to terminate the release, to find it and terminate it. And we knew that the auxiliary building was where most of it was coming from. And we were trying to take internal actions to limit the release, while at the same time we were dealing with radiation levels in a lot of rooms that were high, trying not to over-expose any of our own people. Dick, do you want to amplify that?

MR. DUBIEL: Yeah, I think the concern for off site doses was not really pointed toward significantly higher levels than what we had experienced to that point, meaning that the levels from the early morning of March 28 through the mid-day period, for instance. I think we were pretty much anticipating that those levels would not get appreciably higher. But I think the concern was more, as Gary pointed out, that we didn't see a real easy way to stop those levels. I'm speaking primarily in the one to three to four MR per hour readings. And I don't think that we could see any easy way out of stopping those releases.

MR. TAYLOR: So is this correct? During the course of the day on Wednesday, that I get the impression that you had the feeling that you had the reactor in a stable condition, that there was no imminent danger of something new happening that could release a lot of radioactive material that had not already been released. Is that correct?

MR. DUBIEL: That's correct. In fact, my major concern the bulk of the day, as long as we had water and core cooling

I was convinced that we should go on and I was hoping for reactor cooling pump or for a step down in mode. But the other thing was, the levels on the site began to go up because the wind would stop. And I was more concerned in those early hours with moving all the people off that site and moving them out of that area. Because I have assembly areas, and I actually had people running through the buildings and searching, because I wanted to be sure that we had contractors, consultants. So my concern in those early hours was to get the site evacuated and to keep the people on the site that I had to have. More than any beyond the boundary site because of the wind.

MR. TAYLOR: Now, after, I don't know, five o'clock or something like that Wednesday afternoon, did you at any time, whether it was the following day, or the weekend, or even after the weekend, did you at any time become concerned about the possibility of a major release of radioactive material from the plant on the basis of what you knew at that time. Let's say through Tuesday or, through Tuesday of the following week. Was there any time which you could develop a serious concern that there might be a major release of radioactive material off site?

MR. MILLER: I did not. We were, like Dick characterized it well, we wanted to totally stop the release. We were releasing small amounts and that was causing a lot of concern in the community. And I think all of us were looking for zero release rather than worrying about a major release.

MR. TAYLOR: Within the week following the initial trip, did you get any picture from anyone to the effect that what had caused the formation of the hydrogen was zirconium water reaction and that a lot of the fuel, tons at least, tens of tens probably, of fuel were directly exposed to the cooling water in the core. Were you made aware of any of these numbers, the amount of zirconium that was probably involved, the amount of core that might have been damaged? And the general physical state of the core?

MR. MILLER: Within the week following the accident I stayed on as an emergency director supporting direct operations and we formed task force that Mr. DeCamp described, and I was a party to a lot of those meetings. But the range of core damage was like, a lot of people that had a lot of experience and expertise talking from ten to ninety, looking for more hard data like a reactor cooling sample, to pin point that damage.

MR. TAYLOR: Can you recall when, as far as you're concerned, you in your mind, made the connection between hydrogen and zirconium plating oxidation?

MR. MILLER: I believe either late Thursday or Friday. In a discussion with one of our consultants.

MR. TAYLOR: Thank you.

CHAIRMAN KEMENY: Thank you. I would like to recognize from the staff Dr. Fabricant who has some questions to ask.

DR. FABRICANT: Thank you. Mr. Dubiel, would you please for the Commission, trace very briefly the events of March 28th

at TMI as regards the role and activities of the Health Physics Division and particularly your involvement.

MR. DUBIEL: Initially I arrived on site approximately five forty. I was called in immediately after talking with George Kunder. I was asked to take a real quick look at the containment atmosphere. A sample of containment atmosphere to try to determine, I believe at that time we were trying to determine the activity levels in containment atmosphere. We had difficulty because the atmospheric monitor was in fact flooded with water which in fact was I believe steam condensing in the sample lines.

DR. FABRICANT: What led Mr. Kunder to believe it was necessary to take samples at that time?

MR. DUBIEL: I believe at the time I was asked to analyze the atmosphere to, in preparation, it's a normal thing before having a reactor building entry. In other words, there were thoughts of going in a reactor building, and we were actually trying to, by procedure we do analyzing of the containment atmosphere prior to going in to see that in fact it is safe.

DR. FABRICANT: Yeah, but what led him to believe that it may not be safe?

MR. DUBIEL: I -- (interrupted).

MR. KUNDER: I can answer that. The fact that when I came in the pressure in the reactor building was about 2.2 pounds and it was recognized that the rupture discs in the drain tank apparently had ruptured and that would imply that

there was some potential for radioactivity, airborne radioactivity in the building.

DR. FABRICANT: So the potential for radioactivity did occur at that time? And you asked Mr. Dubiel to go in and assess?

MR. DUBIEL: Well, what we're talking about at that point would imply very low levels of radioactivity but with respect to sending a person in or doing any kind of subsequent inspection, you know, that definitely had to be considered.

DR. FABRICANT: Basically this is a routine that you went through?

MR. DUBIEL: Yes, I'd like to point out I'd never questioned George's motives because I believe, I would expect him to request our standard reactor building entry form to be filled out which requires that we have all of the data from the radioactivity, airborne containment radioactivity.

DR. FABRICANT: But you were not questioning this at five o'clock in the morning when you were called in? Is that the idea? In other words, you were called in at four-thirty or so in the morning, you arrived at five or so, and you were asked by Mr. Kunder to take testing samples of possible radioactivity in the auxiliary building. But you didn't question it?

MR. DUBIEL: In the reactor building, sir.

DR. FABRICANT: In the reactor building, I'm sorry.

MR. DUBIEL: No sir. I did not question it.

DR. FABRICANT: Thank you.

MR. DUBIEL: From that point I reported back to George Kunder the results which essentially were that we could not analyze the air, that I had essentially gave him the picture of a steam atmosphere in the building. The one thing that I did point out was that the activity level was extremely low, and this was evident by the fact that one of the technicians that was trying to draw the sample actually got his hands wet from the liquid that came out of the monitor, and checking his hands there was no detectable contamination. George then asked me to investigate the sample data which indicated that we had a reduction in concentration in the coolant system. And I immediately proceeded over to the Unit I lab where our Unit II sampling system, the primary sampling system is physically located and spoke with the technicians. And they were already in the process of getting a backup sample and also I got a second technician to run a duplicate sample just to insure that there was no question, that it was not a technician error in the analysis. It was about that time that we first saw the, or noted the increase in radiation levels on the sample lines. It occurred in a step function, if you will, the sample lines are relatively long. It takes somewhere in the neighborhood of about forty minutes to get a fresh coolant sample through the sample lines and to the sample panel. And prior to that the radiation levels were essentially a few millicuries per hour. And immediately it spiked up, step changed to several hundred MR and was continuing to rise. At that time

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I paged George Kunder on the, over the page phones, to give him the situation as I had seen it.

CHAIRMAN KEMENY: What time was this?

MR. DUBIEL: This was approximately six forty-five.

CHAIRMAN KEMENY: And you said there was about a forty minute delay?

MR. DUBIEL: Yes sir.

CHAIRMAN: So therefore that sample showed the situation as of let's say 6:05?

MR. DUBIEL: Well, I personally have surmised that the increase in activity in the coolant system would have occurred approximately six o'clock, based on that mode of analyses.

DR. FABRICANT: Where did you believe the radiation could have come from?

MR. DUBIEL: At that point in time there was no question in my mind that we had failed fuel, and by that I don't mean to imply that we could have been, had a zirconium water reaction, or it could have been cladding failing and cracking, or pin hole leaks or something of that nature. It really didn't, at that time, become an issue in my mind. At that time my entire thoughts turned to the emergency plan and my role in the emergency plan which was to immediately get to the control room and begin directing the on and off site radiation monitoring teams and insure that the off site notifications were made and that the emergency plan was in fact being implemented.

DR. FABRICANT: Could you have rechecked that radiation

level to be sure that you were going to implement an emergency plan without a recheck, or were you assured that that level was high enough to be able to implement an emergency plan?

MR. DUBIEL: The level itself --- (interrupted).

DR. FABRICANT: One of the problems that arises is that there's a hot line, there's a line that goes through the hot machine shop. Could that have confused these levels at all in taking your assay?

MR. DUBIEL: No sir. That line that goes through the hot machine shop is the sample line. And the situation was such that there was a fixed radiation monitor in the hot machine shop that alarmed. That is what initially triggered us to investigate. I went back to investigate and before I could even get there two of my technicians had already arrived at the hot machine shop to determine the cause of the alarm, and they arrived with portable instrumentation. And their portable instrumentation backed up the fact that we did in fact have excessive radiation levels back at the hot machine shop. It was very easy simply by pointing or holding the portable instrumentation higher towards the sample lines you could very easily determine the source of the radiation. Also that there was absolutely nothing going on in that area at the time so that one would not expect anything other than those sample lines could have been causing the radiation levels. At that time I immediately appointed the senior technician who was at the lab in charge of the HP Laboratory, Health Physicis Laboratory

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becomes the emergency control station in responding to emergencies. I asked him to begin assembling the personnel for on and off site monitoring teams.

DR. FABRICANT: Do you have authority to implement your own emergency plan under those circumstances or is it part of the comprehensive emergency plan of the plan?

MR. DUBIEL: It's part of the comprehensive emergency plan.

DR. FABRICANT: Were you authorized to do this or did someone tell you to implement, or you did it on your own?

MR. DUBIEL: At this point the emergency plan, the site emergency had not been declared. At the time I was in the Health Physics Laboratory. I relayed the information I had to George Kunder and I had at that time assumed that whether the emergency plan was going to be implemented based on reaching pre-established set points for implementing the plan or not, we would be getting off -- (interrupted).

DR. FABRICANT: When you say set points, you mean radiation levels?

MR. DUBIEL: Yes sir. In other words, the plans, various stages of the plan are triggered by specific levels. And I felt that even if we did not get anywhere near those levels one thing we would be doing would be monitoring both on-site and possibly off site. I felt it was prudent at that time to get the teams organized. At that time, it was just prior to seven o'clock and the on-coming shift was already coming through

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the door, so there's no question in my mind that we would have adequate personnel. We essentially had three or four shifts there at the same time because it was a turnover to the day shift.

DR. FABRICANT: As you were organizing these personnel for emergency plan, were you aware at that time, or could you have been aware that there was an enormous potential hazard to the public, or were your concerns directed primarily to the efficiency and functioning of the plant?

MR. DUBIEL: I don't believe at that time that I was really thinking of anything other than trying to react to the emergency plan. In other words I was trying to do two things: get some, designate someone in charge at the laboratory, relay the instructions to that individual to begin assembling personnel, and secondly to get to the control room to better assess the situation from the control room.

MR. KUNDER: I might say, within the control room at that same time, I believe there were other indications of radiation. One of the specific criteria in the site emergency is that two or more buildings show that. That would have caused the senior people in the control room to declare the site emergency and tell Dick to come to the control room which would have, that would have begun the consideration of off site consequences, automatically.

MR. DUBIEL: When I received Dick's call, of course my interest was in obtaining a sample result so I

could assess the degree of shutdown margin in the core. But he indicated that he had seen six hundred MR per hour in the sample line. That was very alarming to me. And I could tell by his voice that we had a big problem. Of course my perception of failed fuel was qualitative in nature. I had thought that we had some leaking fuel rods and it was apparently substantial. Within a few moments of receiving that information and informing the Superintendent Joe Logan and the people at the console that he was seeing these high levels, we began to get alert alarms and high alarms on various of the radiation monitoring system channels. The fact that we had at least two or more criteria for site emergency, and pretty much concurrently Bill and myself recognized. We were in a site emergency situation. He proceeded to inform the operators to make the announcement, which is the initiation of the plan. And I proceeded to have two of my engineers begin making the phone calls required by the plan and civil defense and so forth.

DR. FABRICANT: Under the emergency plan?

MR. DUBIEL: That's correct.

DR. FABRICANT: Mr. Dubiel, when did you begin off site monitoring, or when did you implement off site monitoring in regards to this emergency plan?

MR. DUBIEL: All right. I think in going through the chronology it will come out. At that time I left the laboratory and concurrent with my leaving I heard the announcement for the

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site emergency and also the site emergency siren. And I proceeded as I was already intending to do, proceeded directly to Unit II control room. When I arrived in the control room I did several things which were essentially to better assess the radiation levels. In my own mind I get a better picture of what was happening. Also to assure that there was somebody already breaking out the area maps, the isoplats and things of that nature. Essentially getting the paperwork out, going through some projections, and then I got to the, I also noted that the calls to the off site agencies were already underway. As a matter of fact most of them had been made by the time I got to the -- (interrupted).

DR. FABRICANT: I believe the individuals were under the direction of George Kunder.

MR. KUNDER: Yeah, they were two of my engineers.

DR. FABRICANT: And to what off site agencies were these calls directed?

MR. DUBIEL: The calls were to be directed to the state civil defense, the NRC -- (interrupted).

MR. KUNDER: I stated in my testimony that we dealt in detail at times basically with civil defense, the NRC, nuclear insurers, management, it's state DRH, that group basically.

DR. FABRICANT: I noted that Mr. Dubiel contacted the Pennsylvania Bureau of Radiological Health early on. What support did they provide, personnel, advice, what?

MR. DUBIEL: Well, first of all, our plan required that

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we maintain communication and provide information to the Bureau of Radiological Protection. At some point early on in the morning an open line was established between the Unit II control room and personnel in the offices of the Bureau of Radiological Protection. They did not support us with personnel. But it's primarily advice and discussion over the off site readings.

CHAIRMAN KEMENY: One second. I think Professor Taylor had a follow up question.

MR. TAYLOR: The -- (interrupted).

MR. MILLER: One thing I might say. You asked about monitoring. To my knowledge between the time frame of seven to seven-thirty we actually had a guy on the west shore of the island with a meter turned on, we had a meter at the Yorkhaven Power Station turned on, we had an off site team in a car and had requested a helicopter to go to Goldsboro. That was the kind of monitoring that I think was occurring before eight in the morning.

MR. TAYLOR: That's correct. I know of at least one press report that was made sometime before four or five o'clock Wednesday afternoon to the effect that there were radiation dose rate levels of several MR per hour a mile from the containment building, and that these were attributed to direct shine of gamma rays from the reactor building a mile away. In fact that press report was my first awareness of the fact that an accident at Three Mile Island. I couldn't believe that

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report because I did do some arithmetic to calculate back what that would mean for a dose level at the site, ignoring the shielding around containment. And I got dose levels of several tens of R per hour outside containment to account for that. Do you have any way of knowing how a press report of that kind, which I know alarmed several physicists that had no connection with the operation at TMI, thoroughly alarmed them. Do you have any idea how that idea got into the press?

MR. MILLER: The normal communications path during an emergency requires that our communications department do the press releasing. Now, quite honestly, I probably didn't give enough information out and I don't know how that specific one occurred.

MR. TAYLOR: Did you get the same report, I mean, does that ring any bell at all?

MR. MILLER: No sir. During the day our conversations with the state BRA agent, in fact the conversations I was involved in at the Lieutenant Governor's office we very specifically gave them the readings, showed them the environmental protection guide and our basis for not recommending and their basis for agreeing.

MR. TAYLOR: Well, during the day on Wednesday, were there any reports of any radiation level readings above 1 R per hour outside the auxiliary building or the containment building?

MR. MILLER: No, not outside.

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MR. TAYLOR: Not outside?

MR. MILLER: Inside the auxiliary building, yes.

MR. TAYLOR: Thank you.

CHAIRMAN KEMENY: What was the highest you did have on the outside?

MR. MILLER: Off site or on site?

CHAIRMAN KEMENY: Let's say on site but outside the building.

MR. MILLER: The highest off site that I remember were that night up near the turnpike we heard one or two of 10 to 13 MR per hour. On site during the day, depending on the wind it could get as high as 50 to 70 in places.

CHAIRMAN KEMENY: MR per hour?

MR. MILLER: MR, miliram.

CHAIRMAN KEMENY: Is that your recollection also Mr. Dubiel?

MR. DUBIEL: Yes sir. There's a kind of a difficult picture that was forming that day with the releases. It was obvious to me after just a few minutes watching the monitoring take place pretty much what was happening. I had in the control room we had wind speed direction indicators, and it was first of all, the wind speed was not making a very good effort to get on scale. It was effectively in stagnant condition. And the direction was changing quite rapidly. In other words it started out blowing towards the west shore at a very, very low wind speed. And then it kind of drifted more northerly.

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And then gradually toward the northeast. Continuing to fluctuate in directions quite dramatically. The wind speed always being -- very low. And I think what we were seeing, at least in my mind what was happening was we were getting pockets of the noble gasses that were being emitted that were meandering, and we were getting readings of, I think Gary mentioned the 50 to 70 MR per hour readings, I can recall those types of numbers being identified as existing near the security building, which is at the north entrance of the Unit I facility. And in confirming those kind of numbers a second individual, or the same individual might go back to the same area ten minutes later and find no detectable radiation. Off site I think we were seeing the same thing. It was a matter of just rising till you could get any kind of an indication, and then just trying to stay with it. We were seeing numbers off site, I think the highest numbers early on that I can recall, were I'm referring to approximately ten or eleven o'clock that morning, of about two to three MR per hour right on Route 441 immediately adjacent to the site. It was very difficult to estimate any kind of a plume. It wasn't a plume in the sense that we typically would expect but it was rather meandering pockets of a gas that -- (interrupted).

DR. FABRICANT: Where is the limit of your off site monitoring? At what point, is it to the fence post, is it to where the helicopter can fly, how do you define this?

MR. DUBIEL: The limit of our off site monitoring

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essentially would be limited to -- (interrupted).

CHAIRMAN KEMENY: No, I think how close and where is the boundary between on site and off site?

MR. DUBIEL: The physical restriction would be the river. In other words we could come right up to the river's edge off site.

DR. FABRICANT: Who is responsible for monitoring outside that area?

MR. DUBIEL: Metropolitan Edison is responsible.

MR. MILLER: We do both on and off site monitoring and they support us and use our numbers, or come along with us.

DR. FABRICANT: Is there any responsibility delegated to the Bureau of Radiological Health, or NRC Regional Office for off site monitoring?

MR. DUBIEL: No sir, there's no responsibility.

DR. FABRICANT: So for that first period of time up to something like twenty-eight hours I'm going to presume, you had been, you were responsible, or Met Ed was responsible for all monitoring. Did you get any support from any other agency?

MR. DUBIEL: Yes we did and I didn't mean to say that the Bureau of Radiological Health was not, excuse me for referring to them as the Bureau of Radiological Health, they just changed their title, Bureau of Radiological Protection. They did support us with some analytical work. They had fixed facilities that were able to support us. We did get support from first of all, I believe the ERDA RAP team which dispatched

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a plane, and I don't recall the exact time that it arrived. But it was flying overhead and making passes over the island to try to track the pocket.

DR. FABRICANT: Was this plane dispatched from Brookhaven National Laboratories?

MR. DUBIEL: That's correct. We also had -- (interrupted).

CHAIRMAN KEMENY: Is this the same one that
Department of Energy?

MR. DUBIEL: I'm not sure, but I believe there's a strong possibility there'd be a connection there. We did get also support from the Nuclear Regulatory Commission. They ---
(interrupted).

DR. FABRICANT: What type of support?

MR. DUBIEL: Both in the -- they had personnel that were monitoring. They were, sent their inspectors that had dose rate instruments that were --- (interrupted).

DR. FABRICANT: When was this instituted?

MR. MILLER: I saw some of those inspectors at noon, somewhere from noon on.

MR. DUBIEL: That's the same recollection that I have.

DR. FABRICANT: Did they interact with you, or did they relate to your emergency plan, or were they separate and distinct?

MR. DUBIEL: They participated in the meetings I've discussed and they were --- (interrupted).

DR. FABRICANT: When they first came on site?

MR. MILLER: Yes sir. They were brought to both control rooms. In fact, they participated and watched some of the engineers make calculations. There were three in one control room, two in the other, and when they came in we tried to separate them out so that we could keep the numbers down but they were in both control rooms and were fully, they were part of the discussions and they were an aid to us.

DR. FABRICANT: Did this augment Mr. Dubiel's activities, supplement them, or get in the way?

MR. MILLER: They definitely did not get in the way. The -- I guess to best describe it, we had several inspectors that were both on and off site. They were not under our direction. In other words, we were not directing them to specific locations for monitoring. But they were essentially out using their own judgment in trying to determine what their, or what points would be of interest and essentially doing that by watching their meters and they were feeding back the information and it was extremely helpful.

DR. FABRICANT: You had mentioned that you had recorded very high radiation levels in the auxiliary building, something of the order of a hundred R to a thousand R per hour. When you were aware of this, to whom did you report this information and what was done with this information?

MR. MILLER: The information was being determined, or generated if you will, by personnel who were monitoring in the auxiliary building. I don't mean that these were individuals specifically sent in to monitor, but rather were going into

the building for a specific function.

DR. FABRICANT: You had mentioned at that time - we have a recording of your interview - that when you were aware of these high levels, you stated that it was very easily - this level would very easily over-expose someone legally which is well below any point where there might be medical concern. What is the difference in your mind between legal exposure and medical exposure?

MR. DUBIEL: Well, I was talking specifically of an acute effect, and in my mind I think that we were trying to use as an objective about a one, I believe about a one point five rem exposure limit on people going into the auxiliary building. I don't feel personally that I would get - and this is - I'd be concerned but not from a medical standpoint of exposures slightly greater than three rem, for instance, four or five, even up to ten knowing that there are guidelines published that go as high as a hundred for life-saving activities, but I think that the intent was really to try to, with every means possible, to stay within the three rem limitations of the Code of Federal Regulations.

MR. MILLER: During any entry into that auxiliary building which would have gone beyond the one point five, Dick would have discussed with me what we were doing it for, what our incentive was, and why we had to do it, and we were using a three based on the fact that three is an accepted limit.

MR. PIGFORD: As a follow-on to that, did you at any time decide that you should send someone in in a situation that he would get more than that?

MR. DUBIEL: We did not send anyone into any areas with the prediction of the individual receiving greater than three rem.

MR. PIGFORD: Did you at any time request authorization from the local NRC man for authority to send a man in where he would get more than the allowable amount.

MR. DUBIEL: No sir.

MR. PIGFORD: Have you reviewed the testimony that was given by the NRC inspectors on this subject to the test course?

MR. DUBIEL: No, I have not.

DR. FABRICANT: When were you relieved of your particular emergency status?

UNKNOWN SPEAKER: Well, we were on the emergency plan at all times.

MR. DUBIEL: I was on an emergency - on my emergency station until approximately 6:00 the following morning.

DR. FABRICANT: And then you were officially relieved. Who took over as a result of this?

MR. DUBIEL: I do not recall. I don't remember the individual's name but it was a health physics foreman. At some point during the day of the 23th...

DR. FABRICANT: From where?

MR. DUBIEL: From Three Mile Island. Sometime during the day of the 28th, we asked a couple of our health physics foremen to go home and get some rest so that they could come back to relieve us, and I don't recall which ones they were.

DR. FABRICANT: What was your role following this when the inter-agency health group, the Department of Energy, HEW, EPA, set up their trailers at Capital Airport? Did you have any role at all to interface with this?

MR. DUBIEL: No sir.

DR. FABRICANT: Did they request any information from you or ask you to be involved?

MR. DUBIEL: No, they did not.

DR. FABRICANT: Did you feel ignored?

MR. DUBIEL: No sir.

DR. FABRICANT: Did you want to be involved?

MR. DUBIEL: I really didn't have - what I say, I didn't feel ignored - there were many things that I would have liked to have been involved in, but there was just no possible way that I could have been involved in anything more than what I was doing.

DR. FABRICANT: Was there some form of official transfer of activities and duties from your division with regard to monitoring and the use of this information to the trailer park group - the inter-agency group? Or did it just happen?

MR. DUBIEL: I'm not quite sure I understand which group you are talking about.

DR. FABRICANT: When you (inaudible) information you had a position of responsibility in the emergency plan, in fact, you did implement the emergency plan as regards health, physics and . Now, this plan, naturally or consequently, went to an inter-agency group that come from Washington. Now, what was your role? What happened during that time? Did you hand over any documents or did it just happen and you were no longer involved?

MR. MILLER: I think that as we started to proceed from Wednesday night into Thursday and Friday, and I recognized along with that this was not a short-term event, I began to try and set up a shift schedule so that I could send some people home and I would have kept people in the emergency plan roles, including an emergency director - I picked a guy and sent him home.

Same with Dick Dubiel's job, but in conjunction with that our service corporation was assembling a task force and there were an awful lot of people arriving quicker than we could assimilate and organize them. And, as they arrived, we gave the data we had to the people that the company had appointed to start that analysis.

DR. FABRICANT: So there was an orderly transition of information?

MR. MILLER: It was orderly inside the plant, but we had an awful lot of people trying to help in an awful small time frame so there were discussions and there were some hard spots and it didn't just move and flow but it did occur. But inside the plant, we kept all the functions going that the emergency plan required.

DR. FABRICANT: Did you advise any off-site facility...

CHAIRMAN KEMENY: Could I just ask a clarification on Dr. Fabricant's earlier question? I'm not sure but that he may have assumed something. Was there a point at which Mr. Dubiel or his replacement - I understand you have to do it in shifts - no longer felt in charge of monitoring?

MR. DUBIEL: I think the answer to that - and it's been two months now, and it's not all crystal clear - at some point during the later evening hours and into the night hours of the 28th and into the 29th, a lot of the functions of the off-site monitoring team - the actual directing of those teams and assimilating the data, the information, was phased out of the control room and - out of both Unit One and Unit Two control rooms - and over to the observation center where we had additional people that were setting up to take over with the radio communications and that type of thing, and I don't really - it was not a step function, it was a very gradual phasing to that group, and I think that my confusion really in answering your question lies in the fact

that I don't know how that group interfaced with the inter-agency group and I think that's where the transition went from, and I really can't answer on that.

DR. FABRICANT: Did you advise any off-site facility or agency of the potential dangers to the health of the public? Thusfar, we have been talking a great deal about the health of the workers at the plant, and I'm aware of that, but at no time yet did you either have the authority, or within the emergency plan, to direct this type of information as regards the health of the public. Were you able to, or was the plant able to contact the Governor's office, or one of his representatives, or did you convey this anxiety and apprehension to the Bureau of Radiological Protection, or one of the very important group, and, that is, did you contact the Radiation Threat Command Center at the Hershey Medical Center?

MR. DUBIEL: I did not contact nor speak to anyone at Hershey Medical Center during that day. Also, I think I pointed out earlier we had direct communications, and I personally was speaking on many occasions with individuals of the Bureau of Radiological Protection, and on many occasions we discussed the off-site dose values that we were receiving - the data that we were receiving - and it was concluded, not formally, but more or less the tone of all of our conversations was that we were not - in any way was Metropolitan Edison recommending any type of evacuation

or I should maybe speak for myself in that particular regard. I was not concerned about evacuation off-site or health effects off-site. I felt we were a factor of a thousand below the EPA guidelines.

DR. FABRICANT: Did you have any input into any decision-making as head of the health physics as regards the possibility of evacuation?

MR. MILLER: I might say that in each of our hourly meetings that I had, one facet of that meeting was to discuss specifically what Dick was doing with the emergency plan and who he was talking to. My memory says that at 7:30 in the morning between there and 8:30 we had a hot line from both control rooms right to the BRP and right to the NRC Region One. At 2:00 in the afternoon or 3:00 in the afternoon when I arrived at the Lieutenant Governor's office some of the BRP people were there at that time. I was informed, and Dick can testify to this, that I was informed throughout the day that we had not recommended evacuation to the state based on what we had seen and that we were not recommending it, and they were agreeing with that recommendation and that was pretty clearly given to me throughout the day.

MR. DUBIEL: That's correct, and I would like to discuss that we per our emergency plan Met Ed would only recommend - we have no authority to direct or order evacuations. And the conversations that were held between myself

and personnel of the BRP throughout the day - at no time did we, did I, indicate any concern for evacuation and my feelings were, in fact, agreed to by the individuals from the BRP.

DR. FABRICANT: I want to ask two general questions now. They're somewhat complicated and they're very subjective, so I'd like you to think about them.

Since you were so close to the activities which influenced the actual and potential dangers to the public health and safety, and the health and safety of the workers, what was your personal assessment of the way the public media reported and interpreted the events of the first two to three days, and why do you feel that way?

MR. DUBIEL: I agree that the questions were somewhat subjective, and it's hard not to give a subjective answer. I think in the days that of the 28th, 29th and 30th I spent an awful - tremendous number of hours in the Unit Two control room, and I at no time personally was concerned that we had a situation that might lead to our reaching the EPA guidelines for evacuation, or protective action guides, if you will. When I left the Unit first on the morning of 29th, and then again on the - would have been about 11:00 at night on the 29th - and again on the 30th at approximately 10:00 or 11:00, I was able to go home and see some of the things that were either in print or over the news media - television and radio, and I really didn't feel that the news media was

presenting the same kind of a picture that I, in fact, had in the control room. And I was quite honestly disturbed about the - being subjective - the sensationalism of the press.

DR. FABRICANT: Were they selective?

MR. DUBIEL: I felt they...

DR. FABRICANT: Were they detrimental in their selection?

MR. DUBIEL: I felt they were, but - and I think I've had a couple of months now to reflect on it, and I've reread some of the articles and I've reread - I should say, I've read - recent articles pertaining to the event and some of the follow-up to the events, and I really do feel that there's an awful large possibility of the news media misconstruing a lot of the information - I think they're dealing in a language, a vernacular, that they're not used to. Simple things like confusing a millirem and a rem. Microcuries, I think, are new to them, they're new to the public. And I think that it lended itself - that unfamiliarity - lended itself to a tremendous amount of misconception by the news media which honestly could result in the wrong picture being presented. But, I also felt, in retrospect and personally, and seeing the newspaper that I have delivered at home, that the sensationalism - the articles that sell newspapers are really played up and possibly the article that would maybe contradict an earlier finding usually appears on the back page. That has disturbed me.

CHAIRMAN KEMENY: Commissioner Trunk.

MS. TRUNK: From your list of agencies, you've talked to the NRC and to the state, have anybody talked to local officials like Middletown mayor, the school board. I'm beginning to feel that you do a lot of talking, but the poor person in the middle is left in the dark, and I'm getting tired of it. I want to know, I live there. Who was talking to the mayor? I depended on the news media - there was no other way to find anything out.

MR. MILLER: I think your concern is a valid one - I live there, too.

MS. TRUNK: I know.

MR. MILLER: Everybody here lives there. And one of the things that was extremely disappointing was to read the paper when you got home, not because of sensationalism, just because of the fact that people came over to my house and wanted to know what was going on. People watch my car. Alright, now I understand that, but I couldn't have talked to the mayor. I couldn't have begun to do that that day. I spent half that day on the phone - I'm just saying that we never geared up as a society to talk about one of these things until we had to. And like Dick said, the language is different, and it's darn hard to tell somebody that you get one MR and that that's OK, because he's been taught that anything above zero is not OK.

MS. TRUNK: OK, but what I mean is, granted, the state is far away from us, the NRC is far away from us, but you have to have somebody to talk to the people in the local areas.

MR. MILLER: I might say one thing to you - that our company has made some effort. They are not publicized efforts, but every year, for instance, I meet with the fire chiefs, and I meet - in fact I met in October myself with all the civil defense directors, discussed this plan with them, and the plan went off. Now, I guess I don't know the answer to your question except we sure got to answer it in the future. It's something we hadn't thought about. Our company tried to put out releases. I don't think we had geared up to talk to everybody that had a valid concern, and there were an awful lot of people that had a valid concern. From inside the control room, I was conditioned to go into an emergency plan, and I did not have the time to take from that and take the chance for an error in that. That was the way I was, there was just no link set up that was effective, and I understand your concern.

MS. TRUNK: Well, I think we'd better get something changed.

CHAIRMAN KEMENY: Mr. Pigford.

MR. PIGFORD: Mr. Dubiel, if I could call up a (inaudible) on the question that was asked when Dr. Fabricant was questioning you. Now, concerning the possible request

by GPU on sending people - your workers in for radiation exposures. I'm referring to testimony given before the Udall Committee Task Force on May 10, and this is Dr. Galina, who I understand works for NRC, and he is discussing there the issue of sending a man in to get a sample and he states, "they asked permission," and I suppose that maybe means the people in the control room, "to exceed NRC limits. In other words, to send a guy in to get five rems in one shot. We told them right off the NRC said no, we're not waiving any limits, as far as that we're going by the book." Later on, he was asked, when was that, and he - was it Wednesday afternoon, maybe it was Thursday morning - he's a little uncertain about the time. So I just wanted to let you know about this statement and see if you have any comments.

MR. MILLER: One thing I might say, once we got in place with all the organizations that came, then we instituted a review of anything we did by the NRC, by anyone else that had a concern. That sample was requested, I believe, by the advisory group who were trying to assess core damage, and I think at the foreman level in the plant, people didn't understand totally the concerns - the total concern and consideration that were given before the decision was made by management or by the group - to ask for the sample.

MR. PIGFORD: Yes. What I really - it had appeared to me that it seemed to be contrary to what Mr. Dubiel had told

me a little while ago. Would you like to clear that up?

MR. DUBIEL: The one thing I can honestly say is I did not know that that request was made. I don't know who made that request. But in Gary's comment, there were a lot of procedure writers, if you will, people who were trying to put together procedures to be reviewed by all the various groups prior to any evolutions taking place. And that might have been an issue that might have been raised by one of the individuals trying to put together procedure.

MR. MILLER: I might say that at one point we had eleven signatures on some of those procedures.

MR. PIGFORD: Mr. Dubiel, is this the first time you've heard of that?

MR. DUBIEL: Yes, sir, it is.

CHAIRMAN KEMENY: There are three commissioners who have asked first Governor Peterson then Governor Babbitt and then Professor Marrett.

MR. PETERSON: I want to follow up on the radiation questions. You mentioned, Mr. Dubiel, that when the emergency was declared you came to the control room and you got out the maps of the area and then concerned yourselves with getting data measuring releases of the air flow. Mr. Miller presents the question, were you concerned about what major releases might have come about because of radar problem and said to Mr. Miller that even though you were concerned about getting the release down to zero - of course,

that's a commendable goal - but, it seemed to me the reason for all these precautions is not to go from insignificant to zero, but what happens when you go the other way. Now, when the radiation monitor went off, as you pointed out, that meant that it was really eight R per hour which meant there were something like eight hundred R per hour within the containability. What would have happened to one of your employees if he were in that building under such conditions?

MR. DUBIEL: If he was in the vicinity of the...

MR. PETERSON: No, I mean right in the eight hundred Rs per hour.

MR. DUBIEL: Depending on the length of time he could potentially pick up a lethal dose.

MR. PETERSON: How about being more precise than that. How long could he be in there and still survive?

MR. DUBIEL: Well, the textbook lethal dose varies but I guess the mean is about six hundred rem, so one could say that he could be in there for three quarters of an hour but I believe the textbook lethal dose also does not include any medical attention as follow-up. I believe people have received doses up to closer to a thousand rem and still survived.

MR. PETERSON: And how high did the reading eventually get within the contaminant zone? The actual radiation, not just the monitor - what was the actual extrapolated intensity

of the radiation?

MR. DUBIEL: I believe, through various methods of calculation, that the radiation levels in the operating floor, which, if you recall, the layout of the reactor building exposes you to about half of the building volume which is above you, reached levels of about a thousand Rs per hour.

MR. PETERSON: When we were there, your instrument was reading much higher than that, but you didn't believe that instrument.

MR. DUBIEL: That's correct. We - the thousand R has been determined through two or three other methods of calculating the exposure rate in the reactor building, and the values will vary by maybe twenty percent but I think the other methods, and predominantly the methods used were measurement of the radiation level on the outside of the reactor building and on the dome of the reactor building, and then using the shielding factors of the reactor building to calculate the dose rate inside and also by using the gas activity of the containment air we - subsequent to the event - were able to draw samples of contaminant atmosphere and, then knowing the - being able to evaluate the activity level of the mobile gases in the contaminant atmosphere, one could calculate what type of activity - what type of exposure rate would result from that type of source.

MR. PETERSON: Do you have plans to deal with the situation if the containment building had ruptured and this kind of radiation had escaped to the community?

MR. DUBIEL: Do we have plans? The emergency plans.

MR. PETERSON: Do you have a description of what might happen to the community if the building had ruptured and that had been released?

MR. DUBIEL: Do I have a description?

MR. PETERSON: Does (inaudible) or anybody have a description of what might happen?

MR. DUBIEL: I don't believe there's one documented, to my knowledge.

MR. PETERSON: Well, what would have happened, do you think, if the building had ruptured for some reason and the stuff had escaped to the environment?

MR. DUBIEL: All right, first of all, the building pressure was, for the most part, other than the spikes that have been referred to...

MR. PETERSON: Assuming it had ruptured....

MR. DUBIEL: Well, what I, the point I wanted to make was that there was through the duration of the accident other than the few spikes that we had, there was no appreciable building pressure so that the gas in the building would not be released in a puff, but rather it would more seep out, if you will. If it were to seep out, then the result would be that, due to dispersion through winds and dispersion

downwind, it would be dissipated to a lower level than what we were seeing in the building, but substantially higher than what we had been measuring during the event. The result - I personally could not predict what kind of level we would see. I would estimate that they would - off-site would be a factor of a thousand to ten thousand less than what they actually were in the building, and I believe that if that type of event had occurred, we probably would have been into an evacuation situation.

MR. PETERSON: We would have had this twenty-eight pound per square inch blimp on the pressure reporter. How much of a pressure increment can the containment building withstand?

MR. MILLER: It's design, I believe, is for a full which is probably fifty-four, fifty-five pounds, it's tested to sixty pounds structurally, and it's tested every so many years by pumping the building up. It's additionally designed for a large aircraft doing about two hundred knots to hit it. And an earthquake design is included also.

MR. PETERSON: Now, the event presumably occurred because of the explosion of hydrogen reacting (inaudible) in the containment building. Had to be triggered off by a spark or something, wouldn't it, to have caused that to occur? What if a greater concentration of hydrogen had developed before it was triggered off, or it were triggered off? Have you calculated what kind of pressure might have

built up? Could it have exceeded that sixty pounds per square inch?

MR. MILLER: There's discussion in the FSAR about hydrogen burning, but I don't know that that calculation's been made for the percent failed fuel that we've got. That's one that we could make probably in the future.

MR. PETERSON: You don't have explosion-proof motors, and so on, within the containment dome?

MR. KUNDER: Some are probably - they're probably duely rated for, not specifically for explosion-proof protection, but rather to qualify those components in the environment that they would have to operate after the design (inaudible) accident.

MR. MILLER: The building goes to like three hundred degrees and sixty pounds after a loca, so those instruments are designed with integrity to support that - all the safety instruments. There are other instruments in there that don't have that design because they're not required for the safety function.

MR. ROSS: It should also be pointed out that the majority of the ES type valves are located outside of the building.

CHAIRMAN KEMENY: Governor Babbitt.

MR. BABBITT: Mr. Miller, the statement by you that we've been referring to throughout this discussion appears to be dated May 7th, 1979, is that correct?

MR. MILLER: Yes sir.

MR. BABBITT: Now, this is the statement that I believe you testified you prepared mostly during the period from about April 14th to 16th, is that correct?

MR. MILLER: I prepared this approximately at that time frame and presented it to my management, not really having knowledge of any of these other kinds of hearings.

MR. BABBITT: OK. And, were there discussions with your management and revisions based upon those discussions?

MR. MILLER: No revisions to the content.

MR. BABBITT: What kind of revisions were there?

MR. MILLER: The introduction and closure were all. There was no revision made within the times I've given or the logic for the events.

MR. BABBITT: Did you write the introduction and closure?

MR. MILLER: Yes.

MR. BABBITT: Prior to preparing this document, did you prepare an earlier chronology of any kind?

MR. MILLER: I had rough notes and some stuff I had tape recorded to put it together.

MR. BABBITT: Do you still possess both the rough notes and the tape recording?

MR. MILLER: I do not.

MR. BABBITT: And, where, to the best of your knowledge, do those presently reside?

MR. MILLER: I may have a tape recording of when I dictated - I'll have to go back home and check on that. The rough notes, I would have thrown away as I wrote a page of this.

MR. BABBITT: OK. But you may still have the tape recordings?

MR. MILLER: Yes sir.

MR. BABBITT: OK. Do you have any other writings, memorandums, diaries or anything that would contain observations relating to this accident?

MR. MILLER: Nothing that would - I want to qualify - I've got about two briefcases full of stuff that I've collected, but nothing that I have written down that pertains any more than this to my logic and what I did.

MR. BABBITT: OK. Would you be willing to attempt to preserve all of the notes and tapes that you presently have in case they are needed by this commission?

MR. MILLER: Yes sir.

MR. BABBITT: Have you given any...

CHAIRMAN KEMENY: Mr. Babbitt, I would like chief counsel to ask could the commission vote here to subpoena those items?

MR. NATALIE: Yes, by doing someone make a resolution to the effect as soon as we can.

MR. BABBITT: I don't think that's necessary right at this moment, I'd just like to ascertain what's there.

CHAIRMAN KEMENY: Let's see, the question I asked chief counselors was whether we can subpoena those documents.

MR. MILLER: I'm willing to give those to you. I don't...

CHAIRMAN KEMENY: Yes, we have your assurance under oath that you will not from here on in any way attempt to alter those.

MR. MILLER: No sir.

CHAIRMAN KEMENY: We accept that. Very good.

MR. BABBITT: Mr. Ross, do you have any written memoranda, notes, tape recordings of your observations of the events that we've discussed here?

MR. ROSS: There are some tape recordings of the events discussed here that were given to the NRC. I personally do not have all them - items and things I wrote down at the time.

MR. BABBITT: Those are notes that you made at the time, or notes...

MR. ROSS: They are not notes that I wrote at the time.

MR. BABBITT: They would have been made subsequently?

MR. ROSS: Subsequent, or information type notes for me.

MR. BABBITT: OK. Now, I take it you would be willing to preserve those and turn them over to the commission?

MR. ROSS: Yes sir.

MR. BABBITT: Mr. Kunder, do you have any tape recordings or writings that you made relating to these events?

MR. KUNDER: Yes, I do. One of the notes that I took the day of the 28th, anything I had we threw in a box that was later confiscated by the Results and Analysis Group that I referred to earlier - the GPU Service Corporation people, so that information, whatever is available, is there. I have a tape of some, a bunch of recommendations that I had made on my own that I think are still in my desk, and you're certainly willing to have that. And, additionally, the tapes of my previous interviews with the NRC, and I guess you already have the tape of my interview with your group, I'm perfectly willing to turn those over.

MR. BABBITT: When was the tape of recommendations made?

MR. KUNDER: I probably had it dated on the tape. I don't recall off hand, but it was one night - it was late at night when I came home from work, I think during the first ten days. Or, it may have been a little later than that. It was prompted in part by Gary's request to put together any recommendations that we could think of relative to this accident that would either prevent or would permit us to mitigate circumstances of similar events as directly related to our units at TMI.

MR. BABBITT: And you'll make every effort to preserve that tape, until you receive a request?

MR. KUNDER: Yes. And there is written - that tape is merely dictation, and from that dictation those recommendations

were typed.

MR. BABBITT: OK. But you will preserve both of them?

MR. KUNDER: Yes.

MR. BABBITT: Now, to whom did you give the materials that you say were confiscated by management. I recognize you...

MR. KUNDER: I didn't mean that word - that was a bad word. We retained, I guess is a better word. We did want to take all the recordings and any information that was pertinent and collect it and preserve it under some tight controls as best we could and as early days for the Data Reduction Group, as we now call it, to utilize, to reconstruct as much of the event as possible.

So I did not really retain any of my hand written notes and a lot of that material went in that direction.

MR. MILLER: We've been asked this question before, and I think that Mr. Blake retained anything that the group has.

MR. NATALIE: Could I ask Mr. Blake one question if he knows the answer to it. Would the custodian of the documents that Mr. Kunder is talking about be the same fellow who is the custodian of the documents that were previously given us under subpoena?

MR. BLAKE: I think it's clear, Mr. Natalie, that that same custodian would exist in the case of Mr. Kunder and his having provided his documents apparently to the data management people. It's not so clear that it's true in the case

of Mr. Miller.

MR. BABBITT: In the case of Mr. Miller?

MR. BLAKE: Mr. Miller I think may have retained some documents...

MR. NATALIE: My question was only related to the documents that were no longer in the possession of these gentlemen.

MR. BLAKE: I think we know who that is.

MR. KUNDER: And much of that information, whatever exists, was utilized for the most part in preparation of the reports.

MR. BABBITT: Mr. Dubiel, do you have any recordings or writings, diaries, memoranda, in your possession relating to these events?

MR. DUBIEL: I also have the same NRC interview tapes which are available to you. I have no diary per se. I have not put together a group of notes and the notes, as I think most of us did in those days, the notes that I took were not recordings of events, but rather reminders to myself to do something and, as I did it, I threw the note away. I have no knowledge of where those notes are from the first days. But anything that I do have, I have not - as I come across things, I haven't been throwing anything away.

MR. BABBITT: So, you will make every effort to preserve any written memoranda of any kind, notes to yourself, or memos?

MR. DUBIEL: Yes I will. Yes I will.

MR. BABBITT: Thank you. Mr. Miller, in your statement you indicate sometime during the morning of the 28th, you received some instructions with respect to the atmospheric dump valve on one of the generators, apparently by someone concerned that you not be releasing steam through that dump valve. Could you explain that in a little more detail?

MR. MILLER: As I explained earlier, we had to go to atmosphere because we lost the ability to go inside. That's a design condition of the plant. We were aware that the brothel of the beasting generator was potentially contaminated and we did not steam from it; we steamed from the alpha steam generator but there was an off-site concern, and I understood it to be coming from the state, that I was releasing radioactive steam. That was where I believed the pressure to be coming from.

MR. BABBITT: Did you receive direct instructions from the state or its representatives to stop steaming the alpha generator?

MR. MILLER: I received those instructions from my management. I received a request to stop steaming.

MR. BABBITT: OK. Do you recall who specifically communicated that to you?

MR. MILLER: I believe it was Jack Herbine, but I can't very clearly say I'm sure of that. I think it was Jack.

MR. BABBITT: OK. But you received no direct communication from the state?

MR. MILLER: Dick, did you? I did not.

MR. DUBIEL: I did not.

CHAIRMAN KEMENY: Professor Marrett.

MS. MARRETT: I just have a few questions regarding the emergency plan and beginning with the section on maintaining preparedness. According to the plan, there is to be training of several local groups. I'd like to know who does the training, and when was the training most recently held?

MR. DUBIEL: The training of the local groups is done by personnel on site and I partake in that training. I'm going to have a hard time pin-pointing when the last training sessions were held, but I believe that they were held in August of '78 was the last evolution of, in the training area. It is written into our plan, I believe it is an annual requirement, and I believe that it was August of '78 was the last one.

MS. MARRETT: Are the various organizations required or simply invited to attend?

MR. DUBIEL: They are invited to attend.

MS. MARRETT: Do you have any idea of how many would have participated, then, in your August, or whenever the last training occurred?

MR. DUBIEL: To the best of my recollection, the civil defense groups were all represented, meaning the state, the

County, Lancaster County, and I believe your county, I can't be positive on your county, state police and several of the local, but local civil defense fire departments - I don't feel that it was a high percentage though.

MS. MARRETT: Is it quite possible, then, that some of the organizations - I believe that includes the Middletown Police Department, fire department, civil defense - is it possible that there are some of those organizations which have not participated at all in any of the training?

MR. DUBIEL: I would not say that they've - that any of them have not participated at all. We have over the course of several years, I believe, had representation from every organization.

MS. MARRETT: You have the records that would indicate which organizations have attended at what times?

MR. DUBIEL: Those records, I believe, exist in the training department.

MS. MARRETT: With reference to the emergencies, the drills for the emergencies, apparently there is an annual site or general emergency drill, one or the other. Does that mean you can alternate between which of the two?

MR. DUBIEL: We generally have an annual drill which the training department makes up a scenario that could run to a site emergency level or a general emergency level, and they provide that scenario and initiate it on site while

agencies like the NRC and the state witness our performance, so generally that drill comes down til about eight or nine drills a year, with the culmination being one final drill. It generally runs to the general emergency level.

MS. MARRETT: Now, the drills require participation of the on-site teams. Do they require participation of the off-site organizations that would be involved?

MR. DUBIEL: I think the word "require" - I would have to say no, but historically the way we've conducted the drills, we will set up, for instance, this past year I believe we ran eight drills, of which at least three involved off-site agencies and those agencies would - we would notify them ahead of time as to the - at least the time of the drill - the day - an approximate time - and request that their participation - and they would respond to us as to what degree they might wish to participate.

MS. MARRETT: When you say there were eight drills, those would not all be general emergency drills, would they?

MR. DUBIEL: Not all general emergency drills.

MS. MARRETT: Would you have any idea when the last general emergency drill was held?

MR. DUBIEL: It was held last year, and I don't remember the specific date, but I would guess September, October?

MR. MILLER: It's October, and it may even be early November, but it's somewhere in the last - we could get that date, but it's the last quarter of the year.

MS. MARRETT: Well, with reference to the actual events, here are the plans, with reference to carrying out those plans, reading through a number of statements, I have a series of questions that may not be very easy. But, with reference to one of them, apparently, the plan calls for contact with the local health officials, particularly the Hershey Medical Center. This is all the personnel from the plant, is that right? So Hershey is prepared if there are problems for plant people.

MR. MILLER: I believe that that part of it is initiated if you have a medical person hurt during the radiation. In other words, that's the one agency that I'd have to go back and look at the exact words, that you would only call if you had injuries at the same time. Because they have by agreement with us - in other words, if we have an injured worker, we have the ability to go to Hershey and have them treated, even if they are contaminated.

MS. MARRETT: I guess the question becomes, does the plan take account of the fact that there may be people from the public who would also have to - you would have an increase possibly in the number of patients at Hershey aside from those who might come from the plant - or is this plan entirely - just what happens at the plant?

MR. MILLER: I think the plan is directed more towards using the protective guidelines - in other words, the first thing you may be told to do would shut your door and go

inside - the second level may be to evacuate before you got to the point of requiring medical assistance.

MS. MARRETT: Well, with reference to the actual implementation to the plan, it seems that if there were several things that might have differed from the actual event from the plan itself - is it the case, for example, that there were more people in the control room during the event than would have occurred at the time of your general emergency on the drill - the last drill.

MR. MILLER: The unit - the emergency plan is set up so that at 3:00 in the morning the people who are normally on shift could initiate it and start the plan working, and some of the drills we described are run on those shifts. It just so happened that we coincidentally had assembled most of our senior people on the site, so it was a lot easier to run from the standpoint of me having the availability of the best talent I had.

MS. MARRETT: But your drills had involved as many people as there were involved during - in the control room - during the first few hours of the event.

MR. MILLER: Some of the drills last year would have involved some of the same people doing the same functions.

MS. MARRETT: With reference to communication, apparently from some of the three interviews, one of the things had to do with the number of calls that were coming in to the control room. Is that different from what would have happened

in terms of just communication? How sufficient were the communication channels with reference to the actual event?

MR. MILLER: The communications channels that are defined in the plan all worked and all were initiated. There was an awful lot of other communication in people trying to call in from the NRC, from the B&W, from my own management, so, from that aspect, which is not part of the plan, or part of the need for the plan, from that aspect, we were overloaded with communication.

MS. MARRETT: Do you see, this is a problem. That is, the plan does not take account of very much - very many inquiries coming in from the outside, it's a matter of being able to transmit from the plant. But, wouldn't that be a reasonable kind of thing to expect, that there are going to be calls from management, from the press, and apparently from a number of other places at the time?

MR. MILLER: I see that as an area that needs to be very well thought out and solved, but you really wouldn't want the emergency director to be the person who was talking or he would quickly lose focus of what his plan was. So, it would have to be solved, but I'm not sure the control room is the solution.

MS. MARRETT: Where should the communications go? How should that be handled?

MR. MILLER: I think it should be somewhere in a remote location that can talk to the control room with a defined

communicator.

CHAIRMAN KEMENY: Commissioner Haggerty.

MR. HAGGERTY: I'd like to go back to the events which initiated the incident. Apparently, at about thirty seconds, the electromatic relief valve opened and then it is believed that it did not close. However, you have temperature indicators on the coolant drain tanks. How is it that at one minute and twenty-six seconds the reactor coolant drain tank normal - temperature normal alarm was received, indicating eighty-five and a half degrees, if hot steam was indeed being vented all during that minute and a half into that tank?

MR. ROSS: I don't think we have an answer for that. I haven't seen that particular sequence of events.

MR. HAGGERTY: This is in your sequence interim report on Three Mile Island Nuclear Station dated May 15th and it shows that event at 1:26 and then very shortly thereafter the temperature is once again indicating high. It raises a question in my mind as to whether the valve did not, in fact, close once and then reopen and stay open the second time.

MR. MILLER: I think that in that time frame, that data was not available to the operations people that you were talking to yesterday. I think that's come off of the backlog of data. My understanding is that within - and I don't think Mr. Daly could tell you the number of minutes, but that he went around to the panel and looked at the

digital indicators and did not see level or pressure, did see some temperature rise.

MR. HAGGERTY: But, nevertheless, this presumably was indicated - it indicates the temperature dropped back - the earlier comments that the temperature and pressure went up in the coolant drain tank. Then, at a minute and twenty-six seconds, all of a sudden it's back down to eighty-five again, and about a minute later it's back up again, indicating - I don't understand it unless there's some special way of cooling or peculiar circulation or other factors. Otherwise, it suggests that the valve closed and then perhaps opened again.

MR. MILLER: I think we have to give you a better answer by looking at the same sequence, but there is a cooling system that does cool that drain tank, it's a part of what I discussed earlier, it's a leakage cooling system, but on a safe guard signal that's not a safety system that would have isolated and, therefore, the drain tank would have heated up just because its cooling was isolated. OK, safe guard's initiation, which probably occurred in the same time frame.

MR. HAGGERTY: Yeah, but this is going down now, I mean this is going down to eighty-five a minute and a half later, after the initiation, after the valve opened and was presumed to remain open. Well, presumably, you can't answer it - I think it's an incident which does need to be

looked into.

Second, when you came on site, Mr. Miller, or earlier, Mr. Kunder, where did you think all the water was coming from? It was getting into the sump tanks and being pumped into the auxiliary building.

MR. KUNDER: Well, I personally was not aware of the degree or the fact that a lot of water, as you stated, Mr. Haggerty, was going into the auxiliary building. Initially, I was not aware of it.

MR. HAGGERTY: You just didn't know.

MR. KUNDER: No. I found out about that later in the morning - it could have been an hour or two later, I'm not really sure.

MR. HAGGERTY: When the coolant pumps failed to start because of cavitation, why did you think that was, Mr. Miller?

MR. MILLER: At the time I was there, we were convinced there was a steam bubble in the hot legs.

MR. HAGGERTY: Had you, in your training, ever been subjected to the possibility of voids in the total loop of the system other than at the top of the pressurizer vessel?

MR. MILLER: I had not, Mike?

MR. ROSS: No, I don't think me or any of my operators have been subjected to that type of training.

MR. HAGGERTY: Were you aware in any way prior to March 28th of the TM Novack NRC letter of January 10th

describing this whole pressurizer loop problem almost exactly as it happened to you?

MR. MILLER: No sir.

CHAIRMAN KEMENY: Commissioner McPherson.

MR. McPHERSON: Mr. Miller, did you remain in charge of the control room after Mr. Harold Denton arrived on Friday?

MR. MILLER: The - we continued an emergency director for the plan. I received specific directions from off-site (inaudible) as far as any plant evolutions, but I remained as the emergency director - as one of the two.

MR. McPHERSON: You worked with Mr. Denton?

MR. MILLER: No sir. I worked inside the plant and I was directed by Jack Herbine. By that time, the organization had formed, with Jack Herbine in charge of operations underneath Mr. Arnold.

CHAIRMAN KEMENY: Mr. Miller, could I just get a clarification on that. To what point were you clearly in charge?

MR. MILLER: To my memory, somewhere in that night of Wednesday, clearly in total charge.

CHAIRMAN KEMENY: Then...

MR. MILLER: From there on I had a lot more direction from management and from agencies that were brought in.

CHAIRMAN KEMENY: Commissioner McPherson.

MR. McPHERSON: Were you aware of NRC's participation in any of the decision-making going on?

MR. MILLER: During the day of the 28th?

MR. McPHERSON: During the period from, let's say Friday morning, the 30th on for the next week.

MR. MILLER: Yes sir, I was aware of that.

MR. McPHERSON: Did you feel that it was necessary to clear what you did with Mr. Denton or NRC representatives?

MR. MILLER: Within the control room, there were representatives from NRC and we didn't do anything without telling each other, so there was not question about being informed before things were done. Now, the only change to that would have been if the operator had had to make a move on the panel, in an emergency nature, he would have told them after the move, OK, that would have been the exception, but, for normal operations in the plant, we would have said, hey, we're going to do this with the reactor coolant pump or we're going to start this, and then everybody was sure that we were all travelling in a defined direction.

MR. McPHERSON: Would you say that the relationship was very smooth between NRC and Met Ed?

MR. MILLER: It was smooth.

MR. McPHERSON: Mr. Denton has testified that there were a great many serious disagreements between you.

MR. MILLER: I think that if you assemble thirty or forty people in a room and you start talking about something like this that you can have a lot of discussion that I wouldn't characterize..

MR. McPHERSON: What disagreements do you recall?

MR. MILLER: A lot of the disagreements that I recall I can't recall specifics. Like I said earlier, we got to a point by Friday or Saturday where it took eleven people to sign to do anything. That can become counter-productive beyond a point, and I think that, from an exhaustion standpoint and a frustration standpoint was where that occurred. I can't remember specifics...

CHAIRMAN KEMENY: Excuse me, Mr. Miller, could you clarify that - what do you mean by eleven people have to sign something, somebody required you...

MR. MILLER: If I was going to take the sample of the reactor coolant system? You hadn't finished...

CHAIRMAN KEMENY: No, no, you're answering my question. Yes, go ahead, give the example.

MR. MILLER: If you were going to take a reactor coolant system sample, we would possibly have eleven different people review that procedure and there might even be two or three of them from different regulatory groups, and they would all have ways of doing it and that can become kind of frustrating.

CHAIRMAN KEMENY: Who required you to do that?

MR. MILLER: Who was boss? I think it was in between Barr Senior Management and Varis. We would finally get to a point and say we're going to get this procedure approved tonight, and we're all going to sit in a room and

resolve it, and that's how it got resolved.

MR. KUNDER: We set up a procedure whereby anything we did was done in accordance with a written and approved procedure. Parties who specifically were approving the procedures at that time was the Plant Operations Review Committee which consisted of five members, and that's a committee chartered by a technical specifications; in addition, we had a representative from the NRC review the procedure and approve it; also...

MR. McPHERSON: Thank you, Mr. Kunder, but would you testify, Mr. Miller, that there were no serious disagreements between the Met Ed people and the NRC people?

MR. MILLER: I would testify that there were no serious disagreements, and the basis of that would be that there were not any of the major objectives where there were disagreements. There were disagreements over specifics, but not over the goal and where we were going...

MR. McPHERSON: Well, clearly, the goal is to bring this plant down and keep it from venting radioactivity to the surrounding area, but that's a very broad goal. As to how to do that, were there serious disagreements?

MR. MILLER: No sir, for instance, whether we started the reactor coolant pump, whether we vented the makeup tank, items that involved the potential exposure or release - those items were resolved, and I'm not...

MR. McPHERSON: After disagreement?

MR. MILLER: After discussion, and I quite honestly wasn't involved in some of the discussion that occurred off the site. OK, so I'm saying it from my perspective, there was agreement. In the control room there wasn't total harmony, but there was agreement on specifics when we went to do something and everybody agreed to it, and we went and did it.

MR. McPHERSON: We're going to hear testimony this afternoon from the NRC people who were present before Mr. Denton got there and then we're going to hear from Mr. Denton, and tomorrow we're going to hear from NRC commissioners, so your testimony would be that there were a few bumps along the road, but they were quickly resolved and there were no serious disagreements as to what to do.

MR. MILLER: The word "quickly" I don't know that I agree with, but one thing I might say, that in that control room on the 28th and through the 29th I talked to some of their senior people and I did not have any disagreement from them that they ever expressed to me.

MR. McPHERSON: Did you ever talk to Mr. Denton?

MR. MILLER: No sir. I talked to some of the other people who we sent up there.

MR. McPHERSON: OK. Mr. Chairman, just a few more questions. Mr. Ross, you are the Supervisor of Operations of TMI I, is that right?

MR. ROSS: That's correct, sir.

MR. McPHERSON: And ordinarily you work in the other plant.

MR. ROSS: Yes sir.

MR. McPHERSON: You came down about somewhere before 5:00 in the morning because there was a flow loss, is that right, in your plant?

MR. ROSS: No sir, that's not entirely correct. I came to the site between around 5:30 in the morning and was asked to come to Unit Two sometime after 6:00...

MR. McPHERSON: Why did you come to the site?

MR. ROSS: I came to the site based on a call from my Unit One shift foreman who had lost heating steam from Unit Two. At that time, the Unit One plant was in the process of being heated up. His concern was chemistry control of the steam generators for the Unit One plant, and we discussed it at some length. After that, not knowing of any problem at the time, I had a leisurely breakfast and came to Unit One. At that point, Mr. ...

MR. McPHERSON: You have leisurely breakfasts before 5:00 in the morning, Mr. Ross?

(Laughter)

MR. ROSS: Sometimes, sir.

MR. McPHERSON: OK. Mr. Ross, are there different - both of these plants, Unit One and Unit Two are Babcock and Wilcox plants, isn't that correct?

MR. ROSS: Yes sir, that's correct.

MR. McPHERSON: But are there differences in construction design and, or in equipment, instrumentations, between the two plants?

MR. ROSS: There are some differences. On the primary plant, they are both supplied - both the NSS systems are supplied by Babcock and Wilcox. Control room locations are somewhat different. Some of them - items are different as far as interlocks and different type of systems reactor coolant pump motors. On the secondary, non-nuclear side of the plant, there are some fairly larger differences. I don't think it's like any other major power plant, there's a different turbine manufacturer. In the case of Unit Two, Westinghouse makes the turbine and in the case of Unit One, General Electric makes the turbine.

MR. McPHERSON: Are there, would you say that there were, with respect to the nuclear side, would you say that there are differences in quality between Unit One and Unit Two?

MR. ROSS: I could not say there is a difference in quality, not known to me.

MR. McPHERSON: If you were again, God forbid, to be in a situation like this, had you rather be dealing with Unit One or Unit Two, had you rather the situation arise in One or Two?

MR. ROSS: I'm not quite sure how to answer that question. Of course, I would rather it didn't arise anywhere.

I don't feel there would be any major difference. There are a little more interlocks in Unit Two than there are in Unit One, but I don't see any...

MR. McPHERSON: What does that mean? More interlocks in Unit Two?

MR. ROSS: Maybe the reactor coolant pump and motor have some more interlocks and as far as the engineering safe guard systems, they're pretty much the same. I would not say there'd be a major difference in my opinion.

MR. McPHERSON: Thank you.

CHAIRMAN KEMENY: I think perhaps we ought to move on to the next witness. I would just like to establish the transition, Mr. Miller, before we excuse you all. Tell me what

I requested that Joe get the emergency plan and all the, any procedures that were applicable to the Unit out and assured that we were following those steps and that he also participated in the discussions throughout the day with the group I talked about.

CHAIRMAN KEMENY: Now may I ask you, had you put Mr. Ross in charge of operations?

MR. MILLER: Yes, sir.

CHAIRMAN KEMENY: Just from an outsider, may I, it seems likely odd, may I ask you why you took the supervisor of operations from the other plant and put him in charge of operations and not the supervisor of operations at TMI 2?

MR. MILLER: Normally I would have put Mr. Floyd in charge as the Unit 2 Shift Supervisor, but he was in Lynchburg. I think Mr. Ross is a far better operator than I am or Mr. Logan is, is the reason.

CHAIRMAN KEMENY: I see. So it's a matter of the different--

MR. MILLER: And he is licensed--

CHAIRMAN KEMENY: He is licensed in Two, so in a way you're saying a supervisor of op--I see Mr. Logan's title is Superintendent--you're saying basically that the Supervisor of Operations is in a better position to run the operations than the Superintendent of the plant.

MR. MILLER: That was my judgment.

CHAIRMAN KEMENY: All right.

COMMISSIONER PETERSON: Mr. Chairman, could I ask one more question, please?

CHAIRMAN KEMENY: Sure.

COMMISSIONER PETERSON: In your written report, you refer to the fact you had so many people in the Control Room that at times you had to chase some of them out; sort of depicted a story of too many people trying to influence what was going on. Well, having spent many years designing and operating complicated chemical plants, but not the dangerous situations you have to cope with, but nevertheless with such a firm written understanding that the people in charge of the Control Room are in charge of it and in an emergency we keep people out of it; you don't want the brass around, or any outside consultants at that critical juncture, because the people are trained to cope with the emergency; they don't let them put their full attention on it. And it appears to me that what happened here was just exactly the opposite, an avalanche of people coming into the Control Room, markedly increasing the difficulty in coping with the problem. And you as captain of the ship were even sent away to see the Lieutenant Governor for an hour and a half during that first day. And shouldn't the people in charge be protected from outside advice at the time of emergency? Shouldn't there be some strict limitations on the people in the Control Room?

There have been comments made that maybe the Nuclear Regulatory Commission ought to have a special team they would send out to the plant in an emergency, or even have monitoring devices in Washington, in other words, going in a normal plant, so it seems to me that would be a sure way to skew the works. I'd like to get your advice.

MR. MILLER: Some of my opinion would be subjective. I don't believe you can bring a team in and assure safety. It's hard not to go up and look at the meter. All of us are engineers, and the NRC guys are engineers, and it's hard not to just drift up there and take a look at the thing, and what I did throughout the day was any time we seemed to have traffic up near Mr. Zewe, I would kind of forcefully clear the area. And I in fact put a rope up, probably.

It's just a hard thing not to--if you've been in chemical plants, you know it's hard to stay away from the hardware. And what we tried to do was limit access to the Control Room. I think you also ought to know that we had, due to the on site readings at one point we had to evacuate the Emergency Control Center out of Unit 1 and bring it into the alternate stations in back of the Unit 2 Control Room. That brought a few more people in, but we were able to control access to Bill Zewe. I don't believe we disturbed him that day. It took some force. That's all.

COMMISSIONER PETERSON: You said in your testimony

on two occasions you were ordered to do something. Did that mean that you were asked to do something you didn't think you should have done?

MR. MILLER: I was directed to do the one thing you mentioned. I did not leave the plant until I was sure of the stability and safety of the plant. I knew the off site readings. I put Joe Logan in charge of the Unit at the time. And I in fact had George call--took George with me and had him call back in. And I made the decision to leave. I was strongly urged to leave by my management, but if I'd had any question, I wouldn't have left the Control Room then. There would have been nothing, there would have been no question about that.

CHAIRMAN KEMENY: Thank you. My intention is to call one more witness now and then take a luncheon break, that's all right with the Commission.

The witnesses are excused.

MR. NATALIE: Mr. Logan, would you come forward, please.

WHEREUPON

JOSEPH LOGAN

Was duly sworn and

testified as follows:

CHAIRMAN KEMENY: Mr. Logan, I'm going to turn over the questioning to the Staff Director. I just want to

establish a couple of facts. What time did you arrive at TMI 2?

MR. LOGAN: I arrived at 0545 through the gate.

CHAIRMAN KEMENY: Five forty-five.

MR. LOGAN: That's right.

CHAIRMAN KEMENY: And therefore you were there before Mr. Miller arrived.

MR. LOGAN: Yes, sir.

CHAIRMAN KEMENY: Am I correct in saying therefore there was a period of an hour or more when you were the senior person present there?

MR. LOGAN: That is correct.

CHAIRMAN KEMENY: Did you assume responsibility for the operations?

MR. LOGAN: I did.

CHAIRMAN KEMENY: You did. Mr. Lundin, would you like to--

MR. LUNDIN: Mr. Logan, when you arrived in the Control Room, did you (inaudible) the status of the plant by surveying the instrumentation that was placed in the Control Room; or talking to the operators, or both?

MR. LOGAN: Both.

MR. LUNDIN: And when you surveyed the Control Room instrumentation, were you made aware, was it apparent to you that the plant at the time was in saturation conditions?

MR. LOGAN: What I saw when I arrived was extremely difficult to fathom. We had all the pumps were off; we had a high pressurizer level, a low pressure; we had one steam generator isolated. This--I might mention that the only word that I had received prior to this was that the turbine and the reactor had tripped. So I was not prepared for the presentation that I received when I got there. I was not aware of the saturation or it didn't hit me, the saturation condition, however.

MR. LUNDIN: Did the question of the approached saturation in the primary loop occur to you as a pertinent one to inquire into at that time?

MR. LOGAN: At the particular time that the, that I arrived, the Control Room personnel were certainly busy handling the casualty. I at that time went to the Supervisor's office, where the Supervisor of Technical Support there, George Kunder, was making phone calls, to try to ascertain from him what had led to the condition. Mr. Zewe was extremely busy in handling the casualty and I didn't want to interrupt him at that particular time with a series of questions. I was trying to sort out really what was the condition.

MR. LUNDIN: So that Mr. Kunder then did not focus or touch on the point of approached saturation and the condition of the fluid around the core.

MR. LOGAN: No, sir, not at that particular time.

MR. LUNDIN: You were aware at the time, Mr. Logan, that the rupture disc in the drain tank had blown?

MR. LOGAN: I cannot recall if I was made aware of that immediately.

MR. LUNDIN: When were you first aware of the rising liquid level in the drain tank, and then the rupturing of the disc?

MR. LOGAN: Some time shortly after I arrived, but I can't say specifically when. I can say within the hour.

MR. LUNDIN: Which would have been some time shortly after six A.M.?

MR. LOGAN: Between six and six thirty, I would say, I was aware of it.

MR. LUNDIN: Where did you think the water was coming from that killed the tank and ruptured the disc?

MR. LOGAN: Well, we had--I was told that we had lifted the electromagnetic relief, which was anticipated on the transient, and that possibly a lot of the water had come from there. There was some speculation, I believe, at that time that perhaps we had a steam generator leak.

MR. LUNDIN: What would the steam generator leak get into the drain tank?

MR. LOGAN: I'm sorry. I'm thinking of the reactor sump. I beg your pardon.

MR. LUNDIN: I was speaking to the drain tank.

MR. LOGAN: Yes, sir. The water was theorized to come from the electromagnetic relief lifting.

MR. LUNDIN: But we've heard earlier that it was considered that the electromatic relief valve was shut shortly after its initial operation at (inaudible) Pond or Fort (inaudible).

MR. LOGAN: Yes, sir. How long it remained open I didn't ascertain at that particular time. The things that were going through my mind then were trying to get a pump back on.

MR. LUNDIN: I'm sorry. To get the pumps back on?

MR. LOGAN: Yes, sir. That was a matter of concern to me.

CHAIRMAN KEMENY: Did you instruct the operators to put the pumps back on?

MR. LOGAN: Initially I was trying to ascertain why they were off in my conversation with Mr. Kunder. When he told me the reasons they had secured them, pressure-temperature relationship, and then I went out and discussed with Mr. Zewe whether we should try to reestablish flow. We had a discussion going, as I recall, about the time we received the radiation indications.

CHAIRMAN KEMENY: What time would that have been, about?

MR. LOGAN: This was in the neighborhood of 6:45.

CHAIRMAN KEMENY: Yes, by that time you had been there for an hour.

MR. LOGAN: Approximately an hour.

CHAIRMAN KEMENY: Approximately an hour. You do realize that that was a critical hour in the life of this particular accident.

MR. LOGAN: Yes, sir.

CHAIRMAN KEMENY: Did you during that hour instruct the operators to do something that they had not been doing?

MR. LOGAN: No, sir, I don't recall instructing them.

CHAIRMAN KEMENY: In retrospect now, do you feel-- we have asked similar questions of other witnesses--that there are actions you should have taken as Superintendent during that hour that could have made this accident be significantly less serious?

MR. LOGAN: I can't say right now that there was any particular action that we could have taken. Well, had we known, of course, that the relief valve was continually leaking, we would have shut the block valve, but there was no indication, or we did not have indication, at least, that the relief valve was continually leaking, but we could have shut the block valve.

CHAIRMAN KEMENY: But it took approximately an hour to make a decision to try to get a lot of water into that system.

MR. LOGAN: I beg your pardon?

CHAIRMAN KEMENY: It took approximately an hour to reach a decision that one ought to get a lot of water into that system.

MR. LOGAN: I'm afraid I didn't understand you.

CHAIRMAN KEMENY: But it took you approximately an hour after your arrived to tell the operators to try to get a lot of water flowing into the system.

MR. LOGAN: It took some time trying to sort out, Commissioner, exactly what I was seeing. If we had no pumps running, we had a steam generator that was isolated, we had a high pressurizer level which to me at that time indicated that we had a--the core covered; we had a low pressure, which didn't go along with the other indications; and in trying to sort out the indications in my own mind, it took some time. Time flies awfully fast, however, in those situations.

MR. LUNDIN: A couple more questions, Mr. Logan. At the time you arrived, in fact from about 20 minutes into the incident and thereafter for some time, the source range nuclear instrumentation, Countrate, the Countrate nuclear instrumentation, chased to the reactor vessel, commenced increasing for the next several hours, exhibiting abnormally high readings. Were you aware of this then? If so, to what do you attribute this increasing countrate?

MR. LOGAN: We had some indication from a sample of a low boron content. We didn't truly believe that. However, I shouldn't say we didn't believe it, but we didn't believe the actual reading, but we had some concern that we might be diluting through some means the boron concentration, and therefore this is one of the reasons that we did go to emergency injection, emergency boration.

And all I can say is that I think we considered that we might be diluting the primary coolant.

MR. LUNDIN: The increase in count rate did not suggest to you the existence of possible voids in the reactor vessel.

MR. LOGAN: Not at that particular time, no, sir.

MR. LUNDIN: Mr. Logan, we heard in another matter, we heard yesterday the statement that the alignment of the valves connecting the sump pump in the reactor building into the auxiliary building were aligned to discharge into the rad waste tank, the large waste tank. But we also heard that there was no indication of rising liquid level in that tank.

Can you help us (inaudible) that contradiction?

MR. LOGAN: Well, we could have a detector that was out of commission and not operating properly. I believe that since the accident that we have determined that that indication is erroneous.

CHAIRMAN KEMENY: Excuse me, which one is erroneous?

MR. LOGAN: Miscellaneous waste holding tank. I believe that is true, sir.

MR. LUNDIN: To make sure I understand: does the alignment to the rad waste tank, which was considered to be existing at that time, is now believed to be in error?

MR. LOGAN: No, sir. I believe your question was, what you're getting at is, if we pumped to the miscellaneous waste tank, why didn't we see an increase in level?

MR. LUNDIN: Yes.

MR. LOGAN: What I'm saying is I think that since the accident we have noted that we have an error in the instrumentation for the level indication in the miscellaneous waste holding tank.

MR. LUNDIN: That's a fairly large tank, as I understand it. If that's true, would that still explain the amount of water that ended up on the floor of the auxiliary building?

MR. LOGAN: Yes, sir. It was my understanding when I got there that we were lined up to the auxiliary building pump.

MR. LUNDIN: A final question, Mr. Logan. In retrospect, considering the difficulties in which the Control Room operators were operating in the first hours after the incident, what sort of instrumentation or data displays do you think would have been more helpful to the operators and

then if I may, what type of operator training would be more helpful in the future?

MR. LOGAN: Well, certainly, if we had had an indication of the actual level in the reactor vessel, it would have been apparent to us that we were experiencing a boiling in the reactor.

Training--in no time either at the simulator or in our training session at the site had this particular accident ever been discussed or analyzed. Obviously, the possibility of it happening should have been, and certainly should be implemented in the training program at all the plants that have this particular design, incorporating certainly any additions that occur as a result of this accident.

MR. LUNDIN: Well, (inaudible) some displays indicating approach to saturation in the primary system.

MR. LOGAN: Well, I--yes, sir, I certainly would think that might be beneficial.

CHAIRMAN KEMENY: Other questions? Professor Pigford.

COMMISSIONER PIGFORD: Mr. Logan, do you take training on the reactor simulator at Lynchburg?

MR. LOGAN: Yes, sir.

COMMISSIONER PIGFORD: How often do you do that?

MR. LOGAN: I have only been working for Met Ed

approximately 17 months, and my first year with the company was spent in a training status. I visited the simulator twice during that year.

COMMISSIONER PIGFORD: What is the requirement? How frequently must you do that?

MR. LOGAN: Every two years, by the licensing requirement.

COMMISSIONER PIGFORD: Do you hold an operator's license for TMI-2?

MR. LOGAN: Yes, sir.

COMMISSIONER PIGFORD: How far up the management staff do the individuals hold operator's licenses?

MR. LOGAN: Effective operator's licenses we require of each of the Unit Superintendents, and then that's as high as it goes, high as the requirement goes.

CHAIRMAN KEMENY: Commissioner McPherson.

COMMISSIONER MCPHERSON: Mr. Logan, you spent 25 years in the Navy.

MR. LOGAN: Yes, sir.

COMMISSIONER MCPHERSON: In the submarine--nuclear subs.

MR. LOGAN: Yes, sir.

COMMISSIONER MCPHERSON: And are a graduate of the Naval Academy. Looking back on this event and now having the knowledge that you do, what indications do you think there

were that the pressurizer relief valve was open? How many signals could you now read as suggesting that that was so? What I'm trying to--I'm trying to ask this question. If you've got--if at the time you had disbelieved the panel in the Control Room that said it was closed, or your mind had just been open to the matter, how many ways were you told that that valve might well be open?

MR. LOGAN: Well, I think the sump level indication, which was full, would have provided one indication. On the other hand, if the rupture--if the drain tank had ruptured, it would have filled that sump, and as I mentioned earlier, there was some speculation that we had a steam generator or a steam leak off the feedwater system, which could have filled that sump also. I don't mean to be, to try to avoid the question. I'm saying there's several problems involved in trying to ascertain the answer to your question.

The fact that we had a temperature indication on the discharge from the relief valve was supposed to be the ultimate indicator. Unfortunately, as you know, we suspected that valve leaking. We knew one of our relief valves, one of the three, to code safeties or electromatic, was leaking before, because of the temperature indications that we had seen on these thermocouples. So that wasn't the best indicator, we didn't feel, for determining if we had a relief valve lifting, or of leaking.

I would say possibly the ultimate would be a valve position indicator that was actually off of the valve itself, indicating it was open or shut, would probably be the ultimate indication.

COMMISSIONER MCPHERSON: Well, that--you didn't have such a thing.

MR. LOGAN: No, sir.

COMMISSIONER MCPHERSON: Right. But you did have the other two circumstantial evidences, the one showing the sump level and the pressures in the containment rising, and you had the high temperatures in the line, which would have showed it.

MR. LOGAN: Yes, sir. I was trying to point out that there were other possible contributors to those indications that--

COMMISSIONER MCPHERSON: I understand. I understand. But as between you, a graduate engineer and the Superintendent here, and the Control Room operators, who would have been more, who would more likely have made that, put that two and two together?

MR. LOGAN: Whether it was leaking or not. That's your question. Is that right?

COMMISSIONER MCPHERSON: Well, whether it was open or not.

MR. LOGAN: I think at that particular time, the

operators being in there every day, they would be more aware if the valve were leaking. Now coming in from the outside with a clear mind, you might think, perhaps I should have made that determination, but I have been living with a leaking relief valve for quite some time, and I shared their question, if you will, on the temperature indication as being indicative of the valve being open or just leaking.

COMMISSIONER MCPHERSON: Right. Throughout the last day and a half, I've had the impression of, and it's something I think all of us recognize in ourselves, of how difficult it is to disenthral ourselves of the past, as Lincoln once said, that you get a certain mind set, and determine that certain phenomena can't be so, because you are going along with the way you think it's got to be. Do you think that that was the case here from time to time?

MR. LOGAN: I think in many instances that occurred, yes, for instance, in the initial pressurizer level indication as being indicative of having the core covered. I think that that impression has lived with all of us for so long that we felt that as long as we had a level in the pressurizer, that we had the core covered. And I think that was overriding for quite some time.

COMMISSIONER MCPHERSON: Did you ever have any doubt about whether that was so in the case of this pressurizer?

MR. LOGAN: Before this happened, no, sir.

COMMISSIONER MCPHERSON: You'd never heard of this Michaelson report or the Davis-Besse plant?

MR. LOGAN: No, sir, nor had that, this accident ever been simulated at the simulator when I was there.

COMMISSIONER MCPHERSON. Yeah. All right. Thank you.

CHAIRMAN KEMENY: I think, Mr. Logan, that it probably is also relevant to the question I asked you. It hadn't occurred to you to put in high pressure water earlier, presumably because of the same mind set?

MR. LOGAN: Yes, sir. We had some water going in, but we had an extremely high pressurizer level. That to me told me, or at least at that time I was under the impression that we had water covering the core.

CHAIRMAN KEMENY: Okay, I mean, that helps me understand the answer to my earlier question. Commissioner Haggerty.

COMMISSIONER HAGGERTY: Did you specifically ask what the electromatic relief valve tailpipe temperatures were?

MR. LOGAN: No, sir, I did not.

COMMISSIONER HAGGERTY: Were you told what they were?

MR. LOGAN: At some time during that morning, I was told, Commissioner, but I don't remember just when.

COMMISSIONER HAGGERTY: You mean before 6:30. I mean, when you say "that morning," you mean that time interval or later, or what?

MR. LOGAN: I can't honestly tell you what time. It was some time during the morning.

CHAIRMAN KEMENY: Other questions?

MR. LUNDIN: One question, perhaps. Mr. Logan, has the drain tank rupture disc ever ruptured before, to your knowledge?

MR. LOGAN: To my knowledge, no, sir.

MR. LUNDIN: And a final question. Procedure requires that when there's a rising temperature, when there's a high temperature in the tailpipe of the relief valve and there are rising temperatures and pressures in the drain tank, that that's indicative of an open relief valve. Procedure is to shut the block valve.

Would you just say very briefly why that procedure was not followed?

MR. LOGAN: I'm not sure that both of those indicators were known to the operators at that particular time.

CHAIRMAN KEMENY: Let's see, Professor Pigford and Governor Peterson.

COMMISSIONER PIGFORD: Mr. Logan, in earlier testimony from someone, it was stated that the auxiliary

building sump tank had a blown rupture disc for a few weeks, prior to the event. Did you know about that?

MR. LOGAN: I did not know that, no, sir.

COMMISSIONER PIGFORD: Do you now know about that?

MR. LOGAN: Yes, sir.

COMMISSIONER PIGFORD: Now can you tell me, was that disc ruptured prior to the accident?

MR. LOGAN: I was told that it was ruptured prior to the accident, yes, sir.

COMMISSIONER PIGFORD: And as you went into the accident, was it still ruptured?

MR. LOGAN: It had not been repaired.

COMMISSIONER PIGFORD: It had not been repaired.

MR. LOGAN: No, sir.

COMMISSIONER PIGFORD: Are there any procedures that apply to whether or not you can continue operation with that rupture disc blown?

MR. LOGAN: There is nothing that prohibits you from operating with it blown. You can bypass that tank.

COMMISSIONER PIGFORD: And is the consequence of that disc being ruptured that that presents another pathway for gaseous radionuclides to get into the air?

MR. LOGAN: With it ruptured, it goes into the aux building sump. Therefore, if you've got radionuclides being emitted from the sump, it doesn't offer another path,

no, I wouldn't say it would.

COMMISSIONER PIGFORD: Well, what I'm getting at, I gather that some water was pumped into the sump in the auxiliary building. Is that correct?

MR. LOGAN: Yes, that is my understanding.

COMMISSIONER PIGFORD: And that water had some dissolved radionuclides which then evolved as gaseous radionuclides.

MR. LOGAN: Yes, sir.

COMMISSIONER PIGFORD: Apparently, did some of those get out to the air by flowing through that blown rupture disc?

MR. LOGAN: No, sir, the aux building sump is vented. It's more or less an open tank right in the aux building itself. It would not go through the tank to which you refer. The tank is also right above that sump.

CHAIRMAN KEMENY: Governor Peterson.

COMMISSIONER PETERSON: Do you have to shut down the reactor in order to replace the leaking pressure relief valve?

MR. LOGAN: Yes, sir.

COMMISSIONER PETERSON: Is that the reason it wasn't corrected before?

MR. LOGAN: We had made a management decision when we determined that one of the valves was leaking that the leak

was within the technical specifications and that we would continue operating until such time as we could plan a shutdown and repair the valve. We had looked for a replacement; at this time we were not quite sure which valve was leaking. And in fact one of the things on my mind when I was coming in that morning was that we had intended to put, go into the reactor compartment and place hand held pyrometers on the lines after we shut down to try to determine which of those lines was actually the hottest.

COMMISSIONER PETERSON: If the valve had been leaking and if you had known about it leaking, then you probably would have taken these other indications very seriously, wouldn't you?

MR. LOGAN: Yes, sir, I think I would.

COMMISSIONER PETERSON: And that's what makes one question whether we should shut down the plant and repair such faulty equipment when it occurs. Do you have a concern about that now?

MR. LOGAN: I think there are other ways of handling that problem, Commissioner. I think if we had an adequate indication of the valve being open or shut, it would have been an easier decision to make.

CHAIRMAN KEMENY: All right. Thank you very much. The witness is excused, and we'll have a luncheon break.

(Luncheon recess)