

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

1 In the Matter of:
2 IE TMI INVESTIGATION INTERVIEW
3 of Mr. James P. Moore, GPU
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9 Trailer #203
10 NRC Investigation Site
11 TMI Nuclear Power Plant
12 Middletown, Pennsylvania

13 June 11, 1979
14 (Date of Interview)

15 July 6, 1979
16 (Date Transcript Typed)

17 #306
18 (Tape Number(s))
19
20

21 NRC PERSONNEL:
22 Mr. Anthony Fasano
23 Mr. Mark E. Resner
24
25

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1 RESNER: James P. Moore, Jr., Mr. Moore is employed with the GPU
2 service corporation as a mechanical engineering manager, the present
3 time is 10:33 a.m. Eastern daylight time, today's date is June 11,
4 1979. This interview is being conducted in room 203 of the GPU facility
5 for which the mailing address is 260, Cherry Hill Road, Parsippany,
6 New Jersey 07054, individuals present for this interview representing
7 the NRC are Mr. Anthony Fasano, Mr. Fasano is an Inspection specialist
8 employed with Region I of the U. S. Nuclear Regulatory Commission,
9 presently speaking and moderating this interview is Mark E. Resner, I
10 am an investigator with the office of Inspector and Auditor, HQ of the
11 U. S. Nuclear Regulatory Commission, also present is Mr. Alan S.
12 Brown, Mr. Brown is a Supervisor for Generation Administration with
13 the GPU Service Corporation and he is acting as a representative for Mr.
14 James Moore. Prior to taping this interview Mr. Moore was given a two
15 page document which explains the purpose the scope and the authority
16 with which the Nuclear Regulatory Commission conducts this investiga-
17 tion, in addition it apprised Mr. Moore that he is entitled to a
18 representative of his choice to be present during the interview and
19 also in no way is he compelled to talk with us, should he not want to.
20 On the second page of this document Mr. Moore has answered three
21 questions which I will state, question 1, do you understand the above?
22 Mr. Moore has checked yes. Is that correct Mr. Moore?

23
24 MOORE: That's correct.
25

1 RESNER: Question 2, do we have your permission to tape this interview?
2 Mr. Moore has checked yes, is that correct Mr. Moore?

3
4 MOORE: That is correct.

5
6 RESNER: Question 3, do you want a copy of the tape? Mr. Moore has
7 checked no, indicating that he does not desire a copy of the tape, is
8 that correct Mr. Moore?

9
10 MOORE: That's correct.

11
12 RESNER: At this time Mr. Fasano has some questions that he would like
13 to ask you.

14
15 FASANO: Jim, we'd like you to describe in your own words your knowledge
16 of the events of March 28, 1979 and in particular your notification
17 and subsequent involvement with the events on that day.

18
19 MOORE: Well I came into the office March 28, normal time and fairly
20 early that morning I was called to a meeting where I learned about the
21 fact that there had been difficulties experienced at Three Mile Two.
22 The main concern as I recall at that time was for some of the components
23 in the primary system and so we designated several individuals to go to
24 the site almost immediately, the selection of these individuals was
25 primarily based on the ability to take a look at the steam generator,

1 for that reason Julien Abromovitch was designated to go along with me
2 for that purpose, the reports were still coming in as to what was
3 happening out at the site, we had a second meeting a little bit later
4 that morning, we still didn't reflect any...the degree of trouble that
5 it eventually turned out to be. Subsequent to the second meeting I
6 went home, gathered other personal effects to going out to the site,
7 we arrived at the north gate about 2:00 in the afternoon, of course I
8 was barricaded so I went on up to the information center to see what,
9 the facilities were up there, of course that was where everybody
10 congregated. As soon as I made access to a telephone I called back to
11 the office here at Mount Lakes, reported to Dick Wilson and Bob
12 Arnold, to let them know that I was on site or the vicinity of the
13 site and relay the message from them to whoever was in charge of Met
14 Ed or Jack Herbein if he did come in to call Bob Arnold back here at
15 Mount Lakes, I can't recall exactly the time but not to long after I
16 was there that some other people starting coming in from Mount Lakes,
17 basically Gary Broden, Julien Abromovitch, Rich Lense, time escapes me
18 a bit here, but sometime in the evening Rich Lense went on site and
19 obtained the alarm summary printout for the first few minutes in the
20 event and he spent the evening analyzing the information we could read
21 from the list. At some point we went out to, had some dinner and came
22 back and we felt we had had a need for additional data and we were
23 attempting to make arrangements to get the information off of the
24 reactimeter log, recognizing that some of us are gonna have to get
25 some sleep, I stayed on with the understanding that if this information
did come available I would contact the other people back at the motel.

1 It turned out the information did not become available during the
2 night, so I guess it was about 7, 7:30 in the morning the other people
3 came back to the information center, the other people being from Mount
4 Lakes, I went to the Motel and checked in, I got about, as I recall
5 about 4 hours sleep, came back to the site at which time GPU people
6 had convened...were involved in a meeting at the processing center
7 adjacent to Unit 1. The meeting was already in progress when I got
8 there, the basic plans were being laided at that time, were conduct
9 interviews of the operators is the...I guess it was the operators that
10 were reporting in to go on shift...

11
12 FASANO: Take your time.

13
14 MOORE: Right it would be the operators, I'm pretty sure it was the
15 operators that reported in to go on shift, which would have been the
16 ones that were on duty at the time the incident happended, so these
17 interviews were to be conducted about 2300. Left the island, after
18 having dinner we met with Dick Wilson and numerous other people at the
19 Sheraton Hotel, we further planned the interviews of that evening,
20 went back out to the site, arrived there I guess about 2200, a little
21 later than that, I was in the process, along with the other people,
22 getting set to interview the operators when a call came from the
23 Control Room that I should go up there to assist Bill Lowe with analyzing
24 hydrogen in the primary system. Thinking back, there are a couple of
25 things I missed covering the evening of the 28th and on into the early

1 hours of the 29th, I did have discussions with George Kunder from the
2 Met Ed operating staff for Unit 2, along with a couple other individuals.
3 They were giving us the run down of the events as they saw them during
4 the day. Around midnight there was a debriefing of 2 of the operators
5 who had been on shift during the incident, I sat in on those debriefings
6 so they were a joint, one debriefing with both operators. Had one, I
7 guess it was a 60 minute tape, we taped what we could of the debriefing,
8 subsequently turned all this information over to the GPU people involved
9 collecting them. Back to the late hours of the 29th, when I went up
10 to the control room Bill Lowe...a consultant for GPU was in the process
11 of trying to determine if the fact we had hydrogen in the primary
12 system. At some point in this discussion it occurred to me that it
13 should possible to calculate the size of the bubble, if there was one,
14 so using the basic logs of physics, proceeded to, derive the...there
15 are just so ways that you do this and I asked Jim Floyd from Met Ed
16 Operating staff if we could get some data necessary to make the calcula-
17 tion and he obtained data from some source, I'm not sure where, for
18 about...it's about 1300 on the 29th. This was the first data point
19 that we calculated, relative to the size of the hydrogen bubble, the
20 time on that was approximately 0300, the time of the calculation about
21 0300 on the 30th. We then proceeded to obtain more data, I believe it
22 was about 6, 0600 on the 30th was the next data point. About 0800
23 somewhere on that time frame on the 30th, I left the site, went back
24 to the motel and returned to the site about 1200, we spent the rest of
25 that day analyzing the size of the hydrogen bubble and trying to come
up with means for getting rid of it from the system.

1 There was indication that the bubble was disappearing, credit that to
2 the removal of the...by the makeup tank, we were anxious to, I was
3 anxious to get it out of the system as rapidly as possible and attempting
4 to get permission to vent the pressurizer into containment and get rid
5 of as much hydrogen as we could by that, in other words successful in
6 getting approval of that till I believe it was the following day, it
7 was at least a day or so later as I recall it was finally, we started
8 venting by then, except for little summarizes on the collection of...two
9 or three days there.

10
11 FASANO: Okay, why don't we go back and maybe pick up some points
12 starting back on the 28th, your initial first notification was, you
13 say early in the morning, 8:00, 9:00?

14
15 MOORE: Unfortunately...I wasn't anticipating this interview, I came
16 back from the island, working a half of time here and a half of time
17 out there, left all my notes out there. I have notes for all the
18 meetings with dates and times and I can't, thinking back I can't put a
19 real time on it.

20
21 FASANO: Do you have any comments...the thing is that all notes, if
22 you have notes on the event and things that you have that may give
23 value in reviewing the event to make sure you don't lose these. I
24 think this is something that (unintelligible).
25

1 RESNER: Jim could you provide us with a copy or, either the original
2 notes.

3
4 MOORE: The original notes were turned over to Bob Long, GPU, I have a
5 copies of those that I retained for my own reference, the original
6 ones I invested in GPU at this time.

7
8 RESNER: Would it be possible for us to get a copy of your copy?

9
10 MOORE: Yes I have them (unintelligible).

11
12 RESNER: Alright thank you.

13
14 FASANO: So fairly in the morning these two meetings and the second
15 meeting, at that time did you know that there was a general emergency
16 or even a site emergency, early in the morning?

17
18 MOORE: Reflecting back on it...I can't recall.

19
20 FASANO: You did find out when you got, arrived at the site.

21
22 MOORE: When I arrived at the site I, well prior to arriving at the
23 site I listened to the radio on the way out obviously, to see what was
24 on the news and by the time I arrived out, prior to my arrival out
25 there I wasn't at all suprised at all to find the north gate blockade.

1 FASANO: Okay, because you say you got to the site and they had it all
2 blockaded, if you hadn't know it was a emergency, you might of known
3 by then. Your main assignment then was initially to get involved
4 with the steam generator, any other equipment can you recall and did
5 you have any other information from these two earlier meetings at GPU?

6
7 MOORE: We weren't given a specific assignment at the time we left.
8 It was basically trying to come up with a group of people with the
9 capability of looking into certain items and people were selected on
10 that basis, the general directions were to get to the site, report
11 back in when you arrived there and by that time we also had more
12 information with which to approach the problem. Initial purpose was
13 to get people to the site as quickly as possible and try to get people
14 there that would be needed once we did get on top of the problem.

15
16 FASANO: Well during the fist day that you were there on the evening
17 right on till the next morning, I guess, ah at least initially when
18 you got there, did you have more information or sufficient information
19 to start making some analysis and providing operations with some
20 guidance or what was the status of your knowledge, say up to about
21 6:00, I guess when Kunder came. I'm saying, I don't think we have a
22 time there but...

23
24 MOORE: I didn't have, we didn't have information to really start the
25 proceeding with any analysis until Rich Lense had obtained, gone out

1 to the Island and brought the data back. No way we could tie up the
2 people in the Control Room to ask them for information, they were tied
3 up with their duties at that time.

4
5 FASANO: So for the first day as far as decisions or suggestions, you
6 and the group were on standby, not really making direct decisions or
7 direct suggestions, is that...what I understand.

8
9 MOORE: That's correct, that's correct.

10
11 FASANO: Basically it's because, as my understanding again is...the
12 quality of the information or the quantity...available to you?

13
14 MOORE: Well I guess it was, there was very little available on which
15 we could analyze what had happened, what the conditions were.

16
17 RESNER: Did you feel that the quality, availability of this information
18 was limited, did you feel the quality of the information that you
19 received was good?

20
21 MOORE: Well I guess, we didn't, when I was dispatched to go out
22 there, it was not to provide operational support to the people in the
23 Control Room as far as making them, helping them make operating type
24 decisions. It was a, make sure we had people out there that could
25 access the state of the plant, that's sort of data we had available

1 also, I did not look on my initial, reporting out there as being one
2 where I would be advising the operator at the plant.

3
4 FASANO: Back to the steam generator, this was one of the key things
5 we mentioned, did you do any further review of the steam generator,
6 why was it a problem?

7
8 MOORE: Well the initial report was a loss of feedwater so we were
9 concerned about this loss of feedwater transient on the steam generators.
10 It was basically that the knowledge that there had been this loss of
11 feedwater raised the concern about the steam generator. Never did do
12 any analysis on the system generator I got out there. Got involved
13 with the hydrogen of the primary system, once I did get into the plant
14 and start working on the problem itself.

15
16 FASANO: When you were informed of the problem with the steam generator
17 and the feedwater, was there any mention of the emergency feedwater
18 and it's status, the first day?

19
20 MOORE: I don't recall just exactly what information I did have when I
21 left the office here, I do know that it did come up, once I did get to
22 the site, talking to people out there in the information center.

23
24 FASANO: Subsequently did you do any analysis on the steam generator
25 at all?

1 MOORE: No.

2
3 FASANO: Even to this day?

4
5 MOORE: Right to this day. I've been involved in operational support
6 since that.

7
8 FASANO: This is the what, the recoup, operational support?

9
10 MOORE: At the present time, I worked at two weeks on and two weeks
11 off out at Three Mile supervising the technical support people from
12 GPU at the site, providing operational support to Metropolitan Edison.
13 So performing in that role several weeks now...

14
15 FASANO: Did you get involved at all with the concern over the reactor
16 coolant drain pump and it's operations or the electromatic relief
17 valve? Did you have information the first day on these events?

18
19 MOORE: It's been so long now it's hard for me to remember what. just
20 when I obtained alot of this information.

21
22 FASANO: Do you recall when you became knowledgable with this kind of
23 information, the first break in the morning or was it later on?
24
25

1 MOORE: I can't recall, if I had my notes here.

2
3 FASANO: If you can't recall, you can't recall, I'll mention some
4 things that may jog your memory and that's about all we can do here I
5 guess. We'll begin on to the, you mentioned that you got involved
6 with the hydrogen. How did you know it was hydrogen at that time,
7 that was on the 29th?

8
9 MOORE: That was 2300 hours on the 29th, I'm trying to recall, at some
10 point in time I became aware of this pressure spike in the building
11 and I have a, as I recall from my notes, that I don't have here, that
12 was on the, it was dated the 30th, but I know when I went up to the
13 Control Room, about 2300 there was a concern about, noncondensables,
14 and as I recall, we were concerned about hydrogen?

15
16 FASANO: 2300 on what day?

17
18 MOORE: On the 29th.

19
20 FASANO: So as far as you remember, your first indication of a spike
21 and that it might be hydrogen was somewhere on the 29th.

22
23 MOORE: The 29th or the 30th, you know the late hours, the last hour
24 or so on the 29th or sometime into the early hours on the 30th.
25

1 FASANO: Did you actually see the spike on the chart, was that in the
2 Control Room at the time?

3
4 MOORE: At some point in time I did see the chart, as to whether I saw
5 that and when I first learned of it or not I can't say, as I recall,
6 somebody told me about it and subsequent to that, I believe that I saw
7 the chart after that, I know I did see the chart at some point in
8 time.

9
10 FASANO: And just from the chart you wouldn't know what caused it.

11
12 MOORE: Those...the only one's I can think of that could cause it, is
13 some sort of a hydrogen burn. There were two instruments there, it
14 could of been just one instrument, I might of suspected some sort of
15 noise, but there were two instruments.

16
17 FASANO: You mean the narrow range and the wide range?

18
19 MOORE: Yes.

20
21 FASANO: Have you looked at the reactor pressure vessel, reactor
22 pressure, do you recall, looking at that, (unintelligible)?

23
24 MOORE: I don't recall at this point.
25

1 FASANO: So as far as you were concerned it was a real blip but it
2 was, you didn't know if it somewhere between the 29 and the 30. Mark
3 do you have any questions?

4
5 RESNER: No Tony not at this time.

6
7 FASANO: Jim at this time would you like to give any of your opinions
8 on what you've learned that others may benefit from what you learned,
9 going through, living through part of this event, that may be helpful
10 to other utilities, the NRC, whoever and also GPU?

11
12 MOORE: I think the majority of the things that come to my mind, I've
13 looked at all the modifications that are being made, supposed to be
14 made at Three Mile 1, technical upgrading, upgrading of the plant
15 itself. Looks to me like basic problems pretty well addressed by
16 modifications, the type proposed for these types of plants. I guess
17 the one area that I feel we have a need to have a mechanism for obtaining
18 data from the Unit without having to tie up operational people to get
19 it...in other words, some mechanism by which we could obtain data from
20 the Unit in a very quick turnaround when something like this happens.
21 I think that's major improvements that need to be made. I understand
22 that they have had these sort of things like, well just under considera-
23 tion, we are actually working on them for some period of time. I
24 think that we possibly put too much, take too much credit for alarms and
25 this sort of thing. My philosophy on annunciator windows would be that

1 these are fine for normal operating conditions or if something fails
2 and we got an alarm that's going off on an infrequent basis, or the
3 means of alerting the operator to some conditions of the plant. But
4 the types and numbers of alarms these operators were receiving throughout
5 this incident, I don't think that they were a good source of informa-
6 tion for an operator presented with something more basic than alarms
7 or sort of thing.

8
9 FASANO: In your experience with, have you actually looked at other
10 control rooms and made any comparisons to come up with comparisons, if
11 you like, with your own design compared to say the way it is at other
12 plants. Well in your experience, basically your main...mechanical
13 engineering and you experience with nuclear power plants, how does it
14 select your basis for your comments here?

15
16 MOORE: I've been involved with power plants, back, we worked on the
17 Pathfinder power plant, and LaCrosse power plant from the design
18 standpoint. I did serve in a start up and test role, for the Pathfinder
19 plant for about 2 years however, I've never been involved in actual
20 operation plants, so I really didn't judge one Control Room versus
21 another from my own personal experience as far as interface for actual
22 operator for that control room, however I do know that...operating
23 experience I did have was on board fossile fuels on Navy surface
24 ships. The're far less things to look at than you got on a nuclear
25 power plant. If you were there, you'd have to, you'd get into some

1 sort of a casualty, you have to make sure there is a few basic things
2 for the operator to look at, and that's all he's gonna have a chance
3 to look at. Peripheral things are not gonna mean very much to him, be
4 more of a hindrance than anything else as far as I could see, so that
5 I think it's the indicators, and that sort of thing, that he's normally
6 working with that have gotta carry the message, alarms, alarm lights,
7 and horns and things going off are not gonna tell him very much.

8
9 FASANO: That human engineering might be called for in the Control
10 Room to a degree, is that what I'm gathering?

11
12 MOORE: Well I'm not, I think we have the, there may be some additional
13 indicators required, I guess the thing I'm getting at is that I hate
14 to see us try to fix this problem by any more alarms.

15
16 FASANO: Oh, okay.

17
18 MOORE: I think that, when I get in my car and the buzzer starts going
19 off because I left the key in or, I did something wrong that hurts me
20 enough. To an operator to have alarms continuously blaring when he's
21 trying to make decisions...

22
23 FASANO: I guess they have more of a ring and then they have to go,
24 push a botton and still have to go and look another panel.
25

1 MOORE: Right, I'm not sure of the exact setup on that Unit, I think,
2 I guess what I feel is you need some real basic instrumentation and
3 possibly the best thing to do is just deactivate alarms, I don't know,
4 at least the majority of them, once you got into casualty, maybe just
5 save a few of the vital ones, you can't help but pay attention to
6 those.

7
8 FASANO: Mark would you like Jim to go over his experience?

9
10 RESNER: Right, we neglected to get the...at the outset of the interview,
11 Jim if you would, would you please give us a brief synopsis of your
12 educational and job experience related to the Nuclear Industry?

13
14 MOORE: I started ah, Bachelor Degree in Marine Engineering, State
15 University, New York, _____ College, I spent two years engineering
16 department, I started _____, employed by Alice Chalmers, a
17 short period of time before active duty in the Navy and then subse-
18 quently returned to Alice Chalmers and their graduate training program,
19 worked in a number of their power equipment divisions, steam turbines,
20 pumps, also the Nuclear Power department, which was located in Greendale
21 Wisconsin at that time. Went to...took a permanent assignment in the
22 Nuclear Power Department as a Systems Engineer and worked on the, at
23 that Pathfinder nuclear power plant, would of been from about 1959,
24 January 59, then for a year and a half, two years, actually went out
25 to the Pathfinder site and worked as a site representative in the

1 Engineering Department, part of the startup and test program out
2 there. Subsequently came back to Greendale office, continuing to work
3 on the Pathfinder finder plant which was, still had the chief startup
4 at the time I left the site. Was then transferred to the Maryland,
5 Bethesda office of Alice Chalmers and worked there on the LaCrosse
6 reactor, coolant systems area, until I left Alice Chalmers at the end
7 of 1968 when LaCrosse was going into operation. That's the time I
8 joined GPU which, Nuclear Power activities group at that time and I
9 subsequently served in the role of a fluid systems engineer and mechanical
10 engineering manager since that time. In addition to this I did complete
11 entire curriculum for masters degree in Nuclear Engineering at Catholic
12 University, employed, and lived in Maryland. Everything except...I
13 took the comprehensive exam, e everything except the thesis, that's
14 about that time I came up here so I never did finish the thesis, so
15 that pretty well summarizes.

16
17 RESNER: Thank you Jim, no additional comments from...gentlemen. At
18 present this concludes interview with Mr. Moore and the time now 11:14
19 a.m.
20
21
22
23
24
25