PDR

UNITED STATES

NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF:

DAVIS-BESSE INCIDENT

(INTERVIEW AND MEETING)

(CLOSED)

Status Report on Quarantine Equipment

LOCATION: OAK HARBOR, OHIO Pages: 1 through 90

DATE: July 11, 1985

ACE FEDERAL REPORTERS
Official Reporters
444 North Capitol Street
Washington, D. C., 20001
(202) 347-3700

SueWalsh

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

THURSDAY, JULY 11, 1985

MEETING BETWEEN THE NRC FACT-FINDING TEAM AND TOLEDO EDISON

ON

STATUS REPORT ON QUARANTINE EQUIPMENT

NRC FACT-FINDING MEMBERS PRESENT:

Dr. Ernest Rossi
Mr. J. T. Beard
Mr. Larry Bell

TOLEDO EDISON MEMBERS PRESENT:

Mr. Kasper
Mr. Isley
Mr. Mominee
Mr. Grime
Mr. L. Huston
Mr. Gradomski
Mr. Borysiak
Mr. Czuba
Mr. DeSando

OTHERS PRESENT:

Mr. Land, Delian Corporation
Mr. R. Huston, Delian Corporation
Mr. Hildebrandt, MPR

(4:25 p.m.)

P R O C E E D I N G S

MR. ROSSI: We are here to talk about the status report on troubleshooting efforts that have occurred since the June 9th event.

And Toledo Edison gave us a document that gives the current status of all the troubleshooting that has occurred, and I assume that that has been made part of the record?

MR. GRIME: I would like to make a notation on that, Dr. Rossi, if we could to get it as part of the record. If I may.

In response to your request that Toledo Edison provide the NRC fact finding team with preliminary status reports on the action plan, the Toledo Edison Special Task Force has compiled preliminary status reports on most of the troubleshooting and testing action plans.

I will mention specifically the steam feed water rupture control system action plans did not have a preliminary status report, since they were just recently approved and do not yet have significant work completed on them.

Please be advised that these reports are preliminary in nature, and do not represent Toledo Edison's final findings or conclusions regarding root causes of the equipment failures which occurred on June 9th, 1985.

The information contained in these preliminary reports is based on our findings to date and is subject to further modifications as more data becomes available.

It is hoped that these reports will sufficiently meet your needs for immediate informational needs, and the preliminary status reports provided are for action plans 1-A and 1-B on the auxiliary feed pump overspeed trips.

Plan 1-B on the overspeed trip mechanism of the auxiliary feed pump. Action Plan 8 on the main feed pump turbine, 1-1.

Action Plans for 9-A and 9-B on the turbine bypass valve, SP-13A2.

Plan 10 on the PORV.

Plan 12 on auxiliary feed water valves AF-599 and AF-608.

Plans 15-A-1 and A-2 on NI 1, source range nuclear instrumentation, and Plan 15-B, on NI-2 source range -- count rate, rather, level indication.

Plan 16 on erratic pressure control experienced on the main steam header.

Plan 18 on main feed water No. 2 startup control valve SP-7-A, and 26, on auxiliary feed water No. 1 suction supply transfer.

And Plan 27, on auxiliary feed pump turbine 1-1, main steam inlet valve isolation, valve MS-106.

9-3
J Walsh

MR. BEARD: May I ask a question? With the exception of the plan for the steam feed rupture control system, does this package include a status report for all the action items that are on the quarantine list, or is there some missing and being developed, or how do we stand in that area?

MR. GRIME: It provides the status on all of the listed areas.

We are developing some additional action plans. In other words, as an example, on the main feed pump issue, we have an action plan that is already approved on the main feed pump 1-1. We have in development Action Plan to address the other main feed pump. So, the report that you have is on the main feed pump topic, addresses main feed pump 1-1, the Action Plan that is already in progress.

So, there are -- if I may relate that, there are more action plans than there are equipment issues, and so --

MR. BEARD: I understand that.

MR. GRIME: Each issue, each equipment issue other than steam feed water rupture control system is addressed in this package.

MR. ROSSI: So you covered everything that is on the quarantine list in this package, except for the steam feed --

MR. GRIME: Yes. And to be technical, we haven't addressed, for instance, main feed pump 2 which is on the list, but we have addressed the main feed pump topic -- mainly main feed pump 1, because that is the only work done to date.

MR. ROSSI: Okay. But if we go through the quarantine list item by item, we will have the status for everything on there except for the steam feed water rupture control system. You haven't done anything on main feed water pump 2 that you haven't done --

MR. GRIME: That is correct to the best of my knowledge.

MR. ROSSI: Okay. I think that was the question that he had.

One thing I would like to ask as we go through these, if you could tell us where you believe you will have to develop or revise current action plan.

In reading some of these , it appears that you have done a lot of what was in the original action plan and you haven't yet identified the problem, and so it appears to us that you are probably going to be revising the action plans to do some further steps, and if you could just make that clear we would appreciate it.

And we would also like to make sure that we get the revised action plans as soon as they are available.

MR. GRIME: Okay.

MR. ROSSI: Okay. So, with that, why don't we just start with the one on Action Plan No. 10, which is the PORV.

MR. BEARD: Wait a minute. Correct me if I am wrong, but we were told prior to the meeting when we were given these action plans an hour or so ago, that the ones that the Company was wanting to talk about tonight, in this one meeting, were only the ones listed on the board, which would be No. 10 on the PORV, 16 on the main steam pressure, 26 aux feed suction transfer set on the nuclear instruments, and 1 Delta on the trip throttle problem. Is that still correct?

MR. GRIME: That is still correct.

MR. BEARD: Okay. You are not going to discuss all that today.

MR. ROSSI: Well, you have a copy of all of them. And you will make that a part of the record, and then tomorrow's meeting will just be a continuation of this.

Okay. So, why don't we start with the PORV. We understand that you disassembled the valve and you inspected it, and you have not been able to find any problems yet, and you are still checking the dimensions on it.

MR. ISLEY: That is correct.

MR. ROSSI: Is there some kind of an analysis

that is going on on the effects of differential thermal expansion?

MR. ISLEY: Yes. Both the vendor and our consultant, MPR Associates, are looking into that along with other possible effects.

MR. ROSSI: Where is the valve right now?

MR. ISLEY: The valve itself is stored in RACA. (Radiation Access Control Area.) The valve was radioactive, so we set up a special area in RACA.

MR. ROSSI: One thing we would like to be sure you do is that the NRC would like to know in advance before you decide to put that valve back on.

That information ought to be given to Region III some time in advance before you decide to reinstall the valve.

MR. ISLEY: What my plan -- my intention was to revise the action plan and make that reinstallation part of the action plan when we decide to do that.

MR. BEARD: I think what Ernie is saying is that we would like to see a hold point and notification as part of that plan. The Region would be notified prior to that step being taken.

MR. ISLEY: My understanding of the action plan was that was a normal part of the action plan, that type of thing would we a hold point.

MR. ROSSI: Well, are there any plans now to take the valve offsite and do tests of it?

MR. ISLEY: We have no specific plans. We are looking at that possibility.

We are currently evaluating what facilities are available, and what kind of testing they can do, and whether or not they can handle a contaminated valve.

MR. BEARD: Let me see if I can understand what the bottom line is, okay?

With the exception of some analysis, I understand you mentioned MPR doing, and some evaluation of the dimensions, would it be a fair statement to say that you basically completed the previous version of the action plan, before you start revising it.

MR. ISLEY: That is correct.

MR. BEARD: And that -- I don't want to put words in your mouth, but I am just trying to understand, would it be a fair statement to say that there was no conclusive indication of the root cause?

MR. ISLEY: That is correct.

MR. BELL: Mr. Isley, do any of the test facilities have the capability of testing that valve at the set point of 2335?

MR. ISLEY: There are facilities out there that can do that, yes.

MR. ROSSI: Have you talked to EPRI at all about the problem that you had?

MR. ISLEY: Yes, we have.

MR. ROSSI: Have they any ideas or any hypotheses on the problem?

MR. ISLEY: No. As I stated in our action plan, we reviewed the EPRI test results and there was nothing in the EPRI testing that would lead us to any one area or to indicate any problem with the valve.

MR. ROSSI: And the vendor?

MR. ISLEY: The vendor stands behind the EPRI Report.

MR. BEARD: What does that mean?

MR. ISLEY: The vendor, from the beginning, thought there was no problem with the valve.

MR. BEARD: Well, obviously the valve -- I think it is obvious the valve did not close properly.

MR. ISLEY: Correct.

MR. ROSSI: So the vendor disagreed that the valve didn't close properly, or --

MR. ISLEY: No.

MR. GRIME: Tom, on that issue of the valve closing properly, was there not one of the hypotheses of some possibility of valve timing and -- coinciding with -- to be timed when the operator closed manually the blocked valve?

MR. ISLEY: Even with that,system pressure was far below the set point to close that valve, and there was thirty seconds or so after the valve should have closed, there was still flow indicated through the valve.

MR. GRIME: So there was a definite anomaly --

MR. ISLEY: There is definitely something wrong.

MR. BEARD: I am trying to reconcile in my mind what the statement means that there is a definite anomany, and that the vendor stands behind the EPRI statements that there was nothing wrong with the valve.

I don't know how you reconcile those two statements.

Maybe you can.

It seems to imply that one should expect that PORV not to close properly, but that is part of its, 'range of normal behavior.' Is that what they are saying?

MR. ISLEY: No, I don't believe the vendor is saying that. The vendor came on site and said that their experience with the valve is that the valve works very well, that they had very little problems with that valve, very few problems with that valve sticking open in their other applications, and that they did not expect that there would be anything wrong with the valve when they disassembled it.

MR. ROSSI: Were they here for the disassembly of the valve?

MR. ISLEY: Yes, they were.

MR. BEARD: Are you considering any actions that you might want to take in the event that there is no root cause found for this valve?

MR. ISLEY: We are looking at the possibility of replacing our valve with either a similar valve from the same vendor, or going to a newer designed valve from a different vendor.

MR. BEARD: Would that replacement activity include testing prior to installation?

MR. ISLEY: Yes.

MR. BEARD: I realize this is in the consideration stage; apparently no decisions are being made, because you are not there yet.

MR. ISLEY: That is correct.

MR. ROSSI: Okay.

End 9. SueWal fols.

#10-1-SueWalsh

MR. ROSSI: Okay. I think that is about everything we have on PORV. Why don't we go to Action Plan 16 on the erratic pressure control and the steam headers.

MR. BEARD: Oh, I do have one question, Ernie, just for clarification.

In this status report, you say that you are still in the process of developing detailed tests to be run from Mode 3, some hot testing of the valve?

MR. ISLEY: That's correct.

MR. BEARD: Are you still planning to maybe hot test this valve prior to making a decision to replace the valve? Or, are you going to make that decision at that point?

Or, do you know?

MR. ISLEY: I don't think we have identified the point where we want to make a decision.

MR. BEARD: Okay. Thank you.

MR. ROSSI: Okay. Erratic pressure control.

MR. MOMINEE: Okay. Larry went out to get the individual who will be addressing that.

MR. ROSSI: Okay. Fine.

(Pause.)

MR. ISLEY: Excuse me, J.T., could I make a clarification on the PORV?

MR. BEARD: Certainly.

#10-2-SueWalsh

MR. ISLEY: My statement concerning the vendor and his support from the EPRI testing, that is about the only experience the vendor has with the nuclear applications of this valve.

MR. ROSSI: The EPRI testing?

MR. ISLEY: Is in the EPRI testing. The vendor does use a very similar valve in non-nuclear applications, and in those applications they have very little problems.

MR. ROSSI: Okay. On to the erratic -- is somebody else coming in now?

MR. GRIME: Yes.

MR. ROSSI: Okay. Fine.

MR. GRIME: It may be just a minute before Larry gets back here.

MR. ROSSI: That's no problem, because I would like to read this again anyway.

(Pause.)

MR. ROSSI: Okay. Let us take a look and we will try to give you some definitive statement tomorrow. But as far as the PORV one, we won't provide any comments on that one.

MR. MOMINEE: You are telling us then that there is no need for you to provide any comments on that?

MR. ROSSI: On that one, that's right.

MR. BEARD: We choose to give no comments and

#10-3-SueWal

you can proceed with the work that you have scheduled.

MR. MOMINEE: Okay.

MR. ROSSI: Okay. We are now ready to begin the discussion on the erratic pressure control. And this one, it's our understanding that you have done some checks of the ICS.

MR. BEARD: ICS being the integrated control system.

MR. ROSSI: You found one module I guess that was out of calibration. Two modules. But you don't feel that either one of those explains the erratic pressure behavior.

And you've had meetings with the safety valve vendor. These safety valves that you have here, you have had experience in the past with it not resetting properly and that kind of thing; is that correct?

Do you have any -- I mean, do you now believe that that was the problem, or are you still in the process of trying to do further evaluations to determine this?

MR. HUSTON: We are still doing further evaluations. Some of the work on the ICS that is involved with main steam header pressure control we just completed about an hour -- a little over an hour ago. And I don't have it all sorted out in my own mind yet.

Indeed, there could have really been a contribution from the integrated control system, not so much from

#10-4-SueWalsh

the work referenced there that you have in front of you which was completed yesterday late, but from some additional testing that we did during the day today.

MR. ROSSI: Well, were the vent valves during the event being controlled by the integrated control system?

MR. HUSTON: Part of the time they were, yes. Part of the time they were under operator manual control.

MR. ROSSI: Do you have any way of telling whether a safety valve could have been not reseated or leaking significantly during the event? Any instrumentation or anything of that sort?

MR. HUSTON: We don't have any instrumentation on the safety valves to indicate position. We are looking into that.

MR. ROSSI: No temperatures downstream or anything of that sort?

MR. HUSTON: No, not on the safety valve exhaust. You can get some real good idea by looking at the pressure traces, however.

MR. ROSSI: You have a statement in the status that says that the inlet bore size to the MSSVs is smaller than Dresser states is basis for the valve rating.

Does that effect the valve rating? I mean, is that another problem that --

MR. HUSTON: It's --

MR. ROSSI: -- you have?

MR. HUSTON: It's more of a problem making sure that you have board certification of the valve. As far as effecting performance, it's -- we have done some preliminary work on that. I was working on that late last night. It appears at this time this is not completed work yet, but that has no effect on valve performance.

MR. ROSSI: Okay.

MR. HUSTON: The difference in bore is minimal; the length of that inlet pipe is short.

MR. BEARD: Would this difference in bore really only, say, effect flow capacity?

I assume that by bore you are saying that the valve throat size is a little smaller than maybe it was thought to have been? Am I misunderstanding?

MR. HUSTON: The valve itself, no, is of the size that Dresser wanted. It's where the valve mounts to the main steam header.

MR. BEARD: So it's at the interface there?

MR. HUSTON: There and down to the main steam line, from the interface on down. Nonetheless, in any case it's larger than the nozzle of the valve itself. So, you are restricted the minute you go past that; or the inch you go past that interface, you are restricted right there.

MR. BEARD: Okay. Let me see if I can somehow

summarize in my mind at least this action plan. My memory is the action plan addressed three major areas that were considered possible sources of the erratic pressure response.

One was a problem with the MSIVs -- I mean, yeah, a prob'em with maybe some leakage through the MSIVs or by the MSIVs, or misoperation or something on the main steam safety release, safety valves.

The second problem was a problem with the atmospheric vent valves, in the valve itself.

And a third aspect, as I remember the action plan, was it's possible there was a "operational problem" with the vent valve which, to me, suggests the possibility that it was manually operated in less than the optimum fashion.

Have you had a chance to look at all of these areas? Because I guess what I'm trying to understand is you have addressed looking at some of the automatic controls for the vent valve, you have looked at some of the aspects of the safety valves themselves. I don't see anything on the status report as to what you have done, or have not done, with regard to the MSIVs and operator actions on the control of the atmospheric vents.

Should I deduce from that there is no action that has been done in those areas?

MR. HUSTON: That is correct. I was not planning

to address the main steam isolation valves or MSIVs, as you were calling them.

MR. BEARD: Was that not part of the original action plan? Or, is my memory just getting weak?

MR. HUSTON: I don't believe that was part of my original action plan, no.

MR. BEARD: Okay.

MR. BELL: I need some information from you, Mr. Huston, in order to understand the steam generator pressure traces.

MR. HUSTON: Okay.

MR. BELL: I think you stated earlier that during the event that the valves were either under RCS control or operator control.

During the early part of the event, immediately after the reactor trip, is there any reason that the atmospheric vent valves would open?

MR. HUSTON: Yes. There is a circuit that will open the atmospheric vent valves at a set pressure when that is reached beyond the main steam pressure caps. They will get an open signal from the ICS.

MR. BEARD: Is that open signal operable in the condition the plant was in at the time? Or, is it bypassed or blocked?

MR. HUSTON: That would not have been blocked at

#10-8-SueWalsh

the time of the trip, no.

MR. ROSSI: Well, the SFRCS I believe was.

MR.HUSTON: Okay. Whether or not that was operable is a question that came up just an hour ago in our testing of the ICS. There is one channel there that we don't know about yet.

MR.BEARD: I guess what I'm trying to understand is, in context with Larry's question, in a post-trip situation which I assume would also include the actuation of the SFRCS, I understood that that actuation forces the control -- overrides the control of the ICS and causes the atmospheric vent valve to be closed unless the operators take special action to take manual control.

MR. HUSTON: That is correct. Upon SFRCS actuation, the AVVs will close.

MR. BEARD: Right. And wasn't that the situation before he took manual control?

MR. HUSTON: We have alarm printouts to show on the -- on one steam generator that indeed they were not closed. We get a closed and a not closed printout.

MR. ROSSI: Larry, why don't you go ahead?

MR. HUSTON: Maybe I'm missing your question, Larry.

MR. BELL: My question really addresses the adjustment of header pressure bias on a reactor trip. I

#10-9-SueWalsh

was under the impression that the turbine bypass valve received an additional bias when a reactor trip signal was generated, that increased the turbine header pressure set-point to somewhere in the neighborhood of ten hundred and ten psig.

MR. HUSTON: Right. That is correct.

MR. BELL: Now, we assume that that action takes place from the pressure curves.

MR. HUSTON: Uh-huh.

MR.BELL: Then, following the closure of the main steam isolation valves or the main steam stop valves, your ICS analog and digital logics show that if those valves are closed then header pressure control is transferred to the atmospheric vent valves.

MR. HUSTON: That is correct.

MR.BELL: I wanted to make sure of that, because as I said before I am trying to go through these curves.

The third thing that would get a signal to those atmospheric vent valves is the steam and feedwater rupture control system. When that system was actuated, either on low steam generator level or low steam generator pressure then those valves should close.

MR. HUSTON: Yes.

MR. BELL: Regardless of the demand from the integrated control system?

#10-10-SueWa1

MR. HUSTON: Right.

MR. BELL: Finally, when the steam and feed rupture control system was reset, then the valves would revert to RCS control or manual control, depending on the position of the selector switch?

MR. HUSTON: That is correct.

MR. ROSSI: Was it under ICS control for some period of time after they reset the SFRCS or not?

MR. HUSTON: I don't know. I asked the operator about that, and he was so busy. I spoke to the operator twice, and he couldn't recall.

MR. ROSSI: And you can't tell from the data printouts?

MR. HUSTON: No. We don't have printout there. It may return -- upon the operator putting in the block, it may return to a preferred state. And I'm not sure. I can't remember what I came up with on that.

You would have to ask one of the operators about that.

MR. BELL: Okay.

MR. ROSSI: We have probably got your status on this. Are you developing another action plan revision on this one? Or, are you still within the current action plan?

MR. HILDEBRANDT: May I ask for a point of clarification? Larry, when you were mentioning what the SFRCS full

#10-11-SueWalls

trip does, as far as the atmospheric vent valve is concerned, I believe the statement was on any full trip, or a trip -- excuse me, you've been using the term trip of the SFRCS, the AVV, the atmospheric vent valve, would be closed automatically.

I believe that is only on a low pressure trip of the SFRCS, not on a level.

MR. BEARD: Okay. We thank you very much.

MR. ROSSI: Okay. Can we go on to Number 26 on the inadvertent auxiliary feedwater suction --

MR. BEARD: Wait a minute. I didn't hear the answer to the question you asked before Larry wanted his point of clarification.

Are you developing a revised action plan?

MR. HUSTON: No, we are not. We are still within the scope of this one, as far as the testing that we are going to do.

MR. BEARD: Thank you. Do we have to wait for the appropriate individual for this plan?

MR. GRIME: They should be here.

MR. BEARD: Right outside the door?

MR. GRIME: Should be.

(Pause.)

END #10
Simons flws

Sim 11-1

MR. ROSSI: All right, why don't we start then and talk about inadvertent Auxiliary Feedwater pump No. 1 suction supply transfer.

I guess the thing that I noticed was that you have done some looking at the time response of pressure switches and concluded that they respond faster than the computer scan rate, which could explain you indicate lack of a computer alarm. Does that then mean that it is possible that you could have gotten some sort of a rapid indication of a loss of suction when you transferred it over that wouldn't show up on the computer?

MR. CZUBA: Correct.

MR. ROSSI: How does it seal in? How does the circuitry seal in for doing that?

MR. CZUBA: That alarm switch, PSL-503, doesn't seal in. It will reset if pressure is restored.

MR. ROSSI: But that is a different switch than is used to do the transfer?

MR. CZUBA: Right. The setpoint on the alarm switch is 11 psi. The setpoint on the actual pressure switches that actuate your transfer is 2 psi.

MR. BEARD: Well, are these two that we are talking about, 503 is the one that sounds the alarm?

MR. CZUBA: It gives you an enunciator alarm and then a computer alarm.

Sim 11-2

MR. BEARD: Okay. But that is at the 11 psi point?

MR. CZUBA: Correct.

MR. BEARD: And the same thing for 507?

MR. CZUBA: Correct. 507 is on the 1-2 side and 503 is on the 1-1 side.

MR. BEARD: I guess I am still trying to understand this thing about the response of those alarm switches is faster than the scan reads it. I understand the computer scan rate is about one second.

MR. CZUBA: One second, correct.

MR. BEARD: And you are saying that this thing can come in and go back out before the thing has a chance to siphon around and get to it?

MR. CZUBA: It can actuate and reset -- the total time response of the actuation plus reset was approximately 200 milli-seconds.

MR. BEARD: So that would be total cycle time?

MR. CZUBA: Correct. So, therefore, if there was a spike or a low pressure in the suction line ---

MR. BEARD: Let me see if I understand this. So the problem is that since it doesn't seal in that the alarm, or the scanner, which takes a second to come around, could miss it during that interval?

MR. CZUBA: Right, but you also have your

Sim 11-3

enunciator alarm which the operator did see come in prior to swap-over. So they did have indication that 503 actually actuated because of the enunciator.

MR. BEARD: But wasn't that an occurrence that took place, was completed and reset several seconds prior to the transfer starting?

MR. CZUBA: That did happen, but it happened again prior to the actual swap-over.

MR. BEARD: Oh, okay. On some of the enunciator inputs I was told that because of previous spurious actuations that the enunciator had been modified to provide an intentional hold-in or delay on clearing or something of that nature. Was that only done for inputs related to the rupture control system or was it done generally for all the enunciator inputs?

MR. CZUBA: I am not sure.

MR. BEARD: Because I get the feeling that that is not applicable at least for these inputs.

MR. CZUBA: I am not sure on that.

MR. ROSSI: What are the consequences of an inadvertent transfer of the suction?

MR. CZUBA: Well, what do you mean by consequences?

MR. ROSSI: The consequence to the plant. Does it simply get water of poor quality into the steam generators? Is that the consequences?

Sim 11-4

MR. CZUBA: Yes, if you consider that a consequence, that service water in the steam generator, I guess that is what would happen.

MR. GRIME: You mean the long-term consequences as opposed to no immediate safety consequences that you are switching to an alternate source of water?

MR. ROSSI: Yes, that was my question. Is it a long-term chemistry problem?

MR. GRIME: To the best of my knowledge, that is correct.

MR. ROSSI: No short-term safety problems.

MR. GRIME: No short term.

MR. ROSSI: Did you have a comment on that, Larry?

MR. BELL: There is a potential safety problem there is the cause of the low suction pressures is a clogged suction strainer. Then the shift to service water would not supply auxiliary feedwater to the steam generators.

If my memory serves me correctly, somewhere in that 24 pages of alarm printouts there is a suction strainer differential pressure alarm. There are a lot of pages to that document, and I could be wrong.

MR. CZUBA: If I could say something. I think I recall seeing one where we did get the alarm and then one second later it cleared. Is that the one you are thinking of?

Sim 11-5

MR. BELL: Well, as I said, the document is 24 pages long, and I didn't commit it to memory. But I do recall that there is a DP alarm on the suction strainer, and I don't recall how long the alarm was in.

MR. GRIME: Do you know which strainer and in which line that was?

MR. BELL: No, sir.

MR. BEARD: My understanding is the strainer is in the common portion of the pipe.

MR. GRIME: We would have to look at a PNIV to be certain of that.

MR. BEARD: We had some other meetings where some different people said that. That is what they told me when the question came up, that it was in the common portion of the pipe.

MR. ROSSI: Well, the strainers are going to be checked.

MR. CZUBA: To my knowledge, the only VP indication across the strainers are the individual strainers in each line.

MR. BELL: But you do agree that there was an alarm generated high differential pressure?

MR. CZUBA: I did see that.

MR. BEARD: Are you still working on the action plan? In other words, it is not completed yet?

MR. CZUBA: Yes, sir, we are still working on it.

Sim 11-6

In fact, today we did pull two of the strainers out and looked at them and they looked clean.

MR. BEARD: Do you have any intent or believe it will be necessary to revise your action plan?

MR. CZUBA: At this time, no.

MR. ROSSI: You said that you had looked at the strainers. That is in your summary down here where you say "Auxiliary Feedwater strainers 5201 and 5206," you have looked at some of those now?

MR. CZUBA: We have looked at 201 and 206 today and did not find any indication of anything that would clog.

MR. BEARD: Down here under the summary where you list the actions to be done yet, is that a complete list?

MR. CZUBA: To date ---

MR. BEARD: I mean at the very bottom of the page you have got three paragraphs. One says "None of the above findings establish the direct cause . . . work is continuing."

The second paragraph says look at the strainers.

The third paragraph says do a functional test.

Is that the essence of what is left of the action plan yet to be done?

MR. CZUBA: We also want to make some high-speed chart recorders across the contacts of the pressure switches to monitor them during the aux feed pump testing.

MR. ROSSI: That is when you do which testing?

11-7

MR. CZUBA: The auxiliary feed pump testing.

MR. ROSSI: That is after you go back to mode 3?

MR. CZUBA: Yes.

MR. ROSSI: And trying to simulate as near as possible the actual conditions that existed on June 9th?

MR. CZUBA: Yes.

MR. ROSSI: But all of this that is remaining to be done is within the current action plan?

MR. CZUBA: Correct.

MR. ROSSI: Including the chart recorders?

MR. CZUBA: Correct.

MR. BEARD: Let me see if I understand you correctly. This summary is a complete list of what is yet to be done in the action plan?

MR. CZUBA: Correct.

MR. BEARD: If that is the case, it seems like that if we put aside for the moment the mode 3 part of the testing and a recalibration of this pressure switch that you found out, that the only thing left to be done is the inspection of the rest of the strainers.

MR. CZUBA: Yes, sir, besides the fucntional test.

MR. BEARD: That is what I mean, the mode 3 test.

MR. CZUBA: Well, the ST-5071.13 does not need to be done in mode 3.

MR. BEARD: So that is not the same test as is referred to by the last item?

MR. CZUBA: No. The ST is you actually drain down both pressure switches and watch the valves and make sure that the valves do swap over.

MR. BEARD: Okay. So that will be done prior to ---

MR. CZUBA: --- prior to mode 3, correct.

MR. BEARD: Just for other related information, if this suction goes low, do you know whether or not the system is capable of making -- how long it takes the system to do this transfer to get the pressure back up, how many seconds that would take?

MR. CZUBA: You want to know how long before the -- when it does get an indication of a low suction pressure until suction pressure is restored?

MR. BEARD: Yes, sir, if you happen to know.

MR. CZUBA: No, I don't know that offhand.

MR. BEARD: Just a ball park. I mean are we talking one second, ten seconds, twenty seconds?

MR. ROSSI: If you truly don't know, it is better to just say you don't know rather than to guess at it I think.

MR. CZUBA: I really don't know.

MR. ROSSI: I mean if we need to know, we can

Sim 11-9

find it I am sure.

MR. BEARD: Is there an interlock on that DP, or on that low pressure, that if the pressure persists for some period of time if will shut down the turbine?

MR. CZUBA: There is another set of pressure switches that if you get below one psi it will shut your steam supply valves, MS-106 and on the other side MS-107.

MR. ROSSI: Anything else?

MR. BELL: Mr. Grime.

MR. GRIME: Yes.

MR. BELL: In reading some events at other utilities, a switchover to service water has occurred during simultaneous starting of emergency feedwater pumps. Has that ever been a problem here?

MR. GRIME: I may have to refer back to Tim. I know we have had a service water transfer occur previously at Davis-Besse at least once or perhaps spill. I cannot recall the details of what precipitated the transfer to service water in the previous case.

MR. CZUBA: To my knowledge, it has happened before in the 1-1 pump. On pump startup they have had the swap-over.

MR. ROSSI: JT?

MR. BEARD: I have no further comments on this section.

Sim 11-10

MR. ROSSI: Okay. I guess we are ready for -- we are going to take a five-minute break while we get ready for the next one.

(Recess taken.)

MR. ROSSI: We are going to talk about 15A-1 and 15A-2 and I guess 15B also.

MR. BEARD: Yes.

MR. ROSSI: Okay. Why don't we start with 15A-1 and 15A-2. Are you now to the point where you have completed your action, your original action plan?

MR. BORYSIAK: No, we are not.

MR. ROSSI: Is work with Ohio State University, is that still within the original action plan?

MR. BORYSIAK: Yes.

MR. BEARD: Could you outline briefly the steps of the action plan that are yet to be done in the way the plan was written?

MR. BORYSIAK: I don't have a copy of my action plan with me. There are four work orders presently written to cover as per the summary draft submitted. We have only completed one-half of 2092-00.

MR. ROSSI: This channel, it is still failed at this time? I mean is it inoperable or operable?

MR. BORYSIAK: It is still declared inoperable.

MR. ROSSI: It is declared inoperable and it is

Siml1-11

still -- at least the failure is still there to investigate; is that right?

MR. BORYSIAK: The elevated court rate occasionally comes and goes. We are trying to catch it when it does in fact appear. When we do catch the elevated count rate data that we require for 2092-00, we can then complete that work order.

MR. BEARD: I guess that is useful information because in contrast on the next one, 15B, it seemed like you had trouble reproducing the anomaly. It just won't seem to come on for you. But in this case, and I guess these are all related to NI-1, which is source range channel 2. On this one you have had occasions where the misbehavior has occurred for you.

MR. BORYSIAK: Occasionally it comes and goes, yes.

MR. BEARD: Do you anticipate that you are going to have to revise the action plan to take steps that are beyond those in the present plan?

MR. BORYSIAK: Not at this point in time. We wish to complete these four work orders initially, which is within the scope of the action plan, and then have Ohio State and ourselves sit down and analyze and take a look at the data and then come up with a possible revision, depending on what that analysis leads us to.

MR. BEARD: I am trying to understand something here. There is a statement in here that says no work orders have been written to investigate action plan 15A-2, and A-2 relates to -- I guess that is the spiking part of the problem, right?

MR. BORYSIAK: That is correct.

MR. BEARD: So really what you are doing is you are working on A-1, which is the elevated count rate?

MR. BORYSIAK: That is correct.

MR. BEARD: Have you done anything on the -- well, whatever the numbers are for the other channel?

MR. ROSSI: Well, that is 15B. Are we ready to go on to 15B?

MR. BEARD: Well, wait a minute. I am confused because up here where it says "maintenance work order is written, there are two identified as having been written for NI-1 and two identified for NI-2. Therefore, I was trying to understand -- you said that the very first one listed for NI-1, I thought you said it was about half complete.

MR. BORYSIAK: That is correct.

MR. BEARD: And I was trying to get the status on the NI-2 part. Now is that part of 15A-1 and A-2, or is that part of 15B?

MR. BORYSIAK: 2192-00 and 2192-01 is part of

action plan 15A-1.

MR. BEARD: And that part is complete or incomplete or partially complete?

MR. BORYSIAK: That has not been started at this point in time.

MR. BEARD: That is right. Okay.

MR. ROSSI: Are we ready to go to 15B?

Okay. Now 15B, as I understand it, this is one where you haven't been able to reproduce the failure after a number of attempts.

MR. DeSANDO: Yes, sir.

MR. ROSSI: So essentially all the time since the event it has worked with the exception of spiking problems that may be similar to those on NI-1 that have occurred now and then?

MR. DeSANDO: No, sir.

MR. ROSSI: You don't have spiking. It has just worked?

MR. DeSANDO: Yes, sir.

MR. ROSSI: And you haven't been able to reproduce the failure and you are still trying to reproduce the failure?

MR. DeSANDO: That is correct.

MR. BEARD: Is this monitoring that you are doing, is that like somebody watching it or do you have

Sim 11-14

instruments recording it or how are you trying to catch this anomaly?

end Sim

Joe fols

MR. DeSANDO: One of the future plans is to install a strip chart recorder to monitor the output of the calibrate amplifier module, and that is just something that would run continuously in case of a failure.

MR. BEARD: Okay. But I guess what I was trying to understand is like on the second bullet here under activities, you said you attempted to reproduce the failure relating to turning the high voltage on and off.

Can you tell me -- did you just go in there and turn it off one time and nothing happened, or what was it?

MR. DeSANDO: The detailed procedure for that was to turn off the high voltage to the detector when using the on and off switch on that detector power supply module, leaving it off for -- well, the first time we did it we left it off for fifteen to twenty minutes.

We returned, we re-energized it, hoping to see that it would -- it remained below ten to the minus one state. It responded properly to the high voltage.

Then we turned it off again and we let it -- we kept it off for three days, and we came back and re-energized it, and it again responded as it should.

So, both of those attempts were unsuccessful.

MR. BEARD: There were basically two attempts, though. It wasn't a continuous monitoring.

MR. DeSANDO: Oh, no, sir.

MR. BEARD: All right. That is what I was trying to understand.

MR. ROSSI: Are you still within the original action plan on this one?

MR. DeSANDO: Yes, sir. Today I submitted to our local committee a Rev. 2 to the action plan. The --

MR. ROSSI: Oh, you did?

MR. DeSANDO: Yes, sir. Today. Just today.

MR. ROSSI: Oh, okay.

MR. BEARD: What would be the general thrust of that revision?

MR. DeSANDO: The revision is to include instructions for an attempt to reproduce the problem by de-energizing the high voltage using the high voltage cutoff bistables, and the reason for this is to more accurately simulate the conditions that were present during the time of the failure on June 9th.

Basically the same theory that is included -- or that we used in turning on and off the high voltage there earlier. Using the bistable.

MR. BEARD: Do you think that the present work plan has a high probability of finding the root cause?

MR. DeSANDO: From the attempts that we have made so far, the channel seems to be functioning properly at this

time, and everything that we have tried so far we have come up empty, and the more we try the more I feel that it is going to be harder to reproduce the problem.

MR. BEARD: I guess I am trying to carry out a line of questions that say: Suppose that you are unable, within the scope of the action plan, to reproduce the anomaly or even if you do reproduce the anomaly, not find the cause for it.

Have you given any thought as to where you would go from there?

MR. DeSANDO: Yes, sir. We consulted with Babcock & Wilcox per telecon only so far.

There suggestion right from the start would be to replace the count rate amplifier module. That is being taken into consideration along with other possibilities.

We have an SER that is planned to be implemented during the 1986 refueling outage, which is a replacement -- which is an installation of a new type source range detection system made by Gamometrics.

That system was going to be installed and used as a secondary system for a year to see how it performed, and if it performed better than the one that we had, we were going to, at that time, consider replacing the existing instrumentation with that instrumentation.

And I guess the point that I am trying to make

is that SER can be speeded up.

MR. BEARD: Okay. But if you take either of those two routes, are you saying that while you were unable to find the root cause, you would be just putting in replacement equipment, either a module, or a whole new chassis, I guess, you are talking about, in the hope that that makes it go away?

MR. DeSANDO: Yes, sir.

MR. ROSSI: Do you have any more?

MR. BEARD: No.

MR. ROSSI: I guess we will go on to the last one. I guess this is the last one for this afternoon, which is the auxiliary feed water pump trip and throttle valve.

Do you have different people coming in for that?

MR. HILDEBRANDT: He is right here. Mr. Gradomski is here to address that.

REPORTER: Could you spell your name for me, please?

MR. GRADOMSKI: Rick Gradomski; G-r-a-d-o-m-s-k-i.

MR. BELL: He got that part, it was the Rick that was hard.

(Laughter.)

MR. BELL: Let Joe settle down for a bit.

(Laughter.)

MR. ROSSI: All right. We are going to talk

about the action plan on the overspeed trip mechanism for auxiliary -- the auxiliary feed water pump turbines, and I gather you have gone through and checked the trip and throttle valves and found that they -- you found no problems with any of the equipment.

You found no problems with the adjustments.

MR. GRADOMSKI: That is correct.

MR. ROSSI: When we went down and looked at the pumps, there was -- I guess it is the arm that comes across to the trip throttle valve, trip mechanisms --

MR. GRADOMSKI: Connecting rod.

MR. ROSSI: Yes, the connecting rod. Is that normal to have it bent, or is that replaced, or what?

MR. GRADOMSKI: No, it is not normal for the connecting rod to be bowed, as it was. That has not been replaced.

We did check the adjustment of the linkage in the bowed condition, and the linkage was still within the adjustment.

MR. ROSSI: So the bowed connecting rod has -- I mean had no effect on the problems.

MR. GRADOMSKI: That is correct.

MR. ROSSI: Okay. And this one, you have -- this one here you really have come to a final conclusion, I gather, it is just a matter of writing the final report?

I mean, your conclusion on this one is that the operators didn't have enough understanding of how to operate the trip throttle valve and resetting it and opening it, and that was the problem, rather than a problem with the equipment.

MR. GRADOMSKI: In the absence of any mechanical deficiencies out of adjustments, viewing how the operator had attempted to reset the linkage during our investigations, that has pretty much led us to the conclusion that is stated on the summary.

MR. ROSSI: Was the problem that he didn't know how to relatch it, or he didn't know how hard he had to open the valve after he got it relatched?

MR. GRADOMSKI: Well, the valve ends up being step four in the action plan, which was trying to get it open after they had relatched the mechanism or in some way got the trip hook into the latchup lever to allow them to open the valve.

That comes under Step 4, which we are going to try to simulate that condition when we get to Mode 3 in conjunction with Plans 1-A and 1-B.

MR. ROSSI: Okay. So, there is one part of the action plan that has not been completed, and that is the actual opening.

MR. GRADOMSKI: That is true. Under steam

generators.

MR. ROSSI: But you have checked the adjustments and so forth for opening the valve. I thought there was some adjustment.

MR. GRADOMSKI: There is an adjustment there, but the only way that we can really make that adjustment is --

MR. ROSSI: -- is in Mode 3?

MR. GRADOMSKI: Is in Mode 3.

MR. BEARD: Rick, you have gone through this action plan with the exception of the part you just described which has to be done in Mode 3.

MR. GRADOMSKI: That is true.

MR. BEARD: And troubleshot the equipment from a mechanical standpoint, I take it?

MR. GRADOMSKI: Yes, sir.

MR. BEARD: To what extent have you involved the operators in your conclusion that the operator made a mistake?

MR. GRADOMSKI: The operators involved have been with us every step of the way in these investigations when we were down in the pump rooms.

The operators, in fact, the last time we were in the pump room, had indicated to me that they did not believe that now there was a mechanical problem.

That they didn't have a good feel for the way the linkage was supposed to be relatched, particularly in the area of the overspeed trip device, which is located directly on the turbine shaft casing.

That particular part of this overspeed trip mechanism is hidden down behind the governors and other components. It is not easy to see. It doesn't command much attention.

The only very particular part that they knew about was that that was where the manual overspeed trip lever was. In case they wanted to manually overspeed it.

They were generally unaware of particulars of that portion of it. From a human factors viewpoint. The trip and throttle valve, the trip hook and latchup lever, are the points of that system which are the most easily viewed, and therefore, they command the attention, especially when the primary emphasis is to get the hook and the latchup lever together so that you get the valve open.

MR. BEARD: So it is a two step part; you got to reach down behind the governor, and do something in that area, and then go over and latch the trip throttle?

MR. GRADOMSKI: No, not really. What you have to do on the valve is, after it has tripped, you have to rotate the hand wheel to get this latchup lever up into position, and then what you have to do is grab the connecting

rod and pull that entire device over until the force nuts on top of the turbine resets.

MR. BEARD: Okay. So, you are saying that the error was that they pulled it far enough to where it latched at the trip throttle part, but maybe not far enough to clear back at manual trip lever?

MR. GRADOMSKI: That is true.

MR. BEARD: Okay. And you said the operators -- are you talking about the equipment operators that were involved in this thing during the night of the event?

MR. GRADOMSKI: Yes, sir.

MR. BEARD: Have they said that they believed that they just didn't understand how to do it?

MR. GRADOMSKI: Yes, sir.

MR. ROSSI: Tell me. The overspeed trips are tested from time to time?

MR. GRADOMSKI: The overspeed trips are exercised under the monthly auxiliary feedwater pump test, and I believe it is surveillance test 5071.01.

MR. ROSSI: What does that consist of?

MR. GRADOMSKI: It consists of manually tripping the overspeed device, resetting the device, and reopening the valve.

MR. ROSSI: But all with no steam, or without it running at all.

MR. GRADOMSKI: That is true.

MR. ROSSI: And who does the resetting then ? Do the equipment operators do that, or --

MR. GRADOMSKI: I am not sure. It is a surveillance test that is conducted by operations personnel.

MR. ROSSI: So the equipment operators would do that test?

MR. GRADOMSKI: To the best of my knowledge, equipment operators operate those. I can check on that to verify it. Standard practice would be that the operators would run that test,

MR. ROSSI: If the equipment operators do that, then doesn't that tell them how to do what they had to do on June 9th? Or is there a significant difference because you had steam to the pump, or -- in terms of resetting the trip throttle valve?

MR. GRADOMSKI: We had reviewed that surveillance test after we had conducted the first round of investigations on June the 29th.

We have looked at that surveillance test and procedure that is given to the operators. Quite honestly, we came to the realization that the surveillance test, the procedure that is given in the surveillance test primarily emphasizes getting the trip hook and latchup lever together and secondarily states that you may have to pull on the

connecting rod in order to reset the linkage.

When, in fact, that is the only way that you are going to reset the linkage is to pull on the connecting rod.

MR. ROSSI: But they must go down and do that every month. Somebody must do it every month when they test the pump.

MR. BEARD: Yes. I hear you saying that maybe the wording in the procedure is not as clear as it could be, but if they actually have to do it every month, it seems like they would know that.

MR. GRADOMSKI: Well, as I understand it, there is a one shift of operations personnel in the six shift rotation that we have, one of those shifts are on -- spend a week with surveillance tests.

MR. ROSSI: You mean the same shift does the surveillance test?

MR. GRADOMSKI: No. No. It varies, depending upon the rotation. And the time that the surveillance test is due.

I don't know how that measures out to tell you how many times a particular operator had gone down there and actually performed that portion of the surveillance test.

MR. ROSSI: Had these operators done this before?

MR. GRADOMSKI: I don't know.

MR. BEARD: But clearly the surveillance test still does not -- still does not give them an operating knowledge, if you will, of the overspeed trip mechanism in general.

MR. ROSSI: Well, yeah, but the point is that it may not give them a knowledge of how it works, but if they have to go and actually reset it, it gives them experience in resetting it that I think they would if they had done it a few times they would know how to do. I think that is the point.

MR. BEARD: That is the point I was trying to understand. If the guys who have done this, maybe their shift happens to only catch it, and the guys have only done it twice in the last five years, or some, even a small number, it seems like that real world experience is going to tell them how to make it work and how to not make it work regardless of the procedure.

MR. GRADOMSKI: It was clear to me that the operator that was on Pump No. 1 did not have the full understanding to pull that linkage as far to the left as he possibly could in order for the mechanism to reset on the turbine end.

MR. BEARD: Okay. Now, during the event, if I remember what took place, two equipment operators went to

the aux feed water pump rooms and started to work on one, and later they went to the second one, but they had this difficulty, and if I remember correctly, some additional people came to the room -- I believe one of the guys was a fellow by the name of Morrison.

MR. GRADOMSKI: That is correct.

MR. BEARD: And Steve Feasel came in.

MR. GRADOMSKI: That is correct.

End 12. SueWal fols.

#13-1-SueWalsh1

MR. BEARD: Was their coming on the scene what actually turned this thing around?

Or, do you know? In other words, I'm trying to understand simply, Rick, is it a situation where the guy that was there didn't understand it well enough and then when the additional person arrived who happened to understand it better, that's what turned the whole problem around?

MR. GRADOMSKI: Well, it appears that on pump Number 2 and on pump Number 1 there were two different things that happened.

Clearly, on pump Number 1 the overspeed trip mechanism was never reset until late.

MR.BEARD: On pump Number 1?

MR. GRADOMSKI: On pump Number 1. On pump Number 2, the mechanism was reset, as a matter of fact, within fifteen seconds after the hatch to the auxiliary feed pumps was open.

MR. BEARD: I have a copy of the DADS traces, the page where they talk about the speed, I believe actually the curves, on the speed and flow from the two aux feedwater pumps.

MR. GRADOMSKI: Uh-huh.

MR.BEARD: And they indicate that before either pump produced any flow that the speed for the Number 1 aux feed pump had been up to at least above a thousand RPM for maybe seven or more minutes.

MR. GRADOMSKI: Uh-huh.

#13-2-SueWals

MR. BEARD: And I was trying to see if that implies that at least that trip throttle valve had been reset quite early, like about seven minutes?

MR. GRADOMSKI: What that indicates to me is that the trip throttle valve was opened.

MR. BEARD: Yeah.

MR. GRADOMSKI: That is possible to do that without setting the overspeed trip mechanism.

MR. BEARD: And what would have -- what would be the effect of that, the turbine --

MR. GRADOMSKI: That there would not be overspeed trip protection.

MR. BEARD: But it would function without the protection?

MR. GRADOMSKI: That's true.

MR. BEARD: Okay. Now --

MR. ROSSI: Can you get it all the way open and --

MR. GRADOMSKI: Yes.

MR. ROSSI: -- run the pump that way?

MR. GRADOMSKI: Yes.

MR. BEARD: Okay. There was a second --

MR. GRADOMSKI: And it was demonstrated that that could be done, and that is what we have surmised has happened, by working that, the DADS, the bypass computer alarm printer, and with interviews with the operators.

MR. BEARD: Okay. There would seem to be a second part of the problem after you get over the trip throttle. And I don't want to get out of your scope of your action plan, but I want to understand how it relates, or if it relates, where the speed on the Number 1 aux feed turbine came up to around two thousand RPM.

And we heard some information that related to the guy had the valve open to a certain point, and it seemed like a hell of a force against it, and maybe he was hesitant for fear of something or another to open it further.

Do you have any idea of whether that relates to this, or I mean the speed leveling out at twenty-two hundred, or whether that's part of the trip throttle valve problem?

MR. GRADOMSKI: Well, at this point in time, I believe that that was associated with controlling the speed of the pump locally, manually via the trip throttle valve.

MR. BEARD: Okay.

MR. GRADOMSKI: Where they were taking the Delta P across the trip throttle valve and not across the governor valve.

MR. BEARD: Well, was there a concern on the part of the operator that the force he was exerting may be extraordinary and he might be about to hurt it?

MR. GRADOMSKI: The operators had indicated to me that they had got the pump up and running and they were

happy to get it that far.

MR. BEARD: Yeah.

MR. GRADOMSKI: Being a little bit leery of it after it had over-sped. They were satisfied with it being up and running.

MR. BEARD: Now, this is the point at which it was at twenty-two RPM or something like that?

MR. GRADOMSKI: Yes.

MR. BEARD: Okay. Was this the time when somebody came along and used a -- I guess it was referred to as a pipe wrench, but I guess a valve wrench and then opened the throttle valve further?

MR. GRADOMSKI: That is true.

MR. BEARD: And was it the -- just the opening it further that caused it to be able to go to full speed?

MR. GRADOMSKI: Yes. As a matter of fact, they did in fact get the Number 1 trip throttle valve fully open at 1:56:08 on the alarm printer.

MR. BEARD: Yeah.

MR. GRADOMSKI: It shows that the Number 1 trip throttle valve was fully open, and the pump speed was approximately thirty-six hundred RPM at that point in time.

MR. BEARD: Okay.

MR. GRADOMSKI: It was shortly after that that the operator had began to back down on the speed by the trip

throttle valve, he again put the valve wrench up on the valve hand wheel, started to back down on it. And that's when the trip hook and latch was disengaged.

MR. BEARD: So actually it retripped.

MR. GRADOMSKI: It retripped.

MR. BEARD: Okay.

MR. GRADOMSKI: However, it retripped because the trip throttle valve slammed shut.

MR. BEARD: Okay. But that's tripping?

MR. GRADOMSKI: Yes, that's tripping without the overspeed trip mechanism --

MR. BEARD: Right.

MR. GRADOMSKI: -- in effect causing that to happen.

MR. BEARD: Right. I understand. Now, that's Number 1 we are talking about?

MR. GRADOMSKI: Number 1 we are talking about.

MR. BEARD: Okay. Would it be a fair conclusion to say that had the individuals who went down there, Mr. X, been familiar with the equipment that at the time where this speed was brought up to twenty-two hundred, you know, just that time frame, that had the guy been familiar he could have gone ahead and gotten aux feedwater flow at that time?

MR. GRADOMSKI: Yes.

MR. BEARD: Okay. So I don't want to criticize

#13-6-SueWalsh

the individual but just to understand the event, but had a different person done it it's possible that aux feedwater flow could have been achieved some seven or so minutes earlier?

MR. GRADOMSKI: Yes.

MR. BEARD: Okay. That's what I understand. Thank you.

Oh, I guess I've got one last question. I understand you haven't finished your review process of your final report on this. But would it be a fair thing for us to take back that the route cause has been determined, although we haven't seen the report?

Is that essentially where we are?

MR. GRIME: We have a draft findings report. We do feel we have a direct cause established for that.

MR. ROSSI: That being the operator not understanding exactly how to do it?

(Mr. Grime nodded in the affirmative.)

MR. BEARD: So what I would really want to know if I should say is, of the various action plans that have been reviewed and discussed and implemented, there is one of them that is at least complete to the point where you feel like you know the route cause, and you are in the process of finalizing the report to fully justify that and explain it?

MR. GRIME: I guess one minor point of clarification.

#13-7-SueWalsh

We may find that there are other contributors to that which, to me, are among the root causes. It's a question of how far you go there. So, we definitely have the direct cause, a problem with it appeared to be an operator operating the equipment not fully understanding all he had to do in that process.

And, of course, there are reasons why the operator did not fully understand that. And, to me, those are where some of the root causes are, some things that were mentioned here today such as the procedure and perhaps in the discussion here we have talked about the surveillance test program, perhaps they are not getting the experience from that that they should be.

So, I feel there are a few unanswered questions yet that we are not ready to absolutely say we are no longer looking for any causes. There were contributors to the incident.

But the direct cause is certainly known.

MR. BEARD: Yes. I think that also the areas that you mentioned are the kind of areas that one would want to look at when you say what kind of actions are appropriate to make sure that that doesn't happen again.

But, you know, there are levels of root causes and there are levels.

MR. GRIME: That's right.

MR. BEARD: And it seems to me that you certainly are at one level.

MR. GRIME: We are at that first level. Yes.

MR. BEARD: Okay. So, I guess, Ernie, we can say that at least for one of these action plans they have, you know, subject to the completion -- I guess you have the hot test you were talking about you wanted to run.

But you basically feel like you have found the root cause.

MR. ROSSI: The hot test is to determine the amount of difficulty you have in opening the valve; is that true?

MR. GRADOMSKI: That's true. It's limited to the valve itself.

MR. ROSSI: Let me be sure I understand one thing. When the pump was running at around two thousand RPM, was the trip -- was the overspeed device latched then, or is your hypothesis that it was not latched and just had the valve open?

MR. GRADOMSKI: It was not relatched.

MR. ROSSI: It was not relatched.

MR. GRADOMSKI: At that point in time. The first place that we get any indication of trip reset is after it had slammed shut, tripped, coming back down from the valve being full open at thirty-six hundred RPM. And being reset

by a different operator.

MR. BEARD: A person, you mean?

MR. GRADOMSKI: Yes.

MR. BEARD: You've got valve operators and you've got people?

MR. GRADOMSKI: No, no, no. By a different operator that was in the pump room. We got up to four operators down there.

MR. BEARD: Yeah, but you are talking people.

MR. GRADOMSKI: A different person, yes. After that had happened, after it slammed shut, a different person was then controlling that pump. And he, in fact, reset the overspeed trip mechanism at 1:58:57.

MR. BEARD: Help me understand something. The computer point you are referring to, does that get its signal from this manual trip lever that we are talking about that may -- you know, you could have it pulled far enough to engage the part over on the trip throttle valve, but not the thing over here?

Which does it get its signal from?

MR. GRADOMSKI: The overspeed trip mechanism gets its signal from a limit switch, if you will, that is -- that changes state when the overspeed trip linkage is reset in its proper position.

MR. BEARD: Enough to clear the manual trip lever

also?

MR. GRADOMSKI: We ran on 7-5, we went down and did some additional investigations in order to tell us whether or not the alarm printer could indicate to us whether they were pulling the linkage far enough so that it would reset.

The indication that there was a mechanical problem in that linkage shows that it would not reset. On July 5th, we went down and firmly established that that switch would not change state until that linkage was almost in its full set position. Additionally, we pushed -- manually pushed the trip hook into the latch-up lever without resetting the linkage to see what the computer would tell us. And it did not show reset.

MR. BEARD: Okay. So that's helpful, because I'm trying to visualize what this man did down there. And it sounds like, from what you are telling me, he had this thing rehooked right at the end of the linkage for the trip throttle valve and was opening it.

And even though he had that position, the computer printout may not have shown it being relatched because maybe the manual lever or the other end of the linkage was still tripped. But he was able to get it up to speed.

So, this clearing of the alarm that you referred to is when, I guess, the second individual came on the scene

#13-11-SueWalsh

and he reclosed it enough to clear it, both ends of the mechanism, so to speak.

MR. GRADOMSKI: Uh-huh. That's correct. When he reset it properly then the alarm showed the reset on the mechanism and they got the valve open.

MR. BEARD: But being unaware of this part over behind the governor, the individual who was doing this probably thought it was cleared and relatched, right?

(No reply.)

Well, that's speculative. I retract that.

MR. ROSSI: Well, tell me, can he hook it on the one end and not relatch it on the other --

MR. GRADOMSKI: Yes.

MR. ROSSI: -- and leave it that way and walk away and --

MR. GRADOMSKI: Well, he has to have the valve in some condition of open to provide --

MR. ROSSI: To keep it hooked.

MR. GRADOMSKI: -- against the trip --

MR.ROSSI: I guess what he did was he hooked it and held it hooked while he opened it?

MR. GRADOMSKI: That's right.

MR. ROSSI: Otherwise, he couldn't have opened it?

MR. GRADOMSKI: That's right.

MR. ROSSI: Okay. So, he hooked it, held it that way, and opened it. But if he had opened the valve all the way up and got it all the way open, then he could have left and he would not have had overspeed trip protection.

MR. GRADOMSKI: This is true. And it still would have indicated that the overspeed trip mechanism was not reset in the control room.

MR. BEARD: Well, you know, this kind of a root cause has obvious bearings on training and on-the-job training and things of that nature, in terms of practical experience, not classroom stuff, doesn't it?

MR. GRADOMSKI: That's true. That's very true. Yes.

MR. BELL: What other signals will cause a closure of the trip throttle valve other than overspeed?

Are there any other signals? You stated that as the operator was closing the valve to slow the turbine down from thirty-six hundred RPM that the trip throttle closed.

What caused the valve to close?

MR. GRADOMSKI: As he applied the valve wrench on the hand wheel, he was trying to back it down from the full open position. So he was giving quick jerking movements on the valve. And this is such an unstable state, the trip hook and the latch-up lever without the overspeed

#13-13-SueWalsh

trip mechanism reconnected. At this point in time, the overspeed trip mechanism is applying a constant disengagement force to that trip hook.

So, any slight vibrations will tend to separate that trip hook and latch-up lever if they are unstable. And that is in fact what happened.

MR. BEARD: Rich, help me understand a control systems interface for a minute, if you will.

Assuming this guy has got the thing pulled over far enough to relatch right at the trip throttle valve and has reopened it but the other part is still tripped, so the computer thinks its at overspeed and still tripped, how will this condition affect the operator in the control room attempting to get manual control or go into auto-essential?

For example, if that end of the system thinks it tripped, would that cause you not to be able to go into auto? Or, would it cause it not to respond? Or, what would happen?

MR. GRADOMSKI: No, sir. It would have no effect. It's just an alarm that is not interlocked with any of the other equipment.

MR. BEARD: So, it's not a functional alarm other than just to notify people?

MR. GRADOMSKI: That's right.

MR. BEARD: So the controls would have been

#13-14-SueWalsh

uneffected by the position?

MR. GRADOMSKI: That's true.

MR. ROSSI: But it would have been more likely to trip just sort of inadvertently had it been left that way?

MR. GRADOMSKI: Oh, absolutely. It was in a very unstable position.

END #13
Simons flws

Sim 14-1

EVENING SESSION

(6:00 p.m.)

MR. ROSSI: Do you have anything more?

MR. BEARD: I guess the only question I have is you have involved the vendor on this problem, right?

MR. GRADOMSKI: That is true.

MR. BEARD: Has the vendor given you any indication as to whether this type of condition where you can have it last at one end of the rod but not clear the trip at the other end of that connecting rod as to whether that is typical of their machines or unique to this particular one? Apparently the same thing on Budd pumps, right, on both turbines, or something very similar?

MR. GRADOMSKI: No. I think we talked about No. 1, but we didn't get back to No. 2.

MR. BEARD: Okay. Well, let me stay on No. 1 for a minute. Did the vendor give you any indication as to whether this is something unique to this one machine or typical of his equipment or what can you tell us in that area?

MR. GRADOMSKI: The vendor did not make any statements regarding that, but this particular overspeed trip design, being their standard mechanical design, I am sure is elsewhere in the industry.

MR. BEARD: So there are other installations

Sim 14-2

that could be vulnerable to a similar situation?

MR. GRADOMSKI: As a matter of fact, there is an INPO notice that is out dealing with this particular piece of equipment, and a notification given to other utilities that they could in fact have a trip condition and not know it. Therefore, they put out a recommendation that says you should have some kind of alarm switches, et cetera, connected to the overspeed trip mechanism to ensure that notification is made.

MR. ROSSI: This would be similar to what you have now?

MR. GRADOMSKI: Yes.

MR. BEARD: Now can you give me roughly the time period when that notice was issued, like a week ago, two years ago or when?

MR. GRADOMSKI: August the 4th, 1982.

MR. BEARD: August 4, 1982. Is this an SEO?

MR. GRADOMSKI: This is an SOER.

MR. BEARD: SOER.

MR. GRIME: Why don't you give the number of that.

MR. GRADOMSKI: 82-8.

MR. BEARD: So you are saying that INPO put out a notice in the summer of '82 that cautioned people

Sim 14-3

about this potential?

MR. GRADOMSKI: Yes.

MR. BEARD: And that is what bit you during this event?

MR. GRADOMSKI: No, no. Our linkages were properly latched at the time of the event. It was their relatching evolution that the operators had difficulty with on No. 1.

MR. BEARD: Okay. I guess I am trying to understand what the thrust of this INPO notice was versus the ---

MR. ROSSI: I think the thrust of the INPO notice, and correct me if I am wrong, was that you could partially latch this and leave it that way and not know it.

MR. GRADOMSKI: That is true. It was notification that unless you had some kind of indication that this in fact could happen, you could have it unlatched, you could have it trip by vibration or whatever, and no one would know it.

MR. ROSSI: So you could have two problems. One of them would be that you could think you had it latched and walk away and leave it in what you thought was an operable condition, and in that condition it wouldn t have overspeed protection, for one thing, and aside from that from two minutes after you walked out of the room it could inadvertently trip and you wouldn't know that.

MR. GRADOMSKI: That is true.

Sim 14-4

MR. ROSSI: So those were the two problems in the INPO SOER.

MR. BEARD: Okay. To correct what I said earlier then, Rick, you are saying that what happened as far as you can determine during the event was something similar to the INPO notice, but not the same in that he relatched it without resetting the overspeed trip?

Or maybe I should just say it this way. Can you say a few words about the root cause you determined and how it relates to the INPO notice?

MR. GRADOMSKI: I regard the INPO notice as more -- not an operational, but a lack of indication that the operator has not correctly reset, or that some spurious activation has caused the trip condition with no notification in the control room.

How it relates to the events of June 9 was that clearly they were able to re-engage the trip hook and the latchup lever without resetting the overspeed trip mechanism to get the trip throttle valve open, but yet the alarm never cleared in the control room which should have alerted someone at that point in time that the overspeed mechanism was not in fact reset.

MR. BEARD: Okay. In other words, the operator really set up the kind of situation that was described in the INPO notice because it was not relatched properly or

Sim 14-5

fully?

MR. GRADOMSKI: Yes.

MR. BEARD: Is that sort of the tie between the two?

MR. GRADOMSKI: I would say so. When I received this INPO notification which talked about limit switches on the valve and on the mechanism to activate the control room alarm, we had found that we had in fact those switches in place.

MR. BEARD: Okay.

MR. HILDEBRANDT: Prior to the trip on June 9th, just for clarification, those alarms were not received in the control room, and presumably the result of the alarms not being received in the control room prior to the trip was the initial overspeed of the auxiliary feedwater pump turbine.

The latch was properly engaged both on the trip throttle valve and on the overspeed mechanism of the turbine. What we have been discussing is the subsequent difficulty in relatching.

MR. BEARD: That is a good point. In other words, the INPO notice talked about if you had relatched it improperly or not fully, you might have a condition where you did clear the trip and you would probably want to have an alarm on that condition.

Sim 14-6

Prior to this event that was not the case, but then when he went down to restore the system, he did apparently not relatch it fully and that is why the alarm didn't clear.

MR. GRADOMSKI: That is true.

MR. BEARD: So in that sense it is similar to the scenario discussed in the INPO notice.

MR. GRADOMSKI: Yes.

MR. ROSSI: This has an alarm in the control room. So that there wouldn't be a possibility of them thinking it was reset and it wasn't in operating the plant.

MR. GRADOMSKI: Yes.

MR. GRIMES: Rick, doesn't that also address the issue of what happens during a normal surveillance test, that the operators would, if they improperly adjusted that during a surveillance test would still have that alarm, and since that was certainy a non-emergency situation, would like pay attention to it and correct the situation as a part of the testing program.

I think you alluded to their normal practice. There is an alarm there to tell them that they did it wrong, and if there is nothing demanding their attention, it indeed gets the attention.

MR. BEARD: Does your enunciator system in your control room have reflash?

MR. BEARD: All right. On some plants the enunciator system will in a case like this, it will light itself up one time when the overspeed trip occurs and maybe flash or sound a horn or whatever, and the operator acknowledges that alarm, and then it goes on as let's say a steady light.

Now when the condition clears itself, for example, in this case the individual downstairs ultimately got the alarm overspeed trip cleared, in some plants that will cause that enunciator to reflash back on to tell the operator that that condition association with that window has changed at which time the operator typically will hit the acknowledge reset button and see if it clears. And if it does, then he knows the reflash was caused and the situation has gone away.

My question was, does your enunciator system have that design capability?

MR. GRADOMSKI: I am unsure. The one thing that I remember from our investigations on July the 5th was in order to get the enunciator clear the operator did in fact have to acknowledge the alarm and then when we reset the linkage, then the enunciator wouldn't clear.

MR. BEARD: So the operator would not know from the continuing presence of the overspeed trip enunciator window whether or not the alarm was still present because the

Sim14-8

thing was not tripped or because he just hadn't had a chance to reset the enunciator itself yet.

MR. GRADOMSKI: I believe that is true, but the alarm printer I think would have come back as saying reset.

MR. BEARD: Well, I realize that, but I am thinking of the operator control room in real time during this event, and he has got a "potential ambiguity" here.

MR. GRADOMSKI: Unless he had acknowledged that alarm, I do believe it would continue to say trip.

I guess getting back to point No. 2, that they did not experience the reset problems, if you will.

MR. ROSSI: Problem No. 2, as I understand it, is after they went into the room they immediately got it reset.

MR. GRADOMSKI: The indication is 50 seconds after they had gotten ---

MR. ROSSI: 50 seconds or 15?

MR. GRADOMSKI: Fifty.

MR. BEARD: Now we are going to shift. All the previous discussion has been on Pump No. 1, and now we are going to talk about Pump No. 2 a minute; is that what you are saying?

MR. GRADOMSKI: Yes, that is true.

MR. ROSSI: Tell me, was it just one operator

Sim 14-9

that had the problem with not knowing how to reset Pump No. 1, or was there another one involved?

MR. GRADOMSKI: There were two operators, one operator on No. 1 and one operator on No. 2.

MR. ROSSI: So the operator on No. 2 did it correctly and the operator on No. 1 did not?

MR. GRADOMSKI: That is true.

MR. ROSSI: And there weren't two operators that tried it on No. 1 and didn't do it properly, but just one?

MR. GRADOMSKI: Just one. Fifty seconds after the hatch to the pump rooms was opened, we received the No. 2 overspeed trip reset.

MR. ROSSI: The hatch opening is on the alarm printout?

MR. GRADOMSKI: It is on the security computer.

MR. BELL: What time was that hatch opened?

MR. GRADOMSKI: 1:45 the hatch was opened.

MR. BEARD: 1:45 even?

MR. GRADOMSKI: 1:45 even.

MR. BELL: And the No. 2 auxiliary feedwater pump indicated that it was relatched at 1:45: ---

MR. GRADOMSKI: 50.

MR. BELL: And the clocks in both of those computers are synchronized?

MR. GRADOMSKI: I don't know that for a fact.

Sim 14-10

MR. BELL: Because we were told that there was a six-second difference between the plant computer and the DADS computer.

MR. GRADOMSKI: Most of the printouts from the security computer are coming out as on the minute.

MR. ROSSI: You mean it is only accurate to the nearest minute?

MR. GRADOMSKI: I don't know.

MR. ROSSI: You don't have any that say seconds, minutes and seconds?

MR. GRADOMSKI: I don't have any that say minutes and seconds.

MR. ROSSI: So that would imply that maybe it only is accurate to the nearest minute.

MR. BEARD: That certainly would be the suggestion. Whether the man did it within 50 seconds or 1 minute and 50 seconds I don't think is all that terribly important in my own personal opinion.

MR. GRADOMSKI: No, it is not, but it indicates to me that the operator that was on No. 2 knew enough to reset that overspeed trip mechanism without a lot of problems and he immediately knew how to do that.

MR. BEARD: That is the significance I place on it also.

MR. BELL: Are the SOE's placed in the reading

Sim 14-11

file for the operators or somehow afforded to the training department so that information in these SOER's is included in the requalification programs.

MR. GRADOMSKI: I am not sure of the process that SOERs ---

MR. GRIME: SOERs are treated on an individual basis and they are reviewed by the STAs, and the STAs will designate -- usually there are several steps in an SOER. Steps one through three perpaps might be engineering related and would go to engineering. Four and five would be training related and go to training. And in some cases there are overlaps in those SOER evaluations.

In this particular one, I am not fully aware of what the program was, but that is currently the way SOERs are handled. I think we cannot expect an entire SOER to necessarily go to training, but if it involved training, it would go there in their opinion.

MR. BEARD: Is that the way the documents would have been handled three years ago in 1982, or was it different?

MR. GRIME: To the best of my knowledge, the SOERs were back-logged so that they should have been handled in that approximate fashion with the SOER.

end Sim

MR. BELL: Item No. 4 and Item No. 5 in your summary, both deal with operator training.

MR. BEARD: Larry, excuse me. When you say Items No. 4 and 5, are you talking about the paragraph that starts out: Operator difficulty -- and then --

MR. BELL: No, sir. I am talking about Items 4 and Item No. 5 under the summary.

MR. BEARD : Where it reads: Operator difficulty in resetting?

MR. BELL: Yes, sir. And the one immediately after that. Are these going to be factored into the OJT program for the equipment operator?

MR. GRADOMSKI: Certainly in my mind they would be.

MR. BEARD: That would be corrective action?

MR. GRADOMSKI: That would be a corrective action, that is true.

MR. BEARD: Did we interrupt your story on what you found out about Turbine No. 2's situation?

(Laughter.)

MR. GRADOMSKI: Okay. Other than the fact that the operator seemed to have been able to reset the over-speed trip mechanism, there was -- the overspeed trip mechanism on No. 2 wasn't the problem. It was getting the valve open that seemed to be the more significant problem

on No. 2.

There is a certain amount of free play in that trip throttle valve after the operator had taken out that free play out of the valve stem travel, it became extremely difficult for him to turn it.

He found that he couldn't get it open by himself.

MR. BEARD: Is this when the guy came running with the valve wrench?

MR. GARDOMSKI: This was some six minutes later is when they finally got that valve open. We see speed indication on No. -- well, 14550 is when the overspeed trip mechanism was reset on No. 2.

We didn't show any speed on No. 2 until approximately 15221, and that is DADS time plus six, to equal the computer, my count time.

MR. BEARD: So the -- okay.

MR. GRADOMSKI: So it would be about 15215 was when we first started to see speed on the No. 2 turbine.

MR. ROSSI: That was what, two minutes later, or --

MR. GRADOMSKI: No, six minutes later.

MR. ROSSI: Six minutes to get it open after he got it relatched.

MR. GRADOMSKI: As a matter of fact, the third operator had gone down into the pump rooms just previous to

that, and it was through his attempts to get the valve open that they were successful on that effort and got No. 2 rolling.

MR. BEARD: Was this Mr. Morrison?

MR. GRADOMSKI: Yes.

MR. BEARD: I bring it up not to be personal about this, but he is I guess a very senior and experienced individual at the plant, I assume.

MR. GRADOMSKI: Mr. Morrison has been with the plant through startup testing.

MR. BEARD: So he has been here a number of years?

MR. GRADOMSKI: Yes.

MR. BEARD: All right.

MR. BELL: Is No. 2 turbine in the same room as the startup feed pump?

MR. GRADOMSKI: Yes.

MR. ROSSI: No. 2 is the one they would get to first. That is the one they get to first when they go down.

MR. GRADOMSKI: That is right. No. 1 is behind that water tight door.

MR. ROSSI: You talked about the hatch. You are talking about the sliding grill work?

MR. GRADOMSKI: Yes, sir.

MR. BEARD: So I guess the bottom line of your problem, your diagnosis so far on No. 2 one was -- I see it as two parts; one, you concluded that the trip throttle valve was operated properly.

In other words, you didn't have the problem you had on No. 1.

And No. 2, that there was difficulty in opening the trip throttle valve until the guy got there with a valve wrench. That is the reason it took so long.

MR. GRADOMSKI: Yes, sir.

MR. BEARD: Is that normal that you would require this valve wrench to do this manipulation, or is that in itself, abnormal?

MR. GRADOMSKI: The operators have said that they did not have a good feel for the way the valve should respond on full steam generator Delta-P. Having not having had ample opportunity to open it in that condition. They were unfamiliar with the way the valve felt, in opening it I guess in full steam generator Delta-P.

Most of the time those tests are done in refueling, overspeed tests are done on aux boiler steam, which is 235 pounds, and the turbine is uncoupled. That is basically how we do the overspeed trip test.

So, there are significant differences in the way that they had to operate the valve on June 9th, and the

way they normally have a feel for the valve through surveillance testing and performance tests.

MR. BEARD: Excuse me. Could I make sure I understand what you said? Normally, when you run tests on aux steam.

MR. GRADOMSKI: For the overspeed.

MR. BEARD: The kind of things where they could have gotten experience.

MR. GRADOMSKI: Yes, sir.

MR. BEARD: It was on aux steam instead of main steam?

MR. GRADOMSKI: Yes, sir.

MR. BEARD: Of course, there is a substantial difference in pressure, and I believe you said that the turbine was disconnected?

MR. GRADOMSKI: Yes.

MR. BEARD: And --

MR. GRADOMSKI: To be able to get it up to 4500 rpm on auxiliary boiler steam.

MR. BEARD: Right. But, I guess basically the way these tests are conducted, or the -- not criticizing the test -- but the experience that the operator, the equipment operators might have derived performing those tests, is not similar to the actual situation you would have during a transient, where they trip, because of the difference at least

in the steam pressure?

MR. GRADOMSKI: Yes.

MR. BEARD: Okay. Does the fact that the turbines disconnected have any impact at all. It doesn't seem like to me it did.

MR. GRADOMSKI: I don't think so.

MR. BEARD: I guess what I am trying to get at is -- is one of the lessons to be learned from this that one needs to have a valve wrench to do this resetting in some sort of an emergency situation?

MR. GRADOMSKI: As I understand, the valve wrench was --

MR. BEARD: In the area. And I am just saying whether that for fortutious or intentional, I am just saying if this plant were to have another situation where the aux speed pump tripped on overspeed, would the guy need to have a valve wrench down there to do the job properly and in a timely fashion?

MR. GRADOMSKI: I don't know, and I guess I would like to defer answering that question until we have had the opportunity to try to open it under full steam generator Delta-P.

MR. BEARD: That is certainly an acceptable answer. I just wondered if you had a feeling.

MR. GRADOMSKI: No, we don't. And that is

one of the things that we would definitely look at.

MR. HILDEBRANDT: There is one adjustment that needs to be made. Adjust the ballast on the valve. And the setting of that is uncertain at this point as to whether that is correct or incorrect. It would potentially help to make it easier to open. The answer is not known at this time.

MR. BEARD: That is a good point you brought out about that setting on the ballast. Have we gotten to the end of your story on No. 2?

MR. GRADOMSKI: I think so.

MR. BEARD: On No. 2, are you at the point like you were on No. 1 we talked about, where you feel like you know the root cause. You are just in the process of finalizing the write up?

MR. GRADOMSKI: Yes.

MR. ROSSI: Well, you still have the step of opening the valve when you go back up into Mode 3.

MR. GRADOMSKI: That is right.

MR. ROSSI: Which is key to the point you brought up, which is whether the ballast is adjusted properly.

MR. GRADOMSKI: That is true, but from the portion of this action plan dealing with the overspeed trip mechanism, that is what the troubleshooting investigation

report is concentrating on now.

MR. ROSSI: And there will be another one on the other part.

MR. GRADOMSKI: There will either be another one, or the one that I am presently preparing will be revised for the inclusion of that.

MR. ROSSI: Okay.

MR. BEARD: Did this six minutes it took the guy to reopen it, is that because he couldn't get to the wrench, or didn't realize he needed it, or was afraid if he forced it too much he is going to damage it, or do we know?

MR. GRADOMSKI: My opinion at this time is that I don't think the operator that was down there initially realized what he needed to do.

That third operator arriving at the scene quickly diagnosed that the mechanism was reset. That the free play was out of the valve, and that it was just sitting there waiting to be taken -- the disc off of the seat in order to get steam into the turbine.

Which, in fact, happened shortly after he got down there.

MR. BEARD: So that in a sense this guy on No. 2 pump really lacked an optimal degree of experience on these things?

MR. GRADOMSKI: One could certainly draw that

conclusion.

MR. BEARD: I mean, that would not be contrary to your determinations at this point?

MR. GRADOMSKI: No.

MR. BEARD: So, to a certain extent operator training or on the job training, I guess, versus classroom training was involved in both?

MR. GRADOMSKI: I think that is a fair statement, yes.

MR. BEARD: I am trying to be careful not to put words in your mouth, but seeing if I can condense several minutes of discussion into one sentence.

MR. GRADOMSKI: I understand.

MR. ROSSI: Do you have anything more?

MR. BELL: Yes. I think you stated that had No. 1 feed pump trip throttle valve been opened as soon as the operator had reset the trip latch mechanism, that that turbine could have been brought up to speed, and flow established.

MR. GRADOMSKI: I think what we had discussed was that if he had gotten the valve open all the way at that point in time, that the flow could have been established.

MR. BELL: Doesn't that really depend on the position of 599 and 608?

MR. GRADOMSKI: Yes, that is true. It does.

That is true.

MR. BEARD: That is a good point. Get the thing up and running, and not have any place to put it.

MR. GRADOMSKI: 599 and 608 were not open.

MR. BEARD: I don't remember offhand the times on those resets. Yeah, I have it right here.

The times on the reset on the valves -- here we go. I am reading from the sequence of events that the team published identified as Revision 2, Preliminary, dated June 24th, and on page 3 it indicates that the valve 599 was opened at 014748, and that was of course the first one opened. That was No. 2.

No. 1 was opened something on the order of a minute and a half later. So, that if one asks the question: Was the valve open at that point in time? You go back and look at it, the 47 time was like one minute after No. 1 was -- trip aux valve was opened.

Let me say this differently. At the point in time 14748, according to the curve, you had just gotten up to the 2200 rpm speed on No. 1 within that last minute, so that those were pretty close together; it is not like one was offset by five minutes from the other.

They came together fairly close.

So, that had the guy done the job right, No. 1 would have been available at the time the valve was opened.

(EVENING SESSION)

MR. GRADOMSKI: It appears that way.

MR. BEARD: Is there anything else that you think you ought to tell us. Have we covered everything?

MR. GRADOMSKI: I think we have covered just about everything. Do you have any other questions?

MR. BEARD: Oh, I guess the last question is an administrative one.

I don't know who is the best person to answer this, but can you give us some feel for the time frame for when this report will be finalized and sent to the team?

MR. GRADOMSKI: Certainly I want to have a thorough technical review of this report done before it leaves Toledo Edison.

I would certainly think that by the middle of next week that that review will be completed.

MR. BEARD: So the middle of next week would be -- let's see -- it would be --a week from the 10th. It will be Wednesday, right. So you are talking about roughly the 17th.

MR. GRADOMSKI: Yes.

End 12
SueWal fols.

6:30P.M.
#16-1-SueWalsh

MR. GRIME: I think the other thing on this report that we ought to at least recognize, it's the first one of the findings reports that we will see and there may be some additional delays due to that process. And also if indeed in the review there is a major problem found with it, either additional work possibly, and there are all kinds of possibilities there of where we might really feel that we could best serve this overall purpose by significantly delaying it.

MR. BEARD: I guess I was really trying to understand whether or not that report would be received by us, or whether there is a fair chance of it being received by us before we release our report, which is scheduled to be released on the morning of the 22.

MR. GRIME: The morning of the 22nd is your last time?

MR. ROSSI: Our report is due the 22nd. You know, we could finish it perhaps next Friday. So, it sounds like there is some possibility we will have their report.

MR. BEARD: Yeah. There is always the chance that something will come up, especially the first time through the barrel.

But I guess I'm getting the flavor that it's also a fair chance it could be finished and we could receive it like the middle of the week.

MR. GRIME: Uh-huh.

MR. BEARD: Which would be maybe before we finish the report so that we might be able to read over and at least be able to say that we had received the report, rather than just the oral discussion we have had at this meeting.

MR. GRIME: I haven't seen the detailed report, but I would guess it is quite a bit of detail in there so that I think it would be quite advantageous to you to have that. So, maybe we are saying we will try to do our best to get that to you.

And we can follow it up with a revision to the report.

MR. BEARD: I certainly am not trying to push you. I am just trying to get some feel for when it's likely to come off the presses.

MR. GRIME: I would agree with Rick's Wednesday's projection if there is not a snag of some kind.

MR. BELL: Since Rick was referring to his draft of this report throughout our discussion, is it fair to summarize that we have most of the information of the report on our transcript?

MR. GRADOMSKI: Yeah. I would say that you have the important points. We did touch upon the important points here. But I think the report does lay it out in a

much easier fashion.

MR. BEARD: I'm sure you have written a report that lays it out in a very systematic and orderly way instead of the way we were bombarding you with questions.

MR. GRADOMSKI: I do my best.

MR. BEARD: Okay. Now, since this is your first report, you know, I would just say that our expectation of these reports will be that they will not only report the root cause and termination results but they will, in essence, present an engineering justification or defense that this is really the root cause.

MR. GRIME: Again, I haven't seen Rick's. We have set up a report scenario that in many cases would have us get only reports that give findings without the report addressing the corrective actions. It would relate back to how the hypotheses that were originally made were either proved or disproved.

It's purely findings. And you may find there will be reports of that nature which will be followed by a separate report that would address the corrective actions and possible generic implications.

MR. ROSSI: I think his point is that when we get the root causes that there will be a technical justification that that is the root cause, and then the corrective action -- that's fine -- can come later. You know, when we get the

root cause we want to --

MR. GRIME: We would expect to have information there that substantiates that indeed they have found the root cause. It would not necessarily be substantiating corrective action or those types.

MR. BEARD: Right. I guess what I'm really trying to get to is in the sense of an engineer presenting the argument that he found the root cause, the obvious question is the question of completeness. And I don't know that it applies in this action plan.

But I think in some of the equipment, it may be that there are several contributory causes and that there are a couple of them that have not even been identified yet.

MR. GRIME: Uh-huh.

MR. BEARD: So I'm really saying that that defense of the conclusion that this is the root cause is really a -- the word slips out of my mind, but an argument that this is in fact the root cause to support that.

MR. ROSSI: Well, it's all the root causes if there is more than one problem.

MR. BEARD: Sure. It may be, you know, like the main feed pump situation is a better example of that type of thing.

But I was really trying to -- because this is the first one -- throw that out as a general comment to let you

#16-5-SueWalsh

know what our expectations are. And then you -- just to make sure there is no misunderstanding. That's all.

I think we have said this several times in other meetings. But now you are at the point of doing the first one.

MR. GRIME: Doing the first one.

MR. GRADMOSKI: I think there are some action plans or some reports that are going to rely and reference analytical work and calculations that were done in defense of what they actually found.

I believe that you are going to get that, J.T.

MR. BEARD: I think that we have thoroughly covered this matter. And I would like to just suggest, sir, that we adjourn immediately if not sooner.

MR. ROSSI: Larry, do you have anything more?

MR. BELL: No, sir.

MR. ROSSI: Okay. Then, we will reconvene in the morning I guess at around 9.

MR. BEARD: I would like to say while we are still on the record, just thank you for the presentation. I think it was a very helpful presentation.

MR. GRADMOSKI: Thank you.

MR. ROSSI: Thank you, gentlemen. We will see you in the morning, then.

(Whereupon, the meeting is concluded at 6:35 p.m., to reconvene at 9 a.m., Friday, July 12, 1985.)

ENDDDDD

Preliminary Status Report on Action Plan 1A, 1B
July 10, 1985

Action Plan Description: To identify the root cause for the Auxiliary Feed Pumps overspeed trips.

MWO's Written: 1-85-2131-00
1-85-2132-00

Activities: Step 1.0 thru 1.7 of the Action Plan have been completed. Both AFPT governors were inspected by the Woodward Representative on 7/3/85. No problems were found. The governors were then reassembled.

The remote trip device (Step 1.8) is being procured. The mounting and linkages must be designed and fabricated.

The test procedure (Step 2.1) rough draft is completed.

The data needed to compare the PGG governor vs. the PG-PL governor (Step 3.0 Action Plan 1B only) is being obtained.

Analyses investigating steam condensation in cold steam supply to the AFPT and possible effects on turbine response are in progress.

Summary: The remaining steps of both Action Plans require the plant to be in mode 3. The actual testing will be at that time.

DW:dld

CERTIFICATE OF PROCEEDINGS

This is to certify that the attached proceedings before the NRC XXXXXXXXXX FACT FINDING TEAM.

In the matter of: DAVIS-BESSE INCIDENT.

Date of Proceeding: July 11, 1985

Place of Proceeding: Oak Harbor, Ohio.

were held as herein appears, and that this is the original transcript for the file of the Commission.

MYRTLE H. WALSH
Official Reporter - Typed

Myrtle H. Walsh
Official Reporter - Sigt.

GARRETT J. WALSH, JR.
Official Reporter - Typed

Garrett J. Walsh, Jr.
Official Reporter - Signature

MARY SIMONS
Official Reporter - Typed

Mary C. Simons
Official Reporter - Signature

Preliminary Status Report on Action Plan 1D
July 10, 1985

Action Plan Description: Determine the root cause of the problem in relatching the Overspeed Trip Mechanism (OTM) and of opening the Trip and Throttle (T&T) valves of AFPT 1-1 and 1-2 on June 9, 1985.

MWO's Written:
1-85-2063-01 (AFPT 1-1)
1-85-2065-01 (AFPT 1-2)

Activities: Completed steps 1, 2, and 3 of the Action Plan.

Step 4 of the Action Plan to be conducted in plant Mode 3 in conjunction with Action Plans 1A and 1B.

Summary: There were no mechanical deficiencies noted that would prevent the OTM from resetting.

The OTM was properly adjusted.

All mechanism pivot points and components were sufficiently free.

Operator difficulty in resetting the OTM was noted during the investigations. This difficulty is attributed to incomplete understanding of the operation of the OTM.

Existing instructions do not accurately reflect the proper operation of the OTM.

When properly operated, the OTM demonstrated stable, positive resetting.

A complete report of the troubleshooting and investigations conducted to identify the root cause of the problem in relatching the OTM is being prepared.

RJG:lrh

Preliminary Status Report on Action Plan 8
July 10, 1985

Action Plan Description: To identify the root cause for the Main Feed Pump Turbine (MFPT) 1-1, June 9, 1985 trip.

MWO's Written: MWO 1-85-1997-01 was generated to perform Action Plan steps 1, 2, and 3a.

Activities: Troubleshooting started on 6-20-85.

During troubleshooting an electrical check of circuit board 4 was performed. The frequency to voltage (F/V) converter on this board, which provides a voltage corresponding to actual turbine speed, was found to be faulty.

Application of a representative varying input signal to the F/V converter yielded a constant zero voltage output.

Summary: The failure resulted in a zero indicated turbine speed, which in turn resulted in an "increase speed demand" error signal.

This speed error signal will cause the control valves to open further. With control valves farther open then actually required, the MFPT's speed will continue to increase until the emergency governor trips the turbine.

During the week of July 8, 1985, the circuit board will be tested at General Electric Factory, Fitchburg, MA to confirm that the direct cause is an electronic failure of the F/V converter. A troubleshooting and investigation findings report will be submitted after the board has been tested.

DEM:dld

Preliminary Status Report on Action Plan 9a & 9b
July 10, 1985

Action Plan Description: To determine the cause of the Turbine Bypass Valve 2.2 (SP13A2) failure.

MWO's Written:
1-85-1942-02
1-85-1942-03
1-85-1942-04
1-85-1942-05
1-85-1942-06
1-85-1942-07
1-85-1942-08

Activities:

1. Disassembled and inspected steam traps ST3 and ST3A and solenoid actuated drain valve MS2575. These steam traps and drain valve are located on the same main steam header as turbine bypass valve SP13A2. The following conditions were noted:

   a. ST3 strainer was clogged and considered inoperable.

   b. ST3A strainer was deformed and the steam trap had failed open.

   c. MS2575 was found to be in an operable condition with no sign of obstruction.

   Preliminary, it appears that while ST3 may not have been operable, drainage of the header could have occurred through ST3A and MS2575, if actuated.

2. Disassembled SP13A2 actuator.

   a. Available actuator piston travel was determined to be 1 9/32 inch. (This compares to a design travel of 1 9/16 inch.)

   b. Discoloration of the yoke was noted at the break location.

   c. Positioner showed no damage other than broken linkage.

3. Disassembled SP13A2 valve.

   a. Stem was scored at several locations, apparently due to clamping in vise.

b. Main plug was found in bottom of valve body and separated from stem.

c. Belleville springs and spacers found jammed together on pilot plug.

d. Main plug nut, cotter-pin, washer, and spacer found to be missing.

e. 3" of water found in bottom of valve.

4. Broken or scored parts from both valve and actuator sent to Fisher for further analysis.

Summary:

The observed condition of the turbine bypass valve is consistent with the primary hypotheses discussed in the Action Plan report.

Destructive analyses and evaluation of possible cause are being performed by Fisher.

Investigation of differences in temperature between No. 1 and No. 2 main steam header downstream of MSIVs prior to repressurization is being performed to evaluate importance relative to turbine bypass valve damage.

MBR:lrh

Preliminary Status Report on Action Plan 10
July 10, 1985

Action Plan Description: To review the operation of the PORV.

MWO's Written:

Activities: The PORV was removed from the system and disassembled on 7/6/85.

- Valve inspection was completed. No corrosion products or debris was found that could have caused the valve to stick open.

- Measurements were taken on the valve. All clearances appeared proper. We are still evaluating the dimensions to determine if they are acceptable.

Summary: We have compared the pressure signal to the PORV control circuit to the other pressure signals and verified it tracked those signals during the transient. Even though the signal tracked during the event, we plan to verify proper calibration. We also plan to verify the control circuits are functioning properly.

We are currently planning to reinstall the valve and perform a functional test. We are still in the process of developing the detailed tests to be run in Mode 3.

TRI:lrh

Preliminary Status Report on Action Plan 12
July 10, 1985

Action Plan Description: To identify the root cause for the failure of AFW valves AF599 and AF608 to open.

MWO's Written:

1-85-1941-01	Inspect and test AF599
1-85-1941-02	Test AF599 at 1050 psid
1-85-1945-01	Inspect and test AF608
1-85-1945-02	Test AF608 at 1050 psid

Activities:

- 6/18/85 - AF608 was inspected and tested using MOVATS at 0 psig
- 6/19/85 - AF599 was inspected and tested using MOVATS at 0 psig
- 7/5/85 - AF608 was tested using MOVATS at 1050 psig
- 7/6/85 - AF599 was tested using MOVATS at 1050 psid
- 7/8/85 - The spring packs for both valves were inspected

NOTE: MOVATS provides detailed information about valve operator performance.

Summary:

The motor operator torque limit switch bypass contacts on both valves were determined to be opening prior to the valves unseating. This bypass switch is used to permit higher torques during initial valve opening. The premature opening of the bypass contacts is considered to be the direct cause of the valves failing to open.

Based on the test results, it also appears that the recommended torque switch settings and the procedure for setting the bypass contacts may be erroneous.

The spring pack locknut for AF599 was installed backwards with no setscrew installed. The AF608 spring pack was lightly preloaded. These two findings had no effect on the June 9th anomalies.

JWL:lrh

Preliminary Status Report on Action Plans 15A-1 & 15A-2
July 10, 1985

Action Plan Description: To identify the root cause for the intermittent elevated count rate of (15A-1) and the intermittent spiking (15A-2) of NI-1, Source Range Nuclear Instrumentation.

MWO's Written:

1-85-2092-00	Pulse/Noise data for NI-1
1-85-2092-01	Cable checks for NI-1
1-85-2192-00	Pulse/Noise data for NI-2
1-85-2192-01	Cable checks for NI-2

Activities: Commenced troubleshooting NI-1. Obtained baseline traces of pulses and noise using both plant equipment and a vendor supplied, faster response digital oscilloscope (per Action Plan Item 1A) without presence of elevated count rate.

Met with Ohio State University personnel cognizant of pulse instrumentation to discuss possible causes for NI noise spiking and inoperability.

Summary: No MWO's have yet been written to investigate the spiking problem as outlined in Action Plan 15A-2. No root causes have yet to be identified for the elevated count rate, Action Plan 15A-1. The data obtained for these MWO's will be presented to OSU personnel for evaluation and analysis. The results obtained will determine/plan next step in identifying root cause.

MLB:lrh

Preliminary Status Report on Action Plan 15B
July 10, 1985

Action Plan Description: To identify the root cause for the failure of NI-2 Count Rate level indication during and subsequent to the June 9, 1985 trip.

MWO's Written: 1-85-2030-00

Activities: Completed source range functional test, ST 5091.01, to demonstrate operability of NI-2 on 6/9/85.

- Commenced troubleshooting NI-2 on 7/5/85.
- Attempted to reproduce failure on NI-2, Count Rate level indication by switching Detector High Voltage "ON" and "OFF". Attempt was unsuccessful.
- Attempted to reproduce failure of NI-2 Count Rate level indication by tapping on associated modules and connectors. Attempt was unsuccessful.
- Attempted to reproduce failure of NI-2 Count Rate level indication by opening and closing RPS cabinet doors. Attempt was unsuccessful.

Summary: Plan to continue attempts at reproducing the failure of NI-2 Count Rate level indication. We will be unable to determine root cause of failure without first reproducing the failure condition. Future plans include installing a strip chart recorder to monitor the output of the Count Rate Amplifier module and attempting to reproduce the failure of NI-2 by tripping and resetting the high voltage cutoff bistables.

JD:dd

Preliminary Status Report on Action Plan 16
July 10, 1985

Action Plan Description: Determine root cause of erratic pressure control experienced in both main steam headers following closure of main steam isolation valves.

MWO's Written: 1-85-2190-00
1-85-2152-00

Activities: Performed visual inspection of non-nuclear instrumentation and Integrated Control System (ICS) cabinets containing control circuitry for the atmospheric vent valves. No abnormalities noted.

Performed string check of ICS modules (Item 4.a) controlling atmospheric vent valves (AVVs). Two modules associated with AVV #2 were found to be out of calibration. As a result of the out-of-calibration condition, the AVV open setpoint would be at about 1030 psig rather than 1015 psig as desired. This condition would not explain the erratic pressure control observed during the June 9, 1985 event.

Performed operational check of hand/auto station in Control Room (Item 4.b). Satisfactory operation observed.

Held meeting with MSSV vendor (Dresser) and MPR Associates to review MSSV operating and maintenance history. Determined that inlet bore size to MSSVs is smaller than Dresser states is basis for valve rating. Initial judgement is that this should not affect proper operation of MSSV.

Summary: The findings to date do not explain the observed conditions. The action plan for investigating and troubleshooting is continuing.

LH:dd

Preliminary Status Report on Action Plan 18
July 10, 1985

Action Plan Description: To determine if there were problems with the operation of the Main Feedwater #2 Startup-Control Valve (SP-7a) or its controls.

MWO's Written: 1-85-2112-00 in Closeout
1-85-2113-00 in Scheduling

Activities: Work Completed:

F-868, Main Feedwater loop 2 startup uncompensated flow instrument string was checked for proper calibration and found to be within specified tolerance for low flow (below 25 inches of water pressure differential over the flow element).

FTSP3A, the associated flow transmitter, was pressurized to 1000 psig to check for a shift in the output voltage at operating pressure. A maximum shift of 50 mv was noted, but in the negative (toward 0 flow) direction. This shows that the indicated flow was lower than the actual flow. Indications are that this was not a contributing factor to the anomaly.

Summary: Calibration checks show the indicated flow through SP-7A to be accurate for the flow range indicated after the SFRCS trip during the transient.

Preliminary study of computer point output, shows that there was flow through SP-7A as the valve opened upon demand.

Projected Work:

Operate SP-7A and verify proper response to control signals, and trip reset.

Check calibration of SP-7A to determine if the valve position is what the demand signal is calling for.

TG:dld

Preliminary Status Report on Action Plan 26
July 10, 1985

Action Plan Description: To determine the root cause for the inadvertent Auxiliary Feedwater #1 suction supply transfer.

MWO's Written:

1-85-2130-00 in Closeout
1-85-2133-00 in Closeout
1-85-2144-00 in Scheduling Process
1-85-2146-00 in Scheduling Process

Activities:

Visual inspections and photographs taken of the following:

PSL4928A, PSL4928B, PSL503 (Auxiliary Feedwater 1-1 suction pressure switches)

PS4929A, PSL4929B, PSL507 (Auxiliary Feedwater 1-2 suction pressure switches)

Calibration check and time response on the following Auxiliary Feedwater suction pressure switches:

Pressure switches in Auxiliary Feedwater 1-1 suction supply were found in tolerance.

Pressure switch PSL507 in Auxiliary Feedwater 1-2 suction supply was found out of tolerance. This finding does not identify a direct cause because this pressure switch is in Auxiliary Feedwater 1-2 suction header. Pressure switches PSL 4928A and PSL 4928B were found in tolerance.

The time response (actuation and reset) of the 11 psi alarm pressure switches PSL503 and PSL507 is quicker than the computer scan rate. This could explain the lack of a computer alarm prior to the auxiliary feedwater #1 suction supply transfer.

Summary:

None of the above findings establish the direct cause of the Auxiliary Feedwater suction supply transfer. Work is continuing to complete the action plan.

Auxiliary Feedwater strainers 5201, 5206, and 5257 will be removed and inspected.

ST 5071.13 (Auxiliary Feedwater System channel functional test) will be performed for Auxiliary Feed Pumps 1-1 and 1-2.

A corrective action plan and MWO will be written to recalibrate PSL507.

Auxiliary Feedwater 1-1 and 1-2 suction pressure switches will be monitored during Auxiliary Feed Pump testing by connecting chart recorders across the pressure switch contacts.

TC:dld

Preliminary Status Report on Action Plan 27
July 10, 1985

Action Plan Description: To determine the root cause for the apparent interruption of the open control circuit to Auxiliary Feed Pump Turbine 1-1 Main Steam Inlet Valve Isolation Valve MS-106.

MWO's Written: 1-85-2105-00 Action Plan 27 - MS-106

Activities:

- Commenced testing and inspection of MS-106 valve, starter D135, and PSL-4930A
- Performed wiring checks of MS-106, starter D135 and PSL-4930A
- Performed as-found calibration check and functional check of PSL-4930A
- Stroked MS-106 with MOVATS monitoring operation of MS-106. MOVATS provides detailed information about valve operator performance.
- Steps 1 through 17 summarized above, of Action Plan 27, Rev. 1 are completed. Step 18 is yet to be completed. Step 18 requires valve testing under system operating parameters.

Preliminary Findings:

1. A loose connection was found between the wire terminal and the stud on the limit switch contact which is used for MS-106 alarm position indication.

2. Wiring discrepancies between as-found wiring of MS-106 and wiring diagram.

3. Wiring discrepancies between as-found wiring of the starter D135 and wiring diagram.

4. Unnecessary gap between the spring pack locknut and outer thrust washer.

5. Packing gland flange cocked to one side.

Summary:

Of the findings, items 1, 2, and 3 do not appear to have had an influence on the operation of MS-106 during the June 9, 1985 transient.

Item #4 may have had an influence on the operation but to what extent is not yet known.

A preliminary assessment indicates that MS-106 probably stopped opening in midstroke due to open torque switch activation. MS-106 would then have driven closed. This would account for the apparent shorter operating stroke time noted on

the alarm printout. This preliminary assessment is based on finding 5 (possible binding) and the MOVATS test data report. The data collected so far is insufficient and any assessment should be considered inconclusive. Further analytical assessment and testing to gather data will be performed prior to making any final conclusions of root cause.

NLB:lrh