

Tuesday Evening Session

June 11, 1985

5:55 o'clock p.m.

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(Present: Messrs. Burns, Rossi, Bell,
Beard, Lanning, Shafer, Jackiw, Kosloff and
Rowles.)

MR. ROSSI: What we are going to do now
is talk to the people from Region III including the
resident that came to the site soon after the event
started and discuss their analysis of what happened
in sequence of events.

Is that a fair assessment of what we are
going to do? And I guess for starters we have a
listing here of the Sequence Of Events that you
prepared, and you can tell us how you did it. You
might also tell us when you got here after the
event started.

MR. KOSLOFF: Right. Okay, I'm Don
Kosloff, I'm the resident inspector, Davis-Besse.

I was informed of the event at
approximately 2:20 in the morning via phone call
from plant manager, and after I received that call,
I called the senior resident to see if he had been

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1 informed of it and he had already been informed and
2 was aware of the situation, so I then went on out
3 to the plant.

4 I got here about 3:20 and I noticed that
5 the steam was coming out of the right places, Aux
6 Feed water pump steam discharge was exhausting and
7 the atmospheric vent valves were steaming. And I
8 went to the control room to see what the situation
9 was there.

10 One thing that I learned in discussion
11 with the operators that isn't -- that I didn't put
12 on my Sequence Of Events was that they had no
13 source range indication, and we discussed their
14 response to that, and it was satisfactory regarding
15 the Boron concentrations that were in the reactor
16 coolant.

17 MR. ROSSI: Still at that time they
18 didn't have it back.

19 MR. KOSLOFF: No. They had put a
20 considerable amount of Boron into the reactor
21 coolant because of that.

22 MR. BELL: Do you have any idea as to why
23 the other source range didn't energize when the
24 intermediate range dropped down to five times ten

1 minus ten?

2 MR. KOSLOFF: No. The high voltage
3 lights were on.

4 MR. BEARD: Appearing dead for no obvious
5 reasons.

6 MR. KOSLOFF: Yes

7 MR. BEARD: And the one that was previously
8 declared inoperable was still not behaving?

9 MR. KOSLOFF: Well, they were unsure of
10 the validity of its indication because they knew it
11 was inoperable.

12 The problem they had with it in the past
13 was that it -- they had two problems. Number one,
14 it gave a readout with the high voltage turned off;
15 and the other problem was when you -- there is one
16 switch on the control panel, I forget which one it
17 is, that when you turn that switch, the source
18 range would jump a couple of hundred counts. So
19 they did not have a lot of confidence in it.

20 Sometimes the operators will declare a
21 piece of equipment inoperable when you could make a
22 good argument for saying that it wasn't inoperable,
23 but they do that in order to get some pressure on
24 it and repair of it on the maintenance side of the

1 organization.

2 MR. BEARD: When you got to the plant,
3 was there a positive indication for each of the
4 control rods that they were fully inserted?

5 MR. KOSLOFF: Yes, I checked the control
6 rods. What do you mean? The rod bottom lights
7 were on and the individual indications were all
8 down.

9 MR. BEARD: So there was indication that
10 all the rods were down?

11 MR. KOSLOFF: Right.

12 MR. LANNING: Let me understand how you
13 performed your review of the event when you arrived
14 on-site. Is this a formal procedure you go through
15 or do you go to the control room and just discuss
16 with the operators the events that's transpired and
17 the status of the plant? Is the senior resident
18 on-site at the time you do this?

19 MR. KOSLOFF: Well, in this particular
20 case, I got here first, which is not always the
21 case. Sometimes -- the procedure is for the
22 Licensee to call the senior resident when something
23 of significance occurs, and he usually is the one
24 who makes the decision as to whether his or my

1 presence or both of us is required at the plant.

2 In this particular case, since he was on
3 training, the Licensee had been informed they
4 should call me instead of him. However, the shift
5 supervisor who was on shift had -- when it happened,
6 he looked up on the board and there was a little
7 piece of paper there with the senior resident's
8 phone number on it and he just called the first
9 number that he saw, and then he also at that same
10 time, he was calling his management people.

11 They have a more formalized procedure and
12 they were aware that -- they didn't know that the
13 senior resident was at home for the weekend. They
14 thought he was in Chattanooga, so they called me
15 and there was a lot of calling around at that time.

16 MR. LANNING: But they also called him I
17 understood you to say --

18 MR. KOSLOFF: The shift supervisor had
19 called the resident also.

20 MR. LANNING: Okay, fine.

21 MR. KOSLOFF: As I say, I got the call
22 from the plant manager. I didn't take a lot of
23 notes at that time because from what I heard, I
24 knew I was going to be out at the plant very shortly

1 anyway. And due to the severity of the incident, I
2 wanted to make personally sure that the senior
3 resident was aware of the situation, because there
4 was no doubt in my mind he would -- if he hadn't
5 heard of it yet, he would be on his way out.

6 We don't have a formal method. I don't
7 have a formal method of reviewing it. I basically
8 look at all the indications that are available and
9 talk to as many people as I can without interfering
10 with transient response. And you know, I get
11 people as they are available to talk. Whenever I
12 catch somebody standing around looking like he's
13 not immediately occupied with something, I discuss
14 whatever he might know.

15 MR. LANNING: Where do you go to get
16 information to compile the Sequence Of Events?

17 MR. KOSLOFF: Okay. The Sequence Of
18 Events, initially when I was doing the rough
19 development of this, it was -- I had some data
20 points that were based on the SOE printout and
21 conversations. But as I went line by line through
22 the SOE printout, I found I could get a more exact
23 time for some of those events from alarm printouts.

24 MR. ROSSI: So what we have here on this

1 piece of paper people is from the alarm --

2 MR. KOSLOFF: This is a combination of
3 the alarm printer, the Sequence Of Events recorder,
4 which is printed out on the same sheets as the
5 alarm printer, and an interpretation of data that
6 is on there -- their data acquisition -- I don't
7 remember --

8 MR. SHAFER: Beta base.

9 MR. KOSLOFF: DADS.

10 MR. ROSSI: The Technical Superintendent
11 Support Center.

12 MR. KOSLOFF: Right. And I also discussed
13 some of these items with the senior resident from
14 his notes and his recollections to come up with the
15 decision of which of these items to include here.

16 MR. BEARD: You have given us this piece
17 of paper here today, could you tell us roughly at
18 what point in time this was compiled, like was this --
19 let's see, the event happened on Sunday morning
20 early.

21 MR. KOSLOFF: Right.

22 MR. BEARD: This is now Tuesday. Roughly
23 when was this available? I don't mean the typing
24 of it.

1 MR. KOSLOFF: I did this on a computer.
2 I used a computer like a note pad, and then I just
3 printed it out. I finished this about 11:00 last
4 night I guess.

5 MR. BEARD: 11:00 Monday night?

6 MR. KOSLOFF: Monday night, right.

7 MR. SHAPER: I would like to add, this
8 started about the same time that we were notified
9 of the formation of the team. We were gathering
10 all the information, Don was working on it by
11 himself, and at that time is when Jack and I also
12 went out to the trailer and started working with
13 Don.

14 MR. BELL: May I ask you a couple of
15 questions? First of all, when you first got here,
16 the plant was stable.

17 MR. KOSLOFF: Yes.

18 MR. BELL: In Mode 3?

19 MR. KOSLOFF: Right.

20 MR. BELL: And no vacuum in the condenser?

21 MR. KOSLOFF: I believe there was vacuum
22 in the condenser at that time.

23 MR. BELL: But not sufficient to cool
24 down to the condenser. They were still electing to

1 cool down.

2 MR. KOSLOFF: Well, they were not -- they
3 were going through their procedures, making sure
4 that they had everything, all their lists signed
5 off and that they hadn't missed something, and they
6 didn't feel concerned that they needed to go to the
7 condensers right away. That was a long-term goal,
8 but they wanted to clear up a lot of the other
9 problems that they had and make sure that they had
10 good records of everything that they had done and
11 that everything was the way that they thought it
12 was.

13 M. BELL: My other question is how long
14 had the inoperable source range channel been
15 declared inoperable?

16 MR. BEARD: You are thinking in hours or
17 days prior to the event?

18 MR. BELL: Yeah.

19 MR. KOSLOFF: In terms of weeks I think
20 is a more appropriate --

21 MR. BELL: Okay.

22 MR. KOSLOFF: -- characterization. I
23 don't remember the exact date.

24 MR. BELL: Say it was inoperable say

1 during the trip on June the 2nd, also?

2 MR. KOSLOFF: Now that you mention that,
3 that may not have -- that particular instrument has
4 been failing and behaving erratically for an extended
5 period of time and I may be -- it's been inoperable,
6 operable, inoperable, and so it may have been
7 inoperable then or it may have been operable. I
8 don't remember, to tell you the truth.

9 MR. BELL: Okay.

10 MR. BEARD: It's been on on again/
11 off again status for a period of weeks?

12 MR. KOSLOFF: Right.

13 MR. JACKIW: John, do you know, is it
14 just the one channel to be operable to restart, do
15 you recall?

16 MR. KOSLOFF: The tech spec requirement
17 is pretty loose on that piece of equipment. There
18 is not much --

19 MR. BELL: It's speculation on my part,
20 it may only be in Mode 6 for spec handling.

21 MR. KOSLOFF: There is some other
22 considerations, but I think there is no time when
23 they need more than one. So they could essentially
24 have that thing out of service forever and be

1 within their license conditions.

2 MR. JACKIW: I think we looked at that.
3 We knew about the problems they had with that
4 channel and we looked at it, and we agreed that the
5 tech spec --

6 MR. KOSLOFF: We couldn't force them to
7 fix it through the tech spec. All we could do is
8 use it as an example of poor maintenance practices
9 and say, Hey, you know, you guys ought to fix that.

10 MR. BEARD: Don't they have a standard
11 304 clause that would require it to be out for a
12 period of time but operable prior to the next restart?

13 MR. KOSLOFF: Not in this textbook.

14 MR. BEARD: Does Davis-Besse have custom
15 tech specs?

16 MR. KOSLOFF: They may be standard tech
17 specs, but they don't look like standard tech specs,
18 because I looked at standard tech specs. If the
19 Davis-Besse tech specs are defined as standard tech
20 specs, then someone has badly twisted the meaning
21 of standard.

22 MR. LANNING: Don, you got in the control
23 room about two hours after the event. Is that
24 correct?

1 MR. KOSLOFF: Right.

2 MR. LANNING: How many people were in the
3 control room after you got there, about?

4 MR. KOSLOFF: About seven or eight.

5 MR. LANNING: Seven or eight. How would
6 you characterize the atmosphere, the feeling about
7 the event?

8 MR. KOSLOFF: There was a great deal of
9 concern. People were -- how would you characterize
10 it? I think the initial shock of the event had
11 worn off to a certain degree.

12 I don't know if you have seen people
13 after something very tense has happened, people
14 react in different ways afterwards. You can see --
15 like some people would be very calm and collected
16 during an event, and then after it is over, their
17 hands are shaking and they are puffing on their
18 cigarettes.

19 And knowing the people involved, having
20 seen them in their normal way of functioning and at
21 other times, minor stress, I could tell that in
22 their own individual ways they were reacting to
23 that.

24 Things were being done in a very calm and

1 well directed, organized manner. There were people
2 who were not in the direct chain of command who
3 were offering assistance as needed, but yet they
4 were not interjecting themselves in a way that
5 would dilute the authority of the shift supervisor.

6 MR. LANNING: Who was in charge?

7 MR. KOSLOFF: The shift supervisor was in
8 charge.

9 MR. BEARD: Did they invoke the function
10 of shift technical advisor for this event?

11 MR. KOSLOFF: The shift technical advisor
12 was in the control room.

13 MR. BEARD: Was he functioning in that
14 role or did he --

15 MR. KOSLOFF: He was functioning in that
16 role as I understand it. I have to admit, my
17 understanding of that is not as good as I would
18 like it to be. But he was providing a -- he was
19 providing technical assistance to the operators and
20 evaluating conditions in conjunction with them and
21 also, you know, I could tell that he was looking at
22 things himself to get sort of an independent
23 analysis of things.

24 MR. BEARD: Did they activate any of the

1 parts of the emergency procedure such as the
2 Technical Support Center?

3 MR. KOSLOFF: The Technical Support
4 Center was not activated to my knowledge. But
5 there were people out there. I don't know -- there
6 was not a formal activation I do not believe, but I
7 didn't verify that myself. I knew at the time that
8 there were people from the technical section in the
9 Technical Support Center gathering information.

10 MR. LANNING: What kind of event did they
11 declare, if any at all?

12 MR. KOSLOFF: When the plant manager
13 called me at 2:20, he was trying to verify in his
14 own mind whether or not it was an unusual event.
15 His -- he was looking at the procedure. I could
16 tell from the way he spoke that he was reading
17 things out of the procedure and trying to see if it
18 fit into any of the items in the procedure.

19 When I arrived at the site, I noticed
20 that they had a procedure out of their manual,
21 their emergency procedures manual that had been
22 filled out. But at that time, they were not in --
23 they were in an unusual event, but I'm not sure at
24 this point why it was considered to be an unusual

1 event at that point. I haven't reviewed that
2 information.

3 MR. BEARD: By being considered an
4 unusual event, are you referring to the fact -- are
5 you referring to the situation that regardless of
6 the safety significance of the event, it may not
7 have fit the outline prescribed in the procedure on
8 when to declare it as such? Is that what you are
9 trying to say?

10 MR. KOSLOFF: Well, I think at the point
11 in time that I became aware of it, it was no longer --
12 the safety significance had decreased so that it
13 was not in the category

14 MR. BEARD: Why would you say the safety
15 significance had decreased?

16 MR. KOSLOFF: Because they had both Aux
17 Feed pumps operating, the steam generator levels
18 were approximately 50 and 90 inches, and there was
19 no equipment that was malfunctioning that would
20 prevent them from performing their safety functions.

21 MR. BEARD: Well, I guess what I hear you
22 saying is largely that the plant had recovered
23 where it was now in a stable situation, that enough
24 equipment that had misbehaved previously had been

1 cranked up to where they had adequate core cooling,
2 didn't have containment troubles, there were no
3 radioactive releases, as I understand it?

4 MR. KOSLOFF: Right.

5 MR. BEARD: And so the immediate hazard
6 had been mitigated, if I can use that word, very,
7 very carefully. But I guess I was really probing
8 around in the area of did they have a keen
9 perception that they had been through a very near
10 miss?

11 MR. KOSLOFF: Yes.

12 MR. JACKIW: Maybe I could add a little
13 bit, because I had talked to Walt Rogers roughly it
14 must have been about an hour after the event. He
15 called me because he was called by the Licensee,
16 and he gave me very little information. I didn't
17 take any notes. He was I guess in a hurry.

18 He had talked to Don and he informed me
19 that he and Don were going to the site. I hung up
20 and called the duty officer, the headquarters duty
21 officer just to verify if the duty officer had
22 known what had happened, and the duty officer
23 informed me there was some discussion about the
24 classification.

1 And so when I called the duty officer
2 again, he gave me a little more information on the
3 discussion between the plant and him. I guess the
4 duty officer said that the Licensee was not sure
5 what the classification was. In fact, when they
6 gave him the original call, the intent was just to
7 let the NRC know they have got a problem and they
8 hadn't really looked into the classification.

9 And after some probing, some asking
10 questions, they agreed. I think maybe it was a
11 common agreement that it looked like an unusual
12 event and at that time the event had -- the fact
13 that they had the Aux Feed pumps back on, the
14 severity of the event, like Don is saying, had been
15 lessened.

16 MR. ROSSI: We will get, by the way, the
17 tapes from the operations center on the calls, so
18 we will have exactly what they told the duty
19 officer concerning the classification. And my
20 recollection of what you will find is that by the
21 time they phoned it in, that the immediate safety
22 concern was passed because it was over, in, what,
23 fifteen minutes or something like that to the point
24 where they had recovered their auxiliary feed?

1 MR. SHAFER: If I may as a point for the
2 record, this is one of the issues that we have in
3 our confirmatory action letter to try to understand
4 the Licensee's thinking at the time of incident.
5 The Region questions whether it should have not
6 been an alert, but the incident, as Ray pointed
7 out, was over so quickly, we may have to look at
8 our own reporting requirements, which I believe in
9 this instance is within one hour.

10 MR. KOSLOFF: Well, I am starting to get
11 concerned that we are looking at reporting
12 requirements as more important than public health
13 and safety. This is a little upsetting to me.

14 MR. BEARD: I certainly hope that's not
15 the case.

16 MR. KOSLOFF: I do too. I'm perfectly
17 willing to discuss it, but some of the things that
18 are starting to be said now are bothering me.

19 MR. BEARD: I don't think anybody wants
20 to focus so much on the reporting aspect as much as
21 use that as a tool to get some feel for what the
22 Licensee's perception of the severity of the
23 transient had been. At least that's been my intent.

24 And I certainly believe that during the

1 first hour that the operators need to focus on
2 whatever is necessary to determine what sort of an
3 event they have on their hands and take the
4 appropriate safety actions. And if the reporting
5 can be done in an hour, that's fine. If it has to
6 be delayed, it has to be delayed.

7 The telephoning to the government in my
8 personal opinion is clearly secondary.

9 MR. JACKIW: I think the Licensee has the
10 option -- as far as being delayed, I don't think
11 they have that option. But as far as the detail of
12 the report, they have got the option to I think, I
13 believe, to call and say we have got a problem.
14 Here is what we see.

15 MR. BEARD: I think we wrote that in '72
16 when we issued a report.

17 MR. JACKIW: At this point we will get
18 back to you as soon as possible.

19 MR. ROSSI: And the headquarters has the
20 option of maintaining an open line, which we have
21 from time to time done.

22 MR. LANNING: I would like to get back to
23 the first impressions when you got to the control
24 room. Did the shift supervisor have any

1 preliminary indications as to why there was
2 interruption of auxiliary feedwater flow?

3 MR. KOSLOFF: No. He knew the pumps had
4 tripped on overspeed, but he did not understand why
5 it happened. And he did not understand why his
6 MSIVs had gone closed on him.

7 The discussion was that, you know, they
8 had seen the MSIV open light go off, and that he
9 looked over to the panel, the enunciator panel that
10 has the SFRCS indications on it to see what knocked
11 his MSIVs out, and there was nothing up there. And
12 I'm sure that had a tendency to shake the
13 operator's confidence a little bit when they saw
14 that.

15 The atmosphere was sort of subdued.
16 People were functioning, they were doing their
17 individual and unit tasks, but I think subdued is
18 the best characterization of the atmosphere in the
19 control room.

20 MR. LANNING: Do you recall who was there
21 besides the four operators?

22 MR. KOSLOFF: The vice president nuclear
23 was there, plant manager was there, the operations
24 superintendent was there, the operations supervisor

1 was there, the STA was there, and there were other
2 individuals.

3 There were maintenance individuals who
4 were waiting outside the control room, you know, as
5 they were needed to perform any tasks that the
6 operators would want them to do. And that was the
7 situation at that point in time.

8 MR. BELL: Had the operators lined up the
9 low pressure injection system to the suction of the
10 high pressure injection system?

11 MR. KOSLOFF: Yes, that had been done.

12 MR. BELL: So then they did this while
13 they were attempting to get auxiliary feedwater
14 back.

15 MR. KOSLOFF: Right.

16 MR. BELL: So they were really concerned
17 about core cooling then.

18 MR. KOSLOFF: Yes. They had the HPI pump
19 in operation also.

20 MR. BELL: I don't think that was brought
21 out with any other of our people.

22 MR. BEARD: I think it could be -- you
23 can get a higher head, but I don't think it was
24 done.

1 MR. ROSSI: I think were we talked to the
2 Licensee. I don't think we talked about the PORV
3 injections at all.

4 MR. KOSLOFF: They lined up. They did in
5 fact inject about 10 to 15 gallons as a result of
6 primary pressure decreasing to below the head of
7 the system, and in that configuration.

8 MR. BELL: And they made this line up as
9 a result of guidelines provided in their emergency
10 procedures?

11 MR. KOSLOFF: They had the guidance in
12 their emergency procedures. They also had the
13 direction of the operations superintendent.

14 MR. BELL: That's Mr. O'Connor.

15 MR. KOSLOFF: That's Mr. O'Connor. Very
16 early in the event from conversations with him, he
17 was notified within five minutes of the trip as
18 soon as they got to the point where they had no
19 feedwater. So I can't say whether, if they hadn't
20 have talked to him, you know, it's right there in
21 their procedure, I have to assume.

22 MR. BEARD: Is that an immediate action
23 procedure?

24 MR. KOSLOFF: No, it's supplementary.

1 MR. BEARD: So it's not part of the steps
2 of the procedure operators are required to have
3 memorized?

4 MR. KOSLOFF: No.

5 MR. BELL: So core cooling in your
6 opinion, core safety was of prime importance to
7 them or they wouldn't have made this line.

8 MR. KOSLOFF: Yes. I think they were
9 well aware of the potential of the situation that
10 they were in.

11 MR. BEARD: How would you characterize
12 the particular shift that was on this night in
13 terms of is this, say, their best shift, lousiest
14 shift, some sort of mix or --

15 MR. KOSLOFF: I would say it's a mix.
16 It's not as though all of their best operators are
17 put on -- are on one shift. There is a mix. If
18 you took all the shifts as they are put together
19 now, I wouldn't say this is the top -- this is the
20 best shift. But it's pretty hard to -- they are
21 not that much different. There are individual
22 strengths and weaknesses and they tend to
23 compliment one another in a lot of respects.

24 MR. BEARD: Maybe we ought to get on to

1 the sequence here.

2 MR. LANNING: Have you compared your
3 Sequence Of Events to the one the Licensee prepared?

4 MR. KOSLOFF: Only because I'm familiar
5 with mine and I read through their's. I didn't do
6 a one-to-one correspondence or anything of that
7 nature.

8 MR. LANNING: Okay. Did you find any
9 discrepancies when you give it a quick look?

10 MR. KOSLOFF: Well, I noticed that it did
11 not go into the detail of the one that I had made
12 up. I also was -- I noticed that the comments on
13 the Power Operated Relief seemed to leave a little
14 bit of information out, whether that information
15 hadn't been evaluated or not I don't know. But
16 that was not there.

17 MR. LANNING: What information are you
18 referring to?

19 MR. KOSLOFF: On the third cycle, the
20 core, it had to be isolated by the operator. I
21 shouldn't say had to, the operator felt it was
22 prudent to isolate it because the pressure had
23 dropped below the receding setpoint and it's an
24 unknown as to what would have happened if he hadn't

1 had done that, and I think that was a significant
2 item to include in a sequence of events.

3 MR. ROSSI: I'm looking through your
4 Sequence Of Events and I notice when you get down
5 to the Steam and Feedwater Rupture Control System,
6 that you indicate that they got a low level half
7 trip and then that the Sequence Of Events recorder
8 also shows that they got a full trip.

9 I didn't recall that from what we were
10 told this morning. That looks a little -- and then
11 both of those cleared shortly thereafter.

12 MR. KOSLOFF: My reason for writing it
13 that way was to indicate there was an anomaly
14 between what actually happened and what the
15 Sequence Of Events recorder portrayed. If somebody
16 was looking at the two documents, they would notice
17 that difference and that question might be
18 clarified in their minds, and at the same time I
19 was trying to keep some degree of brevity in this
20 Sequence Of Events.

21 MR. ROSSI: When you say Steam and
22 Feedwater Rupture Control System low level half
23 trip, they must have determined they had that in
24 some manner other than the SOE recorder.

1 MR. KOSLOFF: Well, the alarm printer
2 prints out a half trip. The SOE recorder has in
3 the past printed out half trips and characterized
4 them as full trips when a review after the fact
5 would indicate that there was no condition that
6 would have given a full trip.

7 MR. ROSSI: Does that mean even if they
8 had like, say, a full trip signal for a very brief
9 period of time, have they ever found relay races
10 that caused the SOE recorder to record it was a
11 full trip when it was really only a half trip?

12 MR. KOSLOFF: It sounded like you asked
13 two different questions there. There have been
14 cases in the past where the Sequence Of Events
15 recorder has printed out that there was an SFRCS
16 full trip and that if you compared -- first of all,
17 if you looked at equipment actuation, when the SOE
18 recorder had printed out a full trip, you would see
19 no equipment actuation.

20 Secondly, there was no enunciator
21 indication of an SFRCS trip.

22 And thirdly, after-the-fact analysis of
23 plant conditions would indicate that at these
24 points, at some points in time when the SOE

1 recorder showed a full trip, there were no plant
2 conditions which should have generated a full SFRCS
3 trip or even a half SFRCS trip.

4 Part of the reason that this would not
5 show up all the time is because the only time that
6 you get a half trip that's really only a half trip
7 is when you have a spurious half trip. So if all
8 you ever had was real SFRCS trips, then you would
9 never know that your SOE recorder printed out full
10 trips when it should have only -- well, it should
11 have printed out -- I don't know if the SOE
12 recorder prints out half trips. I think it only
13 prints out full trips. There is some problem in
14 the buffer or in the computer.

15 MR. ROSSI: Or maybe just in the labeling
16 of what the SOE --

17 MR. KOSLOFF: Well, it doesn't. That
18 could be. I don't know.

19 MR. JACKIW: That question, Ernie, if you
20 recall, came up during earlier discussion with
21 Jacque Lingenfelter, and he concurred they had some
22 problem with the trip a week and a half ago where
23 you were getting a half trip and the SOE recorder
24 was showing a full trip. They thought they had

1 corrected the problem --

2 MR. KOSLOFF: Well, they started to
3 trouble-shoot or they started to trouble-shoot the
4 problem to look and see if there was an obvious
5 cause. They didn't see anything obvious in their
6 initial trouble-shooting, so then they tested it,
7 and they couldn't get it to repeat the condition.

8 So they concluded that there was some
9 kind of a problem with contacts that in their
10 trouble-shooting by looking at the contacts and
11 checking to see if there were loose contacts, that
12 that had corrected the problem. They apparently
13 were mistaken in that judgment from the fact that
14 it happened again. But that's the reason that I
15 put that in there.

16 MR. LANNING: Do you know if there are
17 procedures that address the interruption of all
18 feedwater?

19 MR. KOSLOFF: There are procedures.
20 There are emergency procedures that discusses the
21 interruption of all feedwater flow.

22 MR. LANNING: That includes emergency
23 feedwater flow. I say all of them. I'm
24 emphasizing all.

1 MR. KOSLOFF: Yes, it does. In fact,
2 that's the procedure that gets you into the HPI
3 injection in conjunction with the operation of the
4 LPI to the suction of the HPI.

5 MR. LANNING: And that procedure would
6 also talk to the nonsafety startup feedwater pump
7 being made operable.

8 MR. KOSLOFF: Yes. It gives instructions
9 on using that as a backup source.

10 MR. LANNING: In your opinion, is
11 seventeen minutes, about seventeen minutes a
12 reasonable time to have this auxiliary -- let me
13 make sure the terminology is correct -- startup
14 feedwater pump injecting water to the steam
15 generators?

16 MR. KOSLOFF: Given the sequence of the
17 events and the things that had to be done, yes, it
18 probably could be improved, but it's hard to say
19 without actually having been there at the time.

20 The problem is that you have to go down
21 and unlock a door; it's actually a hatch in the
22 floor. It's a little bit harder to get to than
23 most of the other equipment in the plant.

24 MR. LANNING: There is not an operator's

1 station in this area now, is there?

2 MR. KOSLOFF: There is an equipment
3 operator in the general area, okay, but he's not in
4 the room and he doesn't have easy access to the
5 room. It's not like, you know, most places that
6 you need to get to, you can open a door like a
7 regular door, you know, in a building. The Aux
8 Feed pump room where the startup feedwater pump is
9 located is in a room that is accessible only by a
10 locked hatch that has to be unlocked and then slid
11 open. It's a hatch in -- it's actually part of the
12 floor.

13 MR. LANNING: Why is it locked?

14 MR. KOSLOFF: It's a vital area. All of
15 their vital areas are controlled with locks.

16 MR. LANNING: Does this equipment
17 operator carry with him a key to gain access to
18 this piece of equipment?

19 MR. KOSLOFF: I don't know for sure if he
20 does or not. I know the operators at some times do
21 have keys in their possession, but I'm not familiar
22 enough with that procedure to answer that question

23 MR. LANNING: I want to get back to the
24 time interval to establish some feedwater to the

1 steam generator. Is it a fair assumption that the --
2 let me ask the question. How soon do you think the
3 operators realized that they had no emergency
4 feedwater?

5 MR. KOSLOFF: I think they recognized it
6 when the Aux Feed pumps tripped, which on overspeed,
7 which is --

8 MR. BEARD: Looks to be like six minutes
9 into the event.

10 MR. KOSLOFF: Second overspeed trip,
11 1:41:44. So that's about eight minutes.

12 MR. BEARD: If you start from the time
13 the reactor trip occurred, which appears to be
14 around 1:35:29 or 30?

15 MR. KOSLOFF: But that -- at that point,
16 they were not -- there was no problem in terms of
17 feedwater.

18 MR. BEARD: I'm just saying just for
19 timing considerations, if you use a point of
20 reference the time the reactor tripped as some sort
21 of reference time, then it appears as though the
22 two Aux Feed water parts tripped out on overspeed
23 about six minutes after that rupture. That's all
24 I'm saying.

1 MR. KOSLOFF: Right.

2 MR. ROSSI: I'm looking through your
3 Sequence Of Events. There are a number of
4 questions I have. I'm not sure you can answer them
5 or not. But like at 1:45:50, it indicates that
6 auxiliary feedwater pump turbine No. 2 overspeed
7 trip was reset.

8 MR. KOSLOFF: Right.

9 MR. ROSSI: That has to be done locally
10 at the pump; right?

11 MR. KOSLOFF: That is my understanding.
12 I have not verified that, but I think that means
13 that the trip has been manually reset in the
14 turbine or in the Aux Feed water pump room.

15 MR. ROSSI: Now, the next one has the No.
16 1 pump starting, but I don't see when it is
17 overspeed trip was reset.

18 MR. KOSLOFF: They didn't. My understanding
19 is they couldn't -- that they had some difficulty
20 with resetting the trip, so it may not have ever
21 printed out on the alarm printer because perhaps
22 the logic for that alarm point was corrected.

23 MR. ROSSI: But they got the pump started
24 at --

1 MR. KOSLOFF: Right.

2 MR. ROSSI: They got the pump started,
3 but they must have done something to correct the
4 situation with the overspeed trip, because it did --
5 does indicate that it tripped on overspeed.

6 MR. KOSLOFF: Right. I suspect that
7 either -- the alarm printer seems to printout
8 everything, either I overlooked that on the alarm
9 printer or they did have some difficulty in
10 preparing that feedpump to operate and perhaps in
11 that methodology that they had to use, they by-passed
12 the logic that would have printed out that alarm
13 point?

14 MR. ROSSI: Okay. The next entry is that
15 the auxiliary feedwater to No. 2 steam generator
16 isolation valve opens. Now, is that one of those
17 valves that was supposed to automatically open when
18 they reset the SFRCS low pressure, that they had to
19 go down and manually open?

20 MR. KOSLOFF: Yes. This is either 599 or
21 608. I don't remember which.

22 MR. ROSSI: Then on down they have the
23 No. 1 at 49 minutes and 28 seconds. They have that
24 same valve associated with the No. 1 auxiliary

1 feedwater pump open.

2 MR. KOSLOFF: Right.

3 MR. ROSSI: At that point they must have
4 flow because, I mean, if this Sequence Of Events is
5 right, they started the No. 1 pump at 46 minutes 32
6 seconds, and they got the valve open at 49 minutes
7 and 28 seconds. It would appear to me from this
8 they had below.

9 MR. BELL: Doesn't that depend on turbine
10 speed?

11 MR. KOSLOFF: Yes, it does. I was trying
12 to -- I looked at that information on the printout
13 of -- there is a data point that shows Aux Feed
14 water flow also, and apparently I didn't -- I
15 didn't put that down on here.

16 MR. BEARD: It seems like it didn't have
17 a significant flow because some later entries
18 indicate the level is still continuing to drop.

19 MR. ROSSI: I mean, I'm curious from the
20 Sequence Of Events as to which flow they really got
21 first, because it was my understanding from earlier
22 this afternoon there was a startup feedwater pump
23 feeding the No. 1 steam generator that they got
24 first. And this would indicate that maybe they did

1 get auxiliary feedwater earlier than I thought.

2 MR. KOSLOFF: If you look further on down
3 1:53:25, according to the data -- I did record
4 those points on here after all. I knew I looked at
5 it but I couldn't remember. 1:53:25, AFW flow
6 starts to No. 2 steam generator.

7 MR. ROSSI: I see. Then on the next page
8 it's flow starts to No. 1.

9 MR. KOSLOFF: Right.

10 MR. ROSSI: So maybe it was the speed of
11 the pump or something as to why the flow lagged
12 behind all these other things?

13 MR. KOSLOFF: Right. Because the point
14 where I say on their the No. 1 Aux Feed water pump
15 starts, that's based on an indication of Aux Feed
16 pump turbine speed coming up. That's another data
17 point.

18 MR. ROSSI: So it's just starting up then.

19 MR. KOSLOFF: Right.

20 MR. ROSSI: You hadn't pumped anything at
21 that point?

22 MR. KOSLOFF: No.

23 MR. ROSSI: This other entry down here on
24 auxiliary speed water flow starts comes from an

1 actual flow indicator. That was the first time you
2 actually saw flow from a sequence of events going
3 to a steam generator?

4 MR. KOSLOFF: Yeah. This is the DADS
5 printout that they have.

6 MR. SHAFER: And that is verified by the
7 set of sheets you received?

8 MR. ROSSI: You have other --

9 MR. BELL: That is not from the --

10 MR. KOSLOFF: That is just a graphical
11 representation of the DADS.

12 MR. ROSSI: Okay. The other question is
13 this entry that the auxiliary feedwater pump
14 suction transfers to the service water, is that
15 another anomaly that ought to be added to our list
16 that is not understood at this time?

17 MR. KOSLOFF: Yes.

18 MR. ROSSI: I think we went down through
19 and listed them. That's another anomaly on here
20 that I don't think we have on our list.

21 MR. LANNING: Is this a recurring event?

22 MR. KOSLOFF: This has happened before.
23 I don't know for sure how many times, but it has
24 happened before. They have a design change that

1 last I heard was being developed to put a time
2 delay in there.

3 But after this event and discussions with
4 the senior resident, our concern with this has
5 escalated somewhat because we looked at the speed
6 indication for the Aux Feedwater pump at that point
7 in time and for the interval before and after that,
8 and we looked at the flow indication at that point
9 in time and the time surrounding that, and we could
10 see no anomalies in flow or turbine speed that
11 would account for that having occurred.

12 MR. LANNING: This transfer is based on a
13 pressure, isn't it, water pressure?

14 MR. KOSLOFF: It's based on low suction
15 pressure.

16 MR. LANNING: I'm not sure how you would
17 see that from a flow in speed.

18 MR. KOSLOFF: I'm not either. We were
19 just looking for something to give us some clues.
20 We don't always look in the right spot, but we try
21 to find something that gives us some directions to
22 look in.

23 MR. BELL: Is there any -- if I remember
24 that drawing correctly, the Aux Feed pumps can take

1 a suction out of the deaerator storage tanks; is
2 that correct?

3 MR. KOSLOFF: Yeah, they can.

4 MR. BELL: Is there any possibility we
5 got some hot water in that suction and flashed that
6 suction temporarily?

7 MR. KOSLOFF: There is a possibility.

8 MR. BELL: Well, I'm thinking about these
9 valves for the startup feedpump. Is the suction --
10 he has to open a suction and a discharge valve to
11 put that pump in service; right?

12 MR. KOSLOFF: Right.

13 MR. BELL: Is the suction valve he has to
14 open very close to the suction valve from the
15 deaerator?

16 MR. KOSLOFF: No. The suction valve is
17 right above the room.

18 MR. BELL: But he wouldn't be playing
19 with Aux speed functioning. I'm thinking incorrectly.

20 MR. KOSLOFF: The valves are -- there is
21 where you have to start. But when you actually go
22 out and look at where the valves are and the piping,
23 it doesn't look like that's a likely cause. We
24 haven't looked at this extensively, but so far --

1 in fact, the senior resident has looked at it a
2 little bit in more detail than I have and he
3 doesn't understand.

4 MR. ROSSI: It just switched from the
5 condensate storage tank over to the service water
6 and then back again a couple minutes later.

7 MR. KOSLOFF: Right.

8 MR. BEARD: Did it switch back by itself
9 or was it manual?

10 MR. KOSLOFF: Manual switch back. It
11 transfers over automatically. But to get it back,
12 you have to transfer it, well, manually. There is
13 a button to push on the back panel in the control
14 room.

15 MR. ROSSI: And it's on low suction
16 pressure of the pumps, so any kind of spray by low
17 suction pressure that exists would switch it over
18 and then they would have to manually switch it back.

19 MR. KOSLOFF: Right. Let me find that on
20 here.

21 MR. BEARD: I think that's one of the
22 fixes that we asked people to put in was to avoid
23 damage to the pumps on Aux Feed water, that they
24 have some provision there to automatically protect

1 against damage due to low suction and loss of water.

2 MR. ROSSI: When you have condensate
3 storage tanks I would think.

4 MR. BEARD: There have been pros and cons
5 and discussions up one side and down another on
6 that particular feature in the plant design.

7 MR. KOSLOFF: But some kind of a time
8 delay in the circuit should be able to --

9 MR. BEARD: I think a lot of people
10 proposed a lot of different ways to get around the
11 spurious problem. Can I go back and I'm not sure
12 Ernie has finished his line of thinking here?

13 MR. ROSSI: I was just going through his
14 sequence of events and finding things I wanted to
15 ask questions about and things that were obvious on
16 here that may not have agreed with my understanding
17 from earlier. I don't see any others right now,
18 but you know, we can carefully study it later on.

19 MR. BEARD: I have two separate questions.
20 In some events where there is some confusion as to
21 what has happened or what happened, there is a
22 bogus signal or bogus indication, the operating
23 staff has consulted the Sequence Of Events recorder
24 or the alarm printer to see what that source of

1 information told them.

2 MR. KOSLOFF: Uh-huh.

3 MR. BEARD: During the course of this
4 transient, do you know whether they consulted these
5 bits of information or what do you think they used
6 besides the main indicators on the control board?
7 Did they go down and get any of this kind of
8 information that we have?

9 MR. KOSLOFF: They were using -- there
10 were people off and on looking at the alarm
11 printers trying to determine what had happened.
12 When I was in the control room, the more detailed
13 information from the DADS system was not available
14 yet. That takes a while to printout, although
15 later in the morning about 7:00 when the senior
16 resident and I went over to the TSC, Technical
17 Support Center, the technical staff, technical
18 section staff had the data, their initial run of
19 the data laid out and they were trying to piece
20 together the events.

21 MR. BEARD: Does this plant have a Safety
22 Parameter Display System readout installed and
23 operational in the control room?

24 MR. KOSLOFF: Yes, but it was not -- it

1 was not on initially. Let me think.

2 MR. BEARD: By on, do you mean turned on
3 or inoperable?

4 MR. KOSLOFF: There was some kind of
5 problem with it. I don't recall what it was. My
6 memory is giving me mixed signals on this. At some
7 point it was off and later on I think initially it
8 was off, the monitoring were blank and later in the
9 day there was a display on it.

10 MR. BEARD: Do you know whether they
11 tried to use this source of information during the
12 event? Like for example, they would go over and
13 turn it on?

14 MR. KOSLOFF: Usually when it's available,
15 it's on.

16 MR. BEARD: I see. So it's normally at
17 this plant kept running?

18 MR. KOSLOFF: Yes.

19 MR. BEARD: So there was a preexisting
20 problem?

21 MR. KOSLOFF: There must have been a
22 problem with that.

23 MR. BEARD: The second area I would like
24 to ask you about is on the PORV with regard to

1 indications of the closure of the PORV, I guess the
2 question really is in two parts. Do they have
3 caustic monitors or something comparable to that,
4 maybe pressure monitoring downstream of the PORV to
5 indicate beyond the temperatures whether the PORV
6 is open or closed?

7 MR. KOSLOFF: They have a caustic
8 monitoring.

9 MR. BEARD: They have a caustic
10 monitoring?

11 MR. KOSLOFF: Yes.

12 MR. BEARD: Do you know if they were used
13 during the event when there was a question about
14 the PORV being closed?

15 MR. KOSLOFF: I did not ask the operators
16 that question. Today I asked the operation
17 superintendent, and he said that to his knowledge
18 they were not used, that they relied on the
19 pressure, the fact that pressure was dropping as an
20 indication that the PORV was remaining open.

21 MR. BEARD: Seemed like I had one last
22 tidbit along that same line. It seemed like -- I
23 can't find it right now, but it seemed like you put
24 an entry in your summary here that the PORV was

1 closed, not the block valve, the isolation valve,
2 but the PORV itself closed.

3 MR. KOSLOFF: It's 1:51:49.

4 MR. BEARD: Okay. I guess what I'm
5 curious about is the source of that data point.

6 MR. KOSLOFF: This is a combination of
7 the alarm printer and review of the pressure
8 indications, this pressure was dropping, and at
9 1:51:49 the pressure stopped dropping, and that's
10 the same time that the alarm printer shows that the
11 PORV was closed.

12 MR. BEARD: So it's an incorrect
13 measurement?

14 MR. ROSSI: But if the isolation valve
15 was closed, that would have stopped the pressure
16 from going down, wouldn't it?

17 MR. KOSLOFF: Well, that's true. But --
18 yes. It's the indirect indication. But this entry
19 here, 1:51:42 PORV isolation valve closed, if you
20 notice the pressure, 2141 and the pressure seven
21 seconds later when the PORV indicated closed
22 2112.9, you will see the pressure was still
23 dropping.

24 And in reviewing the data, the pressure

1 was dropping at a rapid rate. At 1:51:42, the rate
2 of decrease slowed and the rate of decrease
3 continued to slow until 1:51:49 when the pressure
4 indication showed a constant pressure.

5 MR. ROSSI: Could that mean that the
6 isolation valve didn't fully close when they closed
7 it?

8 MR. KOSLOFF: I suspect this indication
9 at 1:51:42 on the alarm printer is when the
10 operator took the switch to the closed position and
11 then it took some time for that valve to close.
12 You know, it had flow through at that pressure.
13 I'm sure that it takes a little effort to operate.

14 MR. ROSSI: They opened the isolation
15 valve again here, didn't they, and presumably the
16 PORV was closed at that point or they would have
17 known it, I'm sure.

18 MR. KOSLOFF: Right.

19 MR. BEARD: That's the part I'm trying to
20 understand, is whether or not the PORV was open and
21 blowing down apparently until you got to the time
22 frame of 1:51:42, because at that point apparently
23 the operator chose to isolate the valve. So at
24 that point he told it to go closed. And I'm trying

1 to understand whether or not at later times did the
2 valve reclose itself or why the valve closed.

3 MR. KOSLOFF: I don't know the answer to
4 that. One answer would be that once the isolation
5 valve was closed, then the conditions that the PORV
6 was exposed to were made less severe.

7 MR. BEARD: If the -- if that were the
8 case -- I'm not arguing with you.

9 MR. KOSLOFF: I'm just speculating anyway.

10 MR. BEARD: If that's the case, that
11 would suggest the reason the valve stayed open is
12 more mechanical in nature whereas by the controls
13 in nature.

14 MR. KOSLOFF: That would be the case.
15 The possibility is it is controls.

16 MR. BEARD: I know. But it would tend to
17 push you in that direction, I think.

18 MR. KOSLOFF: But I don't know what --
19 this is the case of the chicken or the egg here.

20 MR. BEARD: But it does appear they have
21 a stuck open PORV and that the operator saw this
22 reactor cooling system blowing down, he isolated
23 the valve, as a good operator should, but it does
24 appear on the surface -- and it's getting late in

1 the day and I am not sure I really want to say this,
2 but it does appear that the transient the plant
3 went through started out as a feedwater type
4 transient for which the system response including
5 operation of the PORV and the PORV stuck open,
6 which constitutes a small break LOCA, loss of
7 coolant accident, I guess to help the reporter.
8 And I guess if we characterized the transient as
9 starting out in one direction, a feedwater
10 transient and then growing to a small break LOCA,
11 the connotations and the implications of that type
12 of characterizations are different from what we had
13 before we arrived at the site.

14 I guess because of that, it seems to me
15 personally that we really need to pursue
16 information with regard to more direct information
17 on the PORV status, for example, the acoustic
18 monitoring, maybe there is some alarm that's
19 connected to the alarm printers and maybe we can
20 dig that back out or other things to see if we can
21 confirm or deny that the PORV was stuck open.

22 MR. KOSLOFF: Your mentioning the alarm
23 printers jogged my memory here. My understanding
24 is that the alarm printer indication is from the

1 accoustic monitor.

2 MR. BEARD: Oh, it is? And do you know
3 what the alarm printer sentence is of the PORV?

4 MR. KOSLOFF: That's the primary source
5 of this information on the PORV being opened or
6 closed here.

7 MR. BEARD: Because earlier you said this
8 is really a compilation from a number of sources
9 and I guess I did not fully appreciate that the
10 PORV entries was primarily from the alarm printer
11 and that in turn the accoustic monitoring.

12 MR. ROSSI: It makes it very difficult to
13 know whether the PORV closed at this point or the
14 isolation valve closed, because if you are looking
15 at the pressure and accoustic monitoring closing,
16 either one of them will give you the same
17 indication.

18 MR. BEARD: You look like you are talking
19 six or seven seconds, it looks like seven seconds,
20 which is really not unreasonable for the isolation
21 of the block valve, but it did bring up the
22 question of -- realizing this is a summary -- does
23 the alarm printer or the Sequence Of Events printer
24 distinguish between the command of a piece of

1 equipment to do something versus the completion or
2 confirmation of that command, that action?

3 MR. KOSLOFF: It depends on the item.
4 Some items have several indications, for instance.
5 Some valves will have a closed, not closed
6 indication. Others will have closed, not closed,
7 open. And to answer that question fully, you have
8 to have at your disposal, there is about a four-
9 inch thick description of what all the alarm points
10 are and how they perform and what their various
11 indications are. But there are a lot of different
12 indications which I didn't -- I didn't put on here.
13 I tried to interpret them as I understood them.

14 MR. BEARD: I'm not criticizing you.
15 After all, this is supposed to be a summary.

16 MR. KOSLOFF: I'm just explaining, those
17 are available. The things like NC for not closed,
18 NO for not open, normal, trouble. There is a
19 variety of indications.

20 MR. BEARD: But I think what I hear you
21 saying that directly relates to the question, that
22 for at least some of the valves, the alarm printer
23 would distinguish between a switch command to do
24 something and the actual final position of the

1 valve, and it may or may not be the case with the
2 PORV and we can look into it.

3 MR. KOSLOFF: Right. I don't recall what
4 the --

5 MR. BEARD: I guess what I'm really
6 coming to, Ernie, is that we are going to have to I
7 think look at not summaries, but the actual
8 material that the summaries were developed from to
9 determine the situation on this PORV.

10 MR. ROSSI: And where the signals come
11 from.

12 MR. BEARD: Because, you know, if you do
13 chose to characterize the transient as starting out
14 as feedwater and proceeding to a small break LOCA
15 which was then mitigated, I'm not sure what the
16 significance of that is, but it is certainly
17 different.

18 MR. BELL: It's speculative now anyhow.

19 MR. BEARD: Yeah, clearly.

20 MR. KOSLOFF: Part of my purpose in
21 developing this was to sort of be as a starting
22 point more than anything else to get things in an
23 organized manner that's also digestable and then --

24 MR. ROSSI: This is very useful.

1 MR. SHAFER: If I may, it might be
2 helpful, we know that the operator opened the
3 blocked valve or isolation valve two minutes later.
4 And his decision for opening that valve would
5 hopefully be based on positive knowledge that the
6 PORV was closed.

7 MR. BEARD: But I don't know how one gets
8 that information.

9 MR. SHAFER: I don't either.

10 MR. ROSSI: Off the record.

11 - - - - -

12 Thereupon, proceedings were
13 adjourned at 7:10 o'clock p.m.

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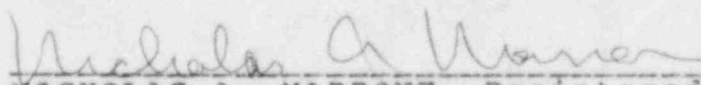
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CERTIFICATE

I, Nicholas Marrone, a Registered Professional Reporter and Notary Public in and for the State of Ohio, do hereby certify that I took the aforementioned proceedings and that the foregoing transcript of such proceedings is a full, true and correct transcript of my stenotypy notes as so taken.

I do further certify that I was called there in the capacity of a Registered Professional Reporter, and am not otherwise interested in this proceeding.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal of office at Columbus, Ohio, on this 12th day of June, 1985.


NICHOLAS A. MARRONE, Registered Professional Reporter, Notary Public in and for the State of Ohio.

My Commission expires November 1, 1987.

178	6	third word should be "their", typo
179	11	eighth word should be "Nick" or "Jackie", error
181	13	third word should be "Don" instead of "John", error
182	13	last word should be "tech spec" not "textbook"
183	11	first word should be "worn" not "ware"
189	6	8th eighth word should be "Ernie" not "Ray"
191	9	7th word should be "annunciator" misspelled
193	19-21	The point of this gibberish sentence is that I wasn't sure if the operating shift would have lined up HPI if the operations superintendant hadn't directed them.
194	23	first word should be "complement" not "compliment"
195	20	first word should be "PORV" not "core"
195	23	fourth word should be "reseating" not "receding"
197	20	last word should be "annunciator"
202	22	Fifth word should be "pumps" not "ports"
203	22	last two words should be "wasn't completed"
206	14	Fifth word should be "there"
206	24	2nd word should be "feed"
213	8	4th word should be "monitors"
214	7	last word should be "acoustic"