

PDR

UNITED STATES
NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF:

DAVIS-BESSE INCIDENT

(INTERVIEW AND MEETING)

(CLOSED)

SFRCS Actuated Equipment and Operations.

(Continued from July 10, 1985.)

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

THURSDAY, JULY 11, 1985

MEETING BETWEEN THE NRC FACT-FINDING TEAM AND TOLEDO EDISON

ON

SFRCS ACTUATED EQUIPMENT AND OPERATIONS

(Continued from July 10, 1985.)

NRC FACT-FINDING MEMBERS PRESENT:

J. T. BEARD

TOLEDO EDISON MEMBERS PRESENT:

SUSHIL JAIN

LARRY STALTER

KENT YARGER

P R O C E E D I N G S

(9:22 a.m.)

MR. BEARD: Okay. This is a continuation of the previous meeting the Fact Finding Team has had for the purpose of discussing the design and operation of the steam feed and reactor control system here at Davis Besse.

As I remember -- correct me if I'm wrong, Sushil -- there are two topics that we need to wrap up on. One is the overall logic diagram for the reactor control system that I gave you --

MR. JAIN: Right.

MR. BEARD: -- on Monday or Tuesday, whenever it was. The second area is a continuation of our discussions on some of the equipment that is actuated by the reactor control system.

MR. JAIN: Right.

MR. BEARD: I think we covered one of those pieces of equipment, and we had like three that we wanted to cover. And I think we are in the middle of the second one.

MR. JAIN: Correct.

MR. BEARD: Something like that.

MR. JAIN: Right.

MR. BEARD: Okay. Now, if you have no particular preference, what my preference is, because I think it's the

#1-2-SueWalsh 1 far more important of the two topics we need to address,
2 is I would prefer that we talk about the overall logic
3 diagram for the system, and then put the actuated equipment
4 second, if that's okay with you.

5 MR. JAIN: Okay. We have reviewed the package
6 that you gave us the other day.

7 MR. BEARD: You mean the cartoons?

8 MR. JAIN: Yes. Overall the logic diagram there
9 looks very good, but what I would do here would be maybe go
10 page by page. I see you have a different package than I
11 do.

12 MR. BEARD: I probably do. I think what I have
13 is a copy that is not as complete as the one you are talking
14 about. I may have that one.

15 The copy that you have is the one that we handed
16 out at the earlier meeting which I think is the same with
17 the exception that that package included the tables of the
18 equipment being actuated.

19 MR. JAIN: Right.

20 MR. BEARD: And --

21 MR. JAIN: I have --

22 MR. BEARD: Okay. That might be easier than my
23 finding -- I've got so much stuff here it's difficult to keep
24 track of it.

25 MR. JAIN: I think the overall logic diagrams look

#1-3-SueWalsh pretty good. I think a significant input that I had was
2 on the tables here. And maybe it will be -- it's your
3 preference, do you want to go item by item or maybe should
4 I just give you a copy?

5 MR. BEARD: Can you describe the general nature
6 of the corrections that we would need to make? And then we
7 could just exchange a copy. That might be more efficient
8 than trying to copy them down as you read them.

9 MR. JAIN: Okay. The general nature of the input
10 here was that the list of actuated equipment here was not
11 complete. And I have made corrections here to make the list
12 complete as we think the SFRCS works.

13 MR. BEARD: Okay. So you are saying that to be
14 correct, we need to add some more items?

15 MR. JAIN: That's one part of the input.

16 MR. BEARD: Okay.

17 MR. JAIN: The other are the typos, which I won't
18 go through.

19 MR. BEARD: Yeah.

20 MR. JAIN: The third one is from the third column
21 relating to MS-106A.

22 MR. BEARD: Wait a minute. Are you on Page 1 or
23 Page 2 of this list?

24 MR. JAIN: Page 1.

25 MR. BEARD: And third column?

#1-4-SueWalsh1

2 MR. JAIN: Third column on the right here, loss
of four RCPs only.

3 MR. BEARD: Yes.

4 MR. JAIN: Okay. It says check closed. It should
5 be AF-3869; and then it has MS-106A, Number 2 main steam to
6 AFBT-1.

7 MR. BEARD: Yes.

8 MR. JAIN: There is an asterisk there --

9 MR. BEARD: Yes.

10 MR. JAIN: -- and the asterisk I believe belongs at
11 the next page, at the end of the next page where it says: If
12 open at the time of the trip valve must be manually closed.

13 MR. BEARD: Oh, I see. It is on the second page,
14 but we need to draw attention to that. Is that what you are
15 saying?

16 MR. JAIN: That's not my problem. I'm not -- my
17 problem is that the loss of four RCPs, trip of the SFRCS does
18 not send a close signal to MS-106A.

19 That may have been your intent when you made the
20 note, but by the token of -- I thought this list was intended
21 to mean all the automatically actuated valve on a given para-
22 meter, if you will. And this particular valve will not get a
23 close signal because it's under the check close column; it will
24 not get a close signal for a loss of four RCPs.

25 MR. BEARD: Okay. You raised a general question I

would like to ask you about. Each of these columns starts out, like if you look at the first column with a category marked "Check Close" and then after a number of items it's marked "Check Open" and then the third category, "Check Trip."

MR. JAIN: Right.

MR. BEARD: Okay. By "Check Close" and that kind of language, do they really mean it gets a close signal?

MR. JAIN: That's what I assumed. I don't know where this table is from but that's what I assumed you meant when you give us this table.

MR. BEARD: Well, let me ask the question a different way. Forget where the table is from; I know where it's from. From your understanding of the way the system is designed and operates, should a more proper title be these signals to this column get -- I mean, excuse me, equipment in this first column where it's marked "Check Closed" really get a closed signal from the SFRCS system?

MR. JAIN: Correct.

MR. STALTER: Yes.

MR. BEARD: Okay. So, I think that the term "check" is unnecessary and may be confusing.

MR. JAIN: Yeah. I think it may be from a procedure, like ATOG or something.

MR. BEARD: But having taken care of that general question, let me come back to the specific one that you raise

#1-6-SueWalsh with regard to this third column under the loss of the reactor
2 coolant pumps. MS-106A does not get a closed signal?

3 MR. JAIN: Correct.

4 MR. BEARD: So, this really should not be there?

5 MR. JAIN: That was my intent.

6 MR. BEARD: Okay. So that's really an item that
7 is different from the first category where we needed to add
8 items; this item should probably should be taken off.

9 MR. JAIN: And if you take that off, you might want
10 to take the note off, too.

11 MR. BEARD: Is that the only place the note applies?

12 MR. JAIN: That's the only place where --

13 MR. BEARD: On the second page, there is a similar
14 entry for MS-107A.

15 MR. JAIN: That applies there, too.

16 MR. BEARD: It applies -- the note does, but should
17 that item really be deleted?

18 MR. JAIN: Correct. The comment applies there,
19 too.

20 MR. BEARD: Okay. So, in that case we can also
21 delete the footnote.

22 MR. JAIN: Correct.

23 MR. BEARD: Okay. All right. Did you have any
24 items of a different nature other than those two?

25 MR. JAIN: Okay. Let me -- I think I did have -- I

#1-7-SueWalsh

don't know if you wish to make this clarification or not, but this table to me, at least, is confusing as far as understanding actuated equipment response, because of the overriding actions as to which valve would go where.

For example, MS-106, 106A, 107, 107A will go closed if you had low pressure in both generators. I don't know if that's totally evident from here. Maybe you will take some time to find that out from here.

MR. BEARD: Let me see if I understand you. You are saying that like, for example, on Page 1, the first column says: Steam line 1 low pressure (overriding action), and so they are saying that certain valves will open and certain things get tripped?

MR. JAIN: Correct.

MR. BEARD: And one of the items says, under check open, or actually I guess we are calling it open now, and that's 106A would get an open signal.

And I think your comment is saying that that's true if that's the only actuation?

MR. JAIN: Right.

MR. BEARD: But if you have both channels low pressure, then this is not true?

MR. JAIN: Correct.

MR. BEARD: Okay.

MR. JAIN: Or the other generator is also bad, then

#1-8-SueWalsh| this will also get closed.

2 MR. BEARD: That's what I'm trying to say, too.
3 So this is true some of the time but not all the time?

4 MR. JAIN: Correct.

5 MR. BEARD: I certainly agree with you that it's
6 confusing. How would you suggest that we could clarify this,
7 or did you give any thought to that matter?

8 MR. JAIN: Yeah. The table that I do like is a
9 matrix format of all the SFRCS-actuated equipment that we
10 made back in 1977. I could give you a copy of that.

11 To me, that has been the best source of under-
12 standing which valve will go where.

13 MR. BEARD: A matrix?

14 MR. JAIN: Correct.

15 MR. BEARD: Is this matrix included in any official
16 Company documents such as Systems Procedures or Emergency
17 Procedures anyplace, or is this not included?

18 MR. JAIN: It was included. And I think that was
19 the only place it was included was the September '77 LER,
20 September 24, 1977 event at Davis-Besse LER.

21 MR. BEARD: If you think that your matrix is a
22 better way to convey the way the system operates, and are
23 willing to give me a copy, I certainly would like to consider
24 using it. Because the whole intent is for me, as a member of
25 this Team, to understand how this system is designed and

#1-9-SueWalsh 1 operates. And, then secondarily to write a report so that
2 other people can understand it.

3 MR. JAIN: Uh-huh.

4 MR. BEARD: And if your matrix is a better way and
5 eliminates confusion, I certainly would like to consider it.

6 MR. JAIN: You realize that it could be personal
7 preferences. For some people, this is better; for some
8 people, that could be better.

9 MR. BEARD: My preference is whichever is the
10 clearest. And so I would like to accept your offer to give
11 me a copy of that.

12 MR. JAIN: Okay. I will do that when we take a
13 break.

14 MR. BEARD: All right. When that document is
15 received, I would like that entered as one of the exhibits
16 so that the record will be complete that this is what we
17 received.

18 (The document referred to is
19 marked as Exhibit 1 and submitted
20 for the record, not attached herein.)

21 MR. BEARD: Okay. Let me ask you a general
22 question. You said earlier that the kinds of changes that
23 need to be made to this set of tables is that a number of
24 items need to be added to be complete.

25 MR. JAIN: Right.

#1-10-SueWalsh

2 deleted.

3 MR. JAIN: Right.

4 MR. BEARD: Can you give me a feel for, like the
5 number of changes that we are talking about to make this thing
6 correct? You know, are we talking onesies, twosies, twenty,
7 a hundred?

8 MR. JAIN: I would make about ten changes on Page
9 1 and maybe five or six on Page 2. Somehow the other, Page
10 1 and Page 2, were different.

11 MR. BEARD: Okay. So, something on the order of
12 fifteen changes?

13 MR. JAIN: Right.

14 MR. BEARD: Okay. And I guess if I looked at the
15 table here, just roughly eyeballing it, there is probably,
16 would you say, twenty items on a page, twenty-five items on
17 a page?

18 MR. JAIN: It's hard for me to --

19 MR. BEARD: Roughly. I don't want to count ther,
20 but I'm just saying, you know, that if I just look at the
21 first page of this table there is something on the order of,
22 say, twenty-five or thirty-five items. So, the two pages --
23 I mean, the total that is on this when it was handed to you,
24 let's say, there is thirty items on each page; that is sixty
25 items.

#1-11-SueWalsh

MR. JAIN: Okay.

2 MR. BEARD: And then we were saying a minute ago,
3 to make it correct we need to correct something on the order
4 of fifteer changes.

5 MR. JAIN: Correct.

6 MR. BEARD: Okay.

7 MR. JAIN: Disregarding the typos.

8 MR. BEARD: Yeah. The typing leaves a bit to be
9 desired.

10 MR. STALTER: Is there any need to continue with
11 your table if you are not going to use it, if you are going to
12 use the table we supply you?

13 MR. BEARD: What I would prefer to do is receive
14 from you folks your mark-up of this table so that I can know
15 where this really needs to be corrected.

16 MR. STALTER: Okay.

17 MR. BEARD: But, in terms of what I will probably
18 put in the Team's report it's most likely going to be the
19 matrix that Sushil suggested. But obviously I haven't made
20 a final decision on that. I won't until I look at it.

21 But that's the way I would like to leave it if
22 that's okay with you.

23 MR. JAIN: Sure.

24 MR. STALTER: Okay.

25 MR. BEARD: If that's the case, have we covered

#1-12-SueWalsh at least in a general way the kinds of things that you are
2 going to give us a copy of that covers the specifics?

3 MR. JAIN: Yeah, I think so.

4 MR. BEARD: Okay. So if we can arrange to get that
5 Xeroxed somehow we can --

6 MR. JAIN: May I take my comment back on the note
7 here.

8 MR. BEARD: The asterisk, you mean?

9 MR. JAIN: Yes.

10 MR. BEARD: You found another valve that it really
11 applies to?

12 MR. JAIN: Yes.

13 MR. BEARD: That's on the second page in the middle
14 column, MS-107?

15 MR. JAIN: Right. And I have a correction there.

16 MR. STALTER: 107A.

17 MR. BEARD: 107A?

18 MR. STALTER: Yes.

19 MR. JAIN: And I have a correction there, too, be-
20 cause the low-high level of RPT trips don't close the valve,
21 only the low pressure closes the valve.

22 MR. BEARD: So, that the --

23 MR. JAIN: The middle column is for three trips.

24 MR. BEARD: Yes. I see that that's the way the
25 column is labeled. And what you are saying is as far as

#1-13-SueWald MS-107A goes, which is only listed once under that column,
2 it --

3 MR. JAIN: Right.

4 MR. BEARD: -- doesn't apply to the three things
5 that the column is titled for?

6 MR. JAIN: Right.

7 MR. BEARD: It only applies to one of them?

8 MR. JAIN: Yes. And if you say in parenthesis
9 there, only on steam line low pressure, then you don't
10 need the asterisk.

11 MR. BEARD: So, we can still take out the
12 asterisk footnote --

13 MR. JAIN: Yes.

14 MR. BEARD: -- and by adding that parenthetically
15 we will have it correct?

16 MR. JAIN: Yes.

17 MR. BEARD: Okay. Anything else you happen to
18 remember?

19 MR. JAIN: I think that is it.

20 MR. BEARD: Okay.

21 MR. JAIN: This is okay.

22 MR. BEARD: Yeah, I just did that for the con-
23 venience of the reader, that when he reads all these tables
24 and it says, for example, MS-375 main steam drain gets a
25 closed signal, that he would have some better understanding

#1-14-SueWalsh if there was a cartoon there he could refer to.

2 MR. JAIN: But those valves don't show --

3 MR. BEARD: I know. I know. But the majority
4 of the ones that are related to this event are.

5 But I would intend that the Team report would have
6 some drawing similar to this for the convenience of the read-
7 er, maybe not this drawing. Okay.

8 MR. JAIN: If you were using this, I would sug-
9 gest you show the motor operator.

10 MR. BEARD: Oh, yeah, yeah. This was for pre-
11 paratory. Okay.

12 Where do we want to go here.

13 MR. JAIN: I am on 3, that's okay.

14 MR. BEARD: Okay. Figure 3, that's the one that
15 shows the buffers and logics.

16 MR. JAIN: Right.

17 MR. BEARD: Okay. All right. For the record
18 I will point out, this is the figure that I drew up to try
19 and convey in some simplified way the way the reactor con-
20 trol system would respond to steam generator low level in-
21 puts.

22 MR. JAIN: Right. I will go through the inputs
23 here one by one.

24 MR. BEARD: Fine.

25 MR. JAIN: On the left side here where we show

#1-15-SueWalsh

the steam generator level instrumentation cabinets --

2

MR. BEARD: Yeah.

3

4

MR. JAIN: -- just a suggestion there. We are showing the low level bistables but the logic also has a high level bistable.

5

6

MR. BEARD: That's correct.

7

MR. JAIN: And it's an Or situation.

8

9

MR. BEARD: So, if I wanted to portray on this figure high level also, I would want to do that?

10

MR. JAIN: Right.

11

12

MR. BEARD: I'm not sure for the purpose of covering this event that it's necessary.

13

MR. JAIN: That's why I said it was a suggestion.

14

MR. BEARD: Right.

15

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fine.

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END #1
Simons flws

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Sim 2-1

1 The gate one slash two immediately following
2 the cyclic -- the steam generator level instrumentation
3 cabinet, it is just a different terminology I guess. We
4 people here, the way it is drawn here, we consider that
5 as an "and" gate.

6 MR. STALTER: This is drawn as an "and" gate.

7 MR. YARGER: Yes.

8 MR. JAIN: It is one out of two.

9 MR. STALTER: Which would make it an "or" gate.

10 MR. BEARD: I know. Unfortunately, the drawing
11 that I used I recognize this really serves an "or" function.
12 But the drawing that your plant seems to use, E-18 to be
13 specific, shows it in the graphical form of an "and" gate
14 with a one out of two written into this box.

15 MR. JAIN: It is not an "and" gate that is
16 shown. It is just a box that is shown.

17 MR. BEARD: Oh, just a box.

18 MR. JAIN: It is not an "and" gate that is shown.

19 MR. BEARD: Maybe for clarity's sake it would
20 be better to just show that as an "or" gate.

21 MR. JAIN: Yes, that would be better.

22 MR. BEARD: Okay. I think for this being a
23 tutorial type system description, I think we can take that
24 liberty for the sake of clarity.

25 MR. JAIN: Okay. Going towards the right here,

Sim 2-2 1 I couldn't read the word. I presume it is manual actuation.

2 MR. BEARD: Up here at the top?

3 MR. JAIN: Yes.

4 MR. BEARD: There are three of them I guess, or

5 four of them that come in from the top. The first one was

6 intended to be manual actuation.

7 MR. JAIN: Well you look at E-18, I presume it

8 was labeled as manual actuation mainly because of the label

9 in here called manual initiation.

10 MR. BEARD: Yes.

11 MR. JAIN: Indeed, the signal here is a reverse

12 differential pressure signal.

13 MR. BEARD: That manual input is a reverse

14 differential?

15 MR. JAIN: In fact, really, the signal that goes

16 through this one out of two logic is in fact a reverse

17 differential pressure input. The manual is a supplement, if

18 you will.

19 MR. BEARD: So let me take my copy and show

20 this. This really -- is it this whole section right here?

21 MR. JAIN: Right.

22 MR. BEARD: All right. This really is ---

23 MR. JAIN: --- is the reverse differential

24 pressure.

25 MR. BEARD: Reverse DP.

Sim 2-3

1 MR. JAIN: Right.

2 MR. BEARD: Is this the one that gives you the
3 feedline break protection?

4 MR. JAIN: Correct.

5 MR. BEARD: All right. This is the feed or
6 steam minus feed or whatever.

7 MR. JAIN: Right.

8 MR. BEARD: Because that is the only place on
9 E-18 that I found a manual input.

10 MR. JAIN: I frankly don't know where that is.

11 MR. BEARD: I found the diagram difficult because,
12 you know, in this event there was a situation where the
13 operator pushed some manual inputs, and I was trying to
14 understand just from the logics where did that signal come
15 in and therefore what did it cause to change states, et cetera,
16 and I couldn't find it.

17 MR. JAIN: Yes. If you wish, we have drawings
18 here which show those manual actuation switches and how they
19 factor in.

20 MR. BEARD: Why don't we go ahead and just jump
21 off, since we are on this subject, and get to that, or at
22 least get a copy.

23 You said you had a copy of that?

24 MR. JAIN: Of the drawings?

25 MR. BEARD: Yes. Why don't we just make a note

Sim 2-4

1 as to what drawing it is and make it part of the record
2 that we received whatever it is.

3 MR. STALTER: E-65-B.

4 MR. JAIN: I don't know if I have them here.

5 (Pause.)

6 Okay, E-65-B, and there are several sheets that
7 show several manual actuation switches.

8 MR. BEARD: Manual actuation inputs.

9 MR. JAIN: Correct.

10 MR. BEARD: Okay. Do you have a copy there that
11 we can have?

12 MR. JAIN: Yes.

13 MR. BEARD: Do you have one or two? I don't know
14 what you have got. I think the way that we have been working
15 that two is preferable.

16 Okay. Let the record show that we received two
17 copies of this drawing E-65-B.

18 Enough on that subject. We will look at those
19 later.

20 MR. JAIN: Now the same I believe should apply
21 to this manual actuation input.

22 MR. BEARD: At the bottom of the page on my
23 cartoon.

24 MR. JAIN: At the lower right?

25 MR. BEARD: Yes, because that was developed from

Sim 2-5

1 the same reasoning going back to what we just talked about.

2 MR. JAIN: Correct.

3 MR. BEARD: So that is the differential. And
4 since that is not relevant, I may either just delete it from
5 this cartoon entirely ---

6 MR. JAIN: If you wish.

7 MR. BEARD: So that is the steam feed DP. Okay.

8 MR. JAIN: Now going forward on the right, the
9 "or" gate that follows, the first "or" gate, I didn't see
10 any input mentioned on that dot.

11 MR. BEARD: Mine was not labeled. Do you happen
12 to know what that was?

13 MR. JAIN: Yes. It will be steam generator
14 2 (1) low pressure and not blocked.

15 MR. BEARD: I thought that that was the third one.
16 See a little further right where it says steam generator
17 low pressure and then there is a "not" gate, this one.

18 MR. JAIN: Right, and that will be steam generator
19 one low pressure and not blocked.

20 MR. BEARD: Oh, I see. I am with you now. So
21 the one that I have labeled as steam generator low pressure
22 1 (2) and the other will be the other input just upstream of
23 that. Okay. Yes, that is a good clarification.

24 MR. JAIN: I believe that that is all that I have
25 on that.

Sim 2-6

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MR. BEARD: So this with these corrections would be reasonably accurate then?

MR. JAIN: Correct.

MR. BEARD: Okay. Good. That is what we want.

MR. JAIN: Next I go to the ---

MR. BEARD: Wait a minute. We skipped over one other item, but before we leave this level cartoon, let's turn back for a minute and show this little cartoon that really is a diagram of what is inside the box that was labeled steam generator level instrumentation cabinet. I don't know that we have discussed that.

MR. JAIN: We didn't discuss that.

MR. BEARD: Could we just touch on that before we get away from the level side of the system?

MR. JAIN: Okay. Ken, would you like to elaborate?

MR. YARGER: Well, how accurate do you want to be?

MR. BEARD: I want to show the kind of level of detail that is depicted here. In other words, I want to show -- I would like to convey that it is a current loop type of transmitter out there some place, there is a power supply, there is a test operate input and then I go into some module that contains amplifiers and bistables.

MR. YARGER: All right. To make it more

Sim 2-7 1 representative, you should probably put a resistor showing
2 that these bistables are voltaged by curved bistables.

3 MR. STALTER: And there is a dropping resistor
4 on the input to the ---

5 MR. BEARD: Yes. It was associated actually
6 on the drawing with the operate test switch where it is
7 physically shown on the schmatic.

8 MR. YARGER: Right.

9 MR. BEARD: So how about if I just put it -- I
10 guess should it be downstream of that switch? Do you remember,
11 Ken?

12 MR. YARGER: Downstream of that switch so that
13 when you throw it into test you can still use the same
14 resistor.

15 MR. BEARD: Fine. I will make that correction.
16 That is a good one. Thank you. I think, except for a few
17 electrical engineers, nobody would have noticed that, but
18 I would like to be accurate.

19 MR. JAIN: The other possible thing would be
20 that the bistables, the low and the high bistables are
21 a composite unit.

22 MR. BEARD: That is correct. So this really is
23 a low/high dual bistable.

24 MR. JAIN: Right.

25 MR. BEARD: Let me ask you, while we are on this

Sim 2-8

1 subject -- excuse me, I don't want to interrupt you any more
2 than necessary. Would that be all the changes you have got?

3 MR. JAIN: Yes, all the ---

4 MR. YARGER: Do you want to reflect your high
5 trip bistable as the contact output from high and low or in
6 series of one another.

7 MR. BEARD: Oh, they are?

8 MR. YARGER: Yes, sir.

9 MR. BEARD: In that case, I do want to show it.
10 Earlier that was not the case, and I probably would have
11 neglected to show it since it may not be relevant to the
12 event. In other words, I was trying to show just a cartoon
13 related to how the low steam generator level causes the
14 reactor control system to respond. But if they are in series,
15 I guess -- okay.

16 And I take it that it is in the shelf position
17 de-energized?

18 MR. YARGER: Correct.

19 MR. BEARD: Both of those contacts would be
20 normally open for high and low bistables?

21 MR. YARGER: In the shelf condition, they are
22 normally closed.

23 MR. BEARD: Normally closed.

24 MR. YARGER: They are fail safe relay.

25 MR. BEARD: I thought that the plant normal inputs

Sim 2-9

1 to the SFRCS were closed contacts and on trip they opened.

2 MR. YARGER: I am sorry. That is right. I was
3 thinking of something else.

4 MR. BEARD: Okay. And if these are fail-safe,
5 then they would have to be normally open contacts.

6 MR. YARGER: Right.

7 MR. STALTER: They have got to be open.

8 MR. BEARD: If they are in series they had better.
9 I guess if you wanted to closed ones, like on enunciators they
10 are normally the other way, you know, so you put them in
11 parallel for multiple inputs. So one is high and one is low.
12 Damn, I don't remember it that way.

13 MR. JAIN: Do we have drawings?

14 MR. YARGER: For what?

15 MR. BEARD: Ken, let me ask you. I didn't bring
16 my copy of that particular drawing in with me this morning.
17 It is back at the motel. My memory is -- and I don't like
18 to do this in a transcribed meeting, but I think it is
19 important to do it.

20 (Mr. Beard goes to the blackboard and proceeds
21 to draw a diagram.)

22 What I am trying to do is redraw some of this,
23 and I have gotten up to the resistor that completes the
24 current loop. Now my understanding of the way that schematic
25 is, if I can remember it right, it looks like this.

2-10

1 I go into a box that I will refer to loosely
2 as the high bistable, and sitting over on the cartoon is a
3 low bistable, and if I remember right, the way it is wired
4 is I have one input straight into the high level bistable, and
5 then wired in parallel with that I go over and drive a
6 low-level bistable.

7 Then over on the right side of the drawings, if
8 I remember it right, I have got some configurations that show
9 terminal strips coming out and it typically would have, if
10 I remember this right, about four contacts on each one of
11 them.

12 And, if I remember right, these are labeled like
13 this is the low output and this is the high output, and then
14 you have like enunciator outputs and computer outputs and
15 other kinds of things.

16 But if I remember right, these on the drawing
17 were shown separately. Now it may be that downstream of that
18 particular cabinet they are joined and then put in series,
19 or it may be that I am not remembering it right. That is
20 why I wondered.

21 MR. YARGER: They are a series in the steam
22 generator level cabinets, if I remember correctly.

23 MR. BEARD: Okay.

24 MR. STALTER: But the drawing you are looking at
25 is the bistable output, right?

Sim 2-11

1 MR. BEARD: No. I have got two drawings. I
2 have got one of the cabinet, and the one of the cabinet is
3 the one that looks like a bridge table. You know, it has
4 this kind of stuff. Do you remember what I am talking about,
5 Ken?

6 MR. YARGER: Yes.

7 MR. BEARD: With all the connections on each
8 of the bistables?

9 MR. YARGER: Yes, sir.

10 MR. BEARD: Okay. And you have that garbage all
11 over the place.

12 Then the output from that, which happened to be,
13 if I remember right, terminal number script little "X" and
14 script "Z" or something.

15 MR. YARGER: Small "z".

16 MR. BEARD: Small "z". Those were the low-level
17 outputs, and I was thinking that they were wired straight to
18 terminals, and the high and low, I didn't remember it as being
19 a series.

20 MR. YARGER: Yes, sir, they are.

21 MR. BEARD: Okay, fine. Let's just let it go
22 if that is the way it is, and I will change the cartoon
23 accordingly.

24 MR. STALTER: Do you think it is a question of
25 where they are put in series before they get to this terminal

Sim2-12

1 strip or after?

2 MR. BEARD: The only question I had is -- and
3 this is a level of detail we probably shouldn't even be into,
4 but if they are wired in series within that domain that we
5 are referring to, the steam generator level instrument cabinets,
6 I would like to show them in series on this particular page
7 we are looking at at the moment.

8 If they, on the other hand, are wired in series
9 outside of that cabinet, I will show it on a different page.

10 Now electrically it makes no difference. It
11 makes zero difference.

12 MR. YARGER: What you are looking at is consoli-
13 dated control storing. In order to see the series, you know,
14 that contact would be on the field side and the connection in
15 the background.

end Sim
Joe fols

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25

1 MR. BEARD: In other words you are saying
2 if I go from here, that it is probably going to jump
3 between these two right there, and then the outputs go out
4 like that?

5 MR. YARGER: Yes, sir.

6 MR. BEARD: That resolves in my mind, okay,
7 why I missed it. That makes sense.

8 So, if I wanted to do this right, I could
9 come up here and show another bistable, you know, and come
10 out with the same type of context, and I think what I will
11 do is try to show that field wiring by putting a jumper
12 right on this page, and then you show the two lines going
13 out.

14 That ought to be clear to everybody, as well
15 as accurate.

16 Okay. What I intend to do, Larry, is this:
17 I will try to reproduce what we had on the chalk board.
18 In other words, these two bistable units, you know, 6-N,
19 889, or whatever the hell the number was, I believe have
20 parallel inputs -- have separate outputs, and then by virtue
21 of the jumper at the output terminals, then the outputs are
22 put in series as far as any downstream electrical contentions
23 go.

24 MR. YARGER: Yes, sir.

25 MR. BEARD: So, this is something like this

1 is what I would propose.

2 MR. YARGER: Do you want to also show the
3 indicator on there as being only off the low level bistable?

4 MR. BEARD: The indicator being only off the
5 low level bistable.

6 MR. STALTER: Andlog output.

7 MR. BEARD: Well, I guess right now, just by
8 default, I did show it that way, because there is an input
9 marked meter adjust, and maybe I can come off with that
10 with something that just says meter, you know.

11 Is that it?

12 MR. JAIN: Yes.

13 MR. BEARD: You are happy with this now? With
14 those changes, is that correct?

15 MR. YARGER: That is correct.

16 MR. BEARD: Good. Okay. The next one we are
17 going to be getting into is the more interesting one, I think,
18 which is the low pressure thing for which I had drawn up two
19 cartoons, and that is a fairly complicated one.

20 Would this be an appropriate time to take like
21 a two minute -- five minute recess.

22 I don't want to do it in the middle of a
23 discussion. I can see that this next discussion goes on for
24 half an hour, maybe, you know.

25 MR. JAIN: Okay.

1 MR. BEARD: If that suits you, why don't we take
2 about a two minute recess.

3 (Short recess taken.)

4 MR. BEARD: Why don't we continue then after
5 that little recess, and Sushil, did you want to make a comment
6 with regard to this matrix that we talked about earlier?

7 MR. JAIN: Okay. The matrix about the SFRCS
8 actuated equipment, SP System procedure 1105.16 --

9 MR. BEARD: That .11, is that the Rev. number?

10 MR. JAIN: Yes. .11 is the Rev. number. And
11 this essentially outlines all the equipment that is actuated
12 by the SFRCS under a different parameters.

13 MR. BEARD: For the record, could you identify --
14 is that listed as an enclosure, or a figure number, or a table
15 number, or something so that we can refer to it?

16 MR. JAIN: It is listed as Enclosure 2 to that
17 SP.

18 MR. BEARD: Okay. So, this is the matrix that
19 you would refer me to?

20 MR. JAIN: Correct.

21 MR. BEARD: And I think you said earlier that
22 for clarity purposes you would get a copy later?

23 MR. JAIN: Yes.

24 MR. BEARD: Okay, thank you. While we are on that
25 subject, let me bring up another related matter, and that is

1 that on the actuation tables that we passed out the other
2 morning, that you had these comments on.

3 MR. JAIN: Right.

4 MR. BEARD: There were a number of types of
5 comments, and one, of course, was obviously some typo
6 corrections. A number of additions and a couple of deletions.

7 MR. JAIN: Right.

8 MR. BEARD: I think it is important to notice --
9 because I am a little disturbed by it, is that neglecting
10 the typos for a minute, okay, the source that that table was
11 typed from -- I could be wrong, but where I got that source
12 is the Plant Emergency Procedures.

13 MR. JAIN: I believe I have seen that similar
14 table in the ATOG procedure.

15 MR. BEARD: Now, it is one thing to say that I
16 had the wrong information for understanding it for the purpose
17 of writing a system description.

18 It is a different matter to say that the
19 emergency procedures that the operators might use in control
20 room late on Sunday night, or early hours, have the wrong
21 list also.

22 That is a whole different ball game.

23 MR. JAIN: I would not like to comment on that.

24 I had thought that the ATOG Emergency Procedure Table was
25 complete.

1 MR. BEARD: Well, what I am trying to convey
2 is I believe that that is the list that this was typed from,
3 so that obviously there can be errors of the typo-type
4 nature, but a significant number of additions and a few
5 deletions seems to suggest rather strongly that that list
6 ought to be re-looked at for completeness or accuracy, or
7 whatever.

8 I don't know what we would do with that other
9 than, you know, we are both making notes that that is the
10 case. What was that, EP-1202 point something or --

11 MR. JAIN: 1202.01.

12 MR. BEARD: 1202.01, okay. All right. With
13 those few items -- do we have any other items before we took
14 the break that we needed to wrap up on before we go forward?

15 You were going to make some copies of that
16 particular one that is marked up, we are going to make that
17 at the end, when we get through. Are there any drawings?

18 I guess not. Okay. So, we are ready to go into
19 this cartoon that deals with the low pressure side of the
20 steam feed rupture control system, and I want to call to your
21 attention, and you have probably already noticed it, that I
22 chose to draw the cartoon for Actuation Channel No. 2, and
23 the Logic Channel No. 2 that is within that actuation channel.

24 And the reason for it is because I understand
25 that is one of the inputs that the inadvertent actuation would

1 have caused to operate. Okay?

2 MR. JAIN: I did not have any significant
3 corrections to the Logic diagram drawn here except for some
4 clarifications which may be because I couldn't see very well
5 as to what they were.

6 MR. BEARD: Is my handwriting that bad? Oh, yeah.
7 If you are talking about like those outputs where it says
8 Number 2 not low, Number 1 low, Number 2 not low, Number 1
9 low, Number 2 low, Number 1 not low.

10 MR. JAIN: So, I think -- well, the first one is
11 2, the second one is 1.

12 MR. BEARD: Let me start up at the top. So that
13 the record is clear, the very top line coming out of the 1 out
14 of 4 gate, is either steam generator low pressure, and that
15 causes 4, the system output, to light up.

16 MR. JAIN: Correct.

17 MR. BEARD: The next one down says steam generator
18 No. 2, low pressure. That is the one apparently that would trip
19 on the initial depressurization of steam line break upstream
20 of the MSIVs.

21 All right. The next one down, I believe, is
22 the combinational output, which is No. 2, not low pressure,
23 but -- or and -- Number 1, with low pressure.

24 MR. JAIN: Correct.

25 MR. BEARD: The next one would be No. 2 not low,

1 No. 1, low.

2 MR. JAIN: Correct.

3 MR. BEARD: And then the last one here would
4 be No. 2 low, No. 1 not low.

5 MR. JAIN: Correct.

6 MR. BEARD: That would correct it.

7 MR. JAIN: And if you wish -- this is No. 1
8 low. (Pointing.)

9 MR. BEARD: Down at the bottom, that would be
10 right. That might be a worthwhile addition to point that
11 out.

12 So, the basic logic seems to be reasonable.

13 MR. JAIN: Correct.

14 MR. BEARD: Okay.

15 MR. JAIN: I did want to clarify though that
16 under RCS 60-B, the list of equipment in the parenthesis
17 -- the very first one is the main feed water control valve.
18 Which I think is obvious if you go through the list, but
19 just for clarification purposes --

20 MR. BEARD: I think -- the main title says
21 isolate main feedwater non-essential valves, and then
22 parenthetically I have listed the main control valve for
23 No. 1 steam generator, and then on No. 2 steam generator
24 you get the main control valve block valve, and you get the
25 startup control valve.

1 MR. JAIN: Now I was just suggesting to add
2 MSW in front of the control. Just to highlight for the
3 main feed control, and then we also have the No. 2.

4 The valve number just below the No. 2 block,
5 I believe it is 779.

6 MR. BEARD: 779?

7 MR. JAIN: Yes.

8 MR. BEARD: Okay. Instead of 799.

9 MR. JAIN: Correct.

10 MR. BEARD: Okay. Are there any other --
11 There are some interesting subtleties like you are talking
12 about Kent, that the MSIV, MS100 comes off a different
13 system output than MS 101. They don't come off the same
14 outputs for the S FARCE (Frecus) system. One comes off
15 RCS 102, and the other one comes off RCS 602.

16 MR. JAIN: One other clarification I wanted to
17 add, if I may, was for the RCS 302 output, and in addition
18 to actuation of the MS 107, 3872, 599, and closure of 3871,
19 this output also sends an inhibit close signal to 599 or
20 608. In this case, it would be 599.

21 MR. BEARD: Wait a minute. Let's see how I
22 would like to word that.

23 Are you saying a close inhibit to, is that what
24 you are saying?

25 Close inhibit to -- and where do they send it to?

1 MR. JAIN: For Logic Channel 2, it will be AF 6,
2 -- excuse me, AF 599.

3 MR. BEARD: Okay. So, with that correction,
4 three types of output coming out of RCS 302? I have some
5 start signals, some stop signals, and this one we will call
6 close inhibit?

7 MR. JAIN: Right.

8 MR. BEARD: Okay. That helps me understand that
9 valve story we were talking about the other day.

10 All right.

11 MR. JAIN: The other thing I think I failed to
12 do, and I don't know if you wish to do that, is to show the
13 low pressure lock of the high level trip.

14 MR. BEARD: Low pressure block of the high
15 level?

16 MR. JAIN: I don't know if you are interested in
17 that, but what we have is a blocking of the high level trip
18 once the steam generator pressure has gone down below 650.

19 The same block button that you use to block the
20 low pressure trip also blocks the high level trip.

21 MR. BEARD: Well, during the course of an event,
22 would you expect an operator to use that?

23 MR. JAIN: No.

24 MR. BEARD: Okay.

25 MR. JAIN: That block button would normally be

1 used during a control cool down.

2 MR. BEARD: Would it be used during the cool down,
3 or when you go into something like wet layup?

4 MR. STALTER: Normal plant shutdown.

5 MR. JAIN: Normal plant shutdown when the steam
6 generator is below 650 to prevent actuation of SFARSE they
7 would block the low pressure trip, and blocking the low pressure
8 trip also blocks the high level trip.

9 MR. BEARD: Okay, I see what you mean. You are
10 right. You have to hit the low pressure one for the normal
11 shutdown process, but you really don't need to block the high
12 level --

13 MR. STALTER: Yes, you do, because you end up
14 refilling the steam generator to a high level.

End 3. 15
SueWal fols. 16

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#4-1-SueWalsh1

MR. JAIN: That's down the line.

2 MR. BEARD: But that's only in wet layup that
3 you fill it up, right?

4 MR. STALTER: Yes.

5 MR. BEARD: So if you were just coming to cold
6 shutdown and plan on restarting it in a couple of days, you
7 would never need to redo that, would you?

8 MR. JAIN: Yes, if you don't go below 290 degrees
9 I believe. You won't have to block the high level trip but
10 you would because the low pressure block also blocks that.

11 MR. BEARD: So, what you are saying is that you
12 get the function although you may not need it? That's what
13 I'm trying to understand.

14 MR. JAIN: Right.

15 MR. STALTER: Right.

16 MR. BEARD: If you were to show that -- I didn't
17 review the logics to try to include that, but it might be
18 worthwhile, like you are suggesting, to say where on this
19 cartoon does that signal come from, and then show it as an
20 arrow going off the page, say a block of high level trip.

21 MR. JAIN: Yeah. But I noticed that the other
22 day, and I was trying to find supporting documents and
23 unfortunately I haven't found them yet.

24 MR. BEARD: Well, if we don't have an easy reference
25 why don't we decide we probably won't need to show that, because

#4-2-SueWalsh, that really would not involve this event?

2 MR. JAIN: Right.

3 MR. BEARD: Good. Okay, so with those few cor-
4 rections you are happy that this is accurate?

5 MR. JAIN: Correct.

6 MR. BEARD: All right. Now, the next page was --

7 MR. JAIN: One clarification, if you might want
8 to show it to make it simple for a reader would be to combine
9 the output of these two And Gates, because 302 and 902 are
10 essentially the same functions.

11 MR. BEARD: This is correct. If you will notice --

12 MR. JAIN: I think you did somewhere else.

13 MR. BEARD: I did it some other places on the
14 level one.

15 MR. JAIN: Just below this you did that.

16 MR. BEARD: Right.

17 MR. JAIN: 402 and 802.

18 MR. BEARD: But the difference is that if one
19 wants to consider single failures, okay, and that's not
20 really part of this review, if you look at the way 402 and
21 802 are configured, you can say: Okay, I can wipe out both
22 of those by postulating the upstream And Gate; in contrast,
23 the 302 and 902 I have to recognize there are two And Gates.

24 So, unless I want to talk about some common
25 phenomena that's a little better design. That's all.

#4-3-SueWalsh 1

MR. JAIN: Yeah, I agree.

2

MR. BEARD: So, I thought why not tell it the way

3

it is. I think that amount of detail, most readers will be

4

able to follow without getting too confused.

5

Okay. Last page finally is the one having to do

6

with the initiate bypass and block logic. And I'm not certain

7

that I'm terribly interested in it other than in the event the

8

operators did use this feature.

9

MR. JAIN: The block feature?

10

MR. BEARD: That's my understanding. Do you

11

remember it differently, Larry?

12

MR. JAIN: He used the manual actuation on low

13

pressure but not to my knowledge that low pressure block.

14

MR. BEARD: He sure did. Well, let me say it

15

differently, okay.

16

We have been told by the people that were in the

17

control room, the operators, particularly the Assistant Shift

18

Supervisor, who I guess was Steve Feasel, that when the isola-

19

tion valves between the steam generators and the aux feedwater

20

did not automatically reopen like they should, then they tried

21

the manual reopen and that didn't work, and then the guy run

22

around, he hit this initiate bypass and block circuit, they

23

still didn't reopen. He came back and tried manual again, and

24

it still didn't reopen.

25

At that time, they started sending people out to work

#4-4-SueWalsh1 on the valve. But it has been told to us repeatedly that
2 in the effort to recover from those valves that would not
3 reopen that this feature was used.

4 And that's the only reason this page is even in
5 this package.

6 MR. JAIN: I just didn't know.

7 MR. BEARD: Okay. It's no big deal. Okay. Did
8 you have any corrections on that page?

9 MR. JAIN: Just some clarifications. The -- in
10 the middle of the page, the output of the two out of two
11 gate it says pressure high.

12 MR. BEARD: Yeah.

13 MR. JAIN: I would have thought it meant pressure
14 low.

15 MR. BEARD: Let me explain to you how I think it
16 works.

17 MR. JAIN: Okay.

18 MR. BEARD: Then, if I'm wrong this point will
19 come out. My understanding is, suppose that one of the
20 various channels has tripped that signify low pressure
21 coming in, then on the previous page where it says one out
22 of four all of those things will kick off. Okay.

23 At the same time, I will provide that one out of
24 four signal into this page coming in here at the top where
25 it says from the one out of four low pressure logic.

#4-5-SueWalsh

1 I would then push a button or turn a switch or
2 whatever it is marked initiate bypass. It's over on the left,
3 that input on my cartoon.

4 And then what would happen is, if the pressure
5 really has, by two separate sensors, not the one that said
6 low pressure but if two separate ones says: Wait, the pres-
7 sure really is higher, at least acceptably high, then maybe
8 I would consider the first signal spurious and want to block
9 it.

10 But if that pressure really is high then it comes
11 to that two out of two logic, goes into an And Gate where it
12 combines with the initiate bypass circuit and goes over
13 through another gate and ends up giving you the light that
14 says: Okay, now I've got permission to block because you've
15 got one input or more inputs that say low but I've got two
16 hard ones that say it's high or okay. So, the light comes
17 on, says: Permission to block.

18 So, then the next thing the guy does is having
19 received that light he pushes the button marked "block" and
20 then it goes through the various gates here and you end up
21 getting the light that says "block." That signal has gone
22 through.

23 And then a parallel output of that is to take and
24 go back to three places that effect that blocking function.
25 And that's my understanding.

#4-6-SueWalsh

MR. JAIN: The understanding is totally correct.

2 But it was confusing to me; the high term there implied that
3 the generator pressure was actually way high up.

4 MR. BEARD: Okay.

5 MR. JAIN: The intent here was you can only block
6 a low pressure if the pressure is within 650 and 600 psi.
7 600 psi being the trip setpoint.

8 If the pressure drops below 600 you cannot
9 physically block.

10 MR. BEARD: Okay. Let me see if I can -- you are
11 saying that as you bring the plant down, is this the one you
12 use for normal cooldown?

13 MR. JAIN: Yes.

14 MR. BEARD: Okay. As you bring the plant down,
15 if you don't block it you are going to get actuation at 600?

16 MR. STALTER: Right.

17 MR. BEARD: So around 650 --

18 MR. STALTER: You get permission to block.

19 MR. BEARD: Don't you have to initiate? Don't
20 you have to push the button to initiate bypass to get the
21 permission to block light?

22 MR. STALTER: I don't think so.

23 MR. JAIN: I don't think so.

24 MR. BEARD: All right. Let's let that detail go for
25 a minute. So, the setpoint here is really 650?

#4-7-SueWalsh

MR. JAIN: Correct.

MR. BEARD: Or, is it --

MR. JAIN: Well, the actual set -- we deal in terms of 650. The actual setpoint --

MR. BEARD: I mean it's in that ballpark?

MR. JAIN: It's --

MR. YARGER: 612 is the trip. 658 I think is the block permit.

MR. BEARD: All right. Let's call that 660 just for talking purposes. So, what this really means is not that the pressure is abnormally high --

MR. JAIN: Right.

MR. BEARD: -- which is what I think you were concerned about. But it's really that it means it is high enough to block?

MR. JAIN: Correct.

MR. BEARD: The dooflickey, and what this also does for you more than that is I believe that if the pressure should have been blocked and then it returns, I think you will get an automatic unblocking?

MR. JAIN: Correct.

MR. BEARD: And that's the safety related aspect of this whole circuit?

MR. JAIN: That's true.

MR. BEARD: Is the automatic unblocking?

#4-8-SueWalsh1

MR. JAIN: That's the IEEE 279.

2

MR. BEARD: Right. And I think that little two

3

out of two box is where you get all of that?

4

MR. JAIN: Correct.

5

MR. BEARD: And --

6

MR. YARGER: It only takes -- you've got to

7

have both of them to block but only one to release the

8

block.

9

MR. BEARD: That's what I mean. So that if you --

10

having been blocked and for some reason, either pressure

11

channel senses you are above 660 then you will get automatic

12

clearing of that block or auto-unblocking is another way to

13

say the same thing.

14

MR. YARGER: You are only showing one channel,

15

right?

16

MR. BEARD: Yeah. This is logic channel 2.

17

Now, what happens -- how they get combined downstream may be

18

a different story, but as far as this logic channel goes --

19

MR. YARGER: I think maybe we are saying the

20

same thing. We've got to receive. You have both pressure

21

switches below 650 to give you a block permissive. It

22

only takes --

23

MR. BEARD: It's below?

24

MR. YARGER: Well, 650.

25

MR. BEARD: I know, but I was thinking it was on

#4-9-SueWalsh

2 the high side. Really, what you want to say is this two out
3 of two block means that there is less than 650, whatever the
4 number is that you want to use, but you get an output of
5 that two out of two box when both are low.

6 All right.

7 Mr. YARGER: Both --

8 Mr. BEARD: So, in your sense you are absolutely
9 correct. This really, to be more precise, should say pres-
10 sure is low and by that, both below 650.

11 Mr. JAIN: Correct.

12 Mr. BEARD: Okay. It's not high. All right.

13 Okay. Now, this particular part of the E-18 drawing is
14 very complicated in the sense that whoever layed it out on
15 the page did not do anybody any favors. I mean, it's hard
16 to follow through.

17 Mr. JAIN: It is.

18 Mr. BEARD: And that's one reason why I want to
19 try to see if I could trace it through and get all the
20 blocks in there and get them in the right places and then
21 figure out, once it's layed out on the paper decent, how
22 the thing really works.

23 Mr. JAIN: In fact, when I showed this to somebody
24 the person said this is much better than what we have, the
25 drawing.

Mr. BEARD: It's easy for me to understand. I had

#4-10-SueWalsh a hell of a time with that thing that is on the E-18. And
2 what this does for you, among other things, is separates it
3 out and by -- I deliberately layed it out on the page, so
4 that the order in which things occur is in the way people
5 normally read in the United States of America; that is, they
6 start at the top and go to the bottom, not right to left and
7 up and down, things like that.

8 So that for me that's the only way that I would ever
9 draw it, you know. But, at any rate, with those corrections --

10 MR. JAIN: One more clarifying thing.

11 MR. BEARD: Good.

12 MR. JAIN: Because these pressure switches relate
13 to channel 2, I think we should mention in the title of this
14 this is logic channel 2.

15 MR. BEARD: Okay. Well, this is intended to be a
16 continuation of the previous drawing.

17 MR. JAIN: As long as that's clear.

18 MR. BEARD: Maybe we should add that just to
19 make sure that that's clear to everybody. Okay.

20 Anything else?

21 MR. JAIN: No.

22 MR. BEARD: Okay. Now, if you will -- some time
23 when we take a break if you will make a Xerox of yours so
24 that I will have all of those notes on it, I will be just
25 tickled pink.

#4-11-SueWalsh

2 MR. JAIN: Yeah. I was going to have someone
copy these.

3 MR. BEARD: Yeah. Just walk out if you are going
4 to have somebody do that.

5 (Pause.)

6 Okay. Are you ready? Let me ask you, Sushil, are
7 we now at the point where we have covered the basic logics
8 and that item is finished, so that now we should go to the
9 actuated equipment discussion?

10 MR. JAIN: Yes. As you -- I believe yesterday
11 that you wanted to look at the CCC logic drawings.

12 MR. BEARD: Yes.

13 MR. JAIN: Do you have copies of that?

14 MR. BEARD: I don't want to spend a great deal of
15 time here in this meeting with a lot of people, but I would
16 just like to understand what drawings we are talking about so
17 that later I will be able to follow through them, if that
18 could be done.

19 MR. STALTER: I believe we gave you copies of
20 these when we went to Bethesda. They are included in that
21 roll of drawings that we delivered there.

22 MR. BEARD: Let me see. Let me just read these
23 things off so that we can resolve that problem. It says
24 Consolidated Controls Drawing. S, as in Sierra, 6, Nancy,
25 295. A couple of pages of that. This looks like a second

#4-12-SueWals1 copy of the same drawing. All right. Here is an S-9-N27.
2 It says Sheet 2 of 2 and 1 of 2. There is one copy of that.
3 And here looks like a second copy of that.

4 At any rate, as I see it, you have given me two
5 copies of two drawings.

6 MR. STALTER: Uh-huh.

7 MR. BEARD: And one is a logic diagram it appears
8 from the look-see at it, and the other one is more of tables
9 and numbers, although Page 1 of that has a lot of inter-
10 connections on it.

11 Yeah. Now, what would you call this type of
12 drawing?

13 MR. YARGER: Signal flow diagram.

14 MR. BEARD: Okay. Signal flow. This is not what
15 you call a connecting diagram or something of that nature?

16 (Mr. Yarger nodded in the negative.)

17 A wiring diagram, I guess, is the term I was
18 thinking of.

19 MR. STALTER: One thing is that we have set up a
20 little demonstration board where we can change the inputs
21 and look at the outputs.

22 MR. BEARD: You mean, like a model?

23 MR. STALTER: Yeah.

24 MR. JAIN: A test model.

25 MR. STALTER: We actually flip the input switches

#4-13-SueWalsh and you can look at what the outputs are, and it demonstrates
2 readily what happens on this drawing, or what this drawing
3 is doing for you, if you are interested in looking at.

4 MR. BEARD: I think it's nice that you have a
5 system, but unfortunately with the press of business I'm
6 probably not going to be able to take advantage of seeing
7 it this trip.

8 Okay. Now, Kent, could you tell me just in a
9 few sentences, how would you characterize these drawings?
10 One is obviously -- the one I was trying to call a wiring
11 diagram, you call signal flow.

12 How would you characterize the other one? Just
13 the actual detail logic components that implemented the
14 E-18 drawing?

15 MR. YARGER: That would be correct.

16 MR. BEARD: I don't want to put words in your
17 mouth. Don't misunderstand me.

18 MR. YARGER: That's the logic drawing that the
19 E-18 is representative of.

20 MR. BEARD: Okay. Just out of curiosity, do you
21 know which drawing originally way back when came first?

22 MR. JAIN: I think the E-18 drawing came first.

23 MR. BEARD: Okay. So there was a general logic
24 in terms of Or Gates and And Gates and one out of fours and
25 things of that nature. And from that, someone developed

#4-14-SueWalsh this detailed design logic?

2 MR. JAIN: Right.

3 MR. STALTER: I'm guessing, but I would assume
4 that this is part of the big package that went out, the E-18
5 was then, and the logic drawings were developed by CCC to
6 implement this.

7 MR. BEARD: Okay.

8 MR. STALTER: And they were bound together.

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Sim 5-1

1 MR. BEARD: Does he know we have had a lot of
2 trouble over the years on logic diagrams versus schematics
3 of real design drawings of which came first?

4 MR. STALTER: Yes. Sometimes if a system exists
5 ahead of time, you will make a logic diagram.

6 MR. BEARD: I think some of the original
7 designs at some plants never had logic diagrams. They went
8 from I think an idea straight to the detailed design and
9 then later there was a desire to have logics.

10 MR. STALTER: And then you develop them
11 backwards.

12 MR. BEARD: And sometimes they agree with the
13 drawings and sometimes they don't, you know.

14 All right. This should be very helpful.

15 Remember, we had this discussion when we talked
16 before, Ken, about there were apparently some details, and
17 I don't remember now what they were, but there were some
18 details that were not obvious from the E-18 logic drawing
19 that may be more obvious on this logic diagram from CCC.

20 Do you remember any of those that we brought
21 up that maybe we need to discuss rather than just trying
22 to review it at night?

23 MR. YARGER: Well, one of them was in reference
24 to 599608.

25 MR. JAIN: What this logic module will show

Sim 5-2

1 you is just one logic module, you know, and it will not
2 show the actual functioning of contacts or something in
3 the other channel.

4 MR. BEARD: But this signal flow diagram would
5 show the inputs and outputs to the logic board, right?

6 MR. YARGER: The signal flow diagram shows you
7 from input to output, or I think it is channels one and
8 three?

9 MR. BEARD: I didn't even look to see which one
10 it is. Wait a minute. I was reading from S-9 and 27, the
11 signal flow diagram. Note No. 1 says "This drawing
12 illustrates cabinet No. 1, 1/3 and A-1/A-2. Cabinet No. 2
13 is 2/4 and B-1 and B-2."

14 So apparently this is typical of actuation
15 channel 1.

16 MR. YARGER: That is correct.

17 MR. BEARD: Oh, I know what it was. The other
18 day we were talking about the outputs of the logic diagram
19 E-18, that notation that says "System Outputs" and then
20 within the block it will say RCS-602, for example. And
21 we were discussing that maybe 602 doesn't represent a
22 discrete relay and it is symbolic to represent something
23 else maybe, or it is a family of relays. I think that is
24 the area where this came up, didn't it?

25 MR. YARGER: I think like RCS-602 is Bechtel's

Sim 5-3

1 representation of the relay, and our representation would
2 be K-602.

3 MR. BEARD: Okay. So where it says 602, does
4 that represent a single relay or a family of relays, like
5 602-A, B, C, D, and E?

6 MR. YARGER: I couldn't tell you that. I don't
7 know how Bechtel does theirs.

8 MR. BEARD: Because the reason I am curious is
9 because some of these tables that I have seen of actuated
10 equipment, for example, the E-19 I believe is the drawing
11 that lists the actuated equipment will say that for valve
12 599 it is actuated by RCS-602-F, and I just make that example
13 up.

14 MR. YARGER: That would be the residual relay
15 designation.

16 MR. BEARD: Is the "F" a relay or a contact?

17 MR. YARGER: It is a relay.

18 MR. BEARD: So that subsequential letter is
19 a whole relay and not a contact?

20 MR. YARGER: That is right.

21 MR. JAIN: So what we are saying then is that
22 the 600 output could drive a whole set of relays, A, B, C,
23 D, E and F in each channel.

24 MR. BEARD: Right.

25 MR. YARGER: But you don't say it is a 600 output.

Sim 5-4

1 MR. BEARD: If I look on E-18 and it says
2 RCS-602, I should interpret that -- or I am asking -- I
3 should interpret that as being all the 602 relays A, B, C,
4 D and E or however many it is, would be actuated where
5 it says 602?

6 MR. YARGER: Not necessarily. Do you have
7 sheet 2 of that drawing?

8 MR. BEARD: Sheet 2, yes.

9 (Pause.)

10 MR. YARGER: Underneath the DCM.

11 MR. BEARD: Yes.

12 MR. YARGER: Starting at the top, this 101-A ---

13 MR. BEARD: You are in this middle column here?

14 MR. YARGER: Yes.

15 MR. BEARD: You have got a table with flag
16 number channel one, two, three and four.

17 MR. YARGER: Right. Those are the actual
18 relay designations that Toledo Edison uses.

19 MR. BEARD: Which is the E-18 nomenclature and
20 which is the actual field installation number?

21 MR. JAIN: What Kent is saying is that the
22 600 output on the E-18 would be these, like 601-A and
23 601-B and 601-C, D, E and F and then 602 and 603 and 604.

24 MR. BEARD: Let me see if I can say it a
25 different way and see if I understand this.

Sim 5-5

1 If I look down here under the column marked
2 "Channel 1" and I come to a thing that says 601-A, all right,
3 and then if I go to the left to the column marked "Flag"
4 it says 116. Now does that mean that 601-A on E-18
5 corresponds to the relay, and if I go to the rack it is
6 marked No. 116?

7 MR. YARGER: No.

8 MR. BEARD: I guess I still don't understand
9 it. I am sorry.

10 MR. YARGER: The flag, all right, is the line
11 number.

12 MR. BEARD: Just for the purposes of the tables?

13 MR. YARGER: Right.

14 MR. BEARD: Oh, okay.

15 MR. YARGER: The Channel 1, those relays say
16 601-A. That is PECO's relay designation ---

17 MR. BEARD: Right.

18 MR. YARGER: --- and you look over on the
19 outputs relay column and you will see K-13-1.

20 MR. BEARD: Yes.

21 MR. YARGER: That is consolidated controls
22 designation for the 601-A relay.

23 MR. BEARD: Okay. Let me see if I can mark
24 this up so that I will be able to follow this at least
25 an hour after we leave here.

Sim 5-6

1 Let me just take, for example the one you
2 mentioned, 601. At Flag No. 116, 601-A -- and correct
3 me if I say this wrong now -- if I would use that example
4 and now mark it, what I think you said, at the item number
5 in the table which is Flag 116, there is 601-A.

6 MR. YARGER: Correct.

7 MR. BEARD: And you are saying that is whose
8 designation?

9 MR. YARGER: TECO's designation, Toledo
10 Edison's.

11 MR. BEARD: Okay. And does that also corres-
12 pond to the E-18 type of numbering system?

13 MR. YARGER: Yes.

14 MR. JAIN: Yes.

15 MR. BEARD: Okay. So that is the company
16 and E-18, those two agree?

17 MR. YARGER: Right.

18 MR. BEARD: Okay, got it. Now if I continue
19 along in that same row, I get over here to where it
20 says output signal relays, K-13-1, for example.

21 MR. YARGER: Correct.

22 MR. BEARD: And you are saying that that
23 is the nomenclature for the CCC drawings?

24 MR. YARGER: That is correct.

25 MR. BEARD: Well, I am glad to see that there

Sim 5-7

1 is a cross reference. I really am.

2 MR. YARGER: And you will see like 61-A, B and
3 C.

4 MR. BEARD: Yes.

5 MR. YARGER: All right. They all come off the
6 relay driver board and block to the slot 4.

7 MR. BEARD: Wait a minute. Block to slot 4
8 right here.

9 MR. YARGER: Yes.

10 MR. BEARD: Okay. This is the relay driver board?

11 MR. YARGER: That is the relay driver, yes.

12 MR. STALTER: But all of that is driven by 601
13 logic, isn't it? I don't understand the 601 logic. What
14 I am saying is that if 601 actuates over here, it is all the
15 601 relays, right?

16 MR. JAIN: This one here would drive several ---

17 MR. BEARD: Why don't we have the record show
18 that we will take a brief pause.

19 (Pause while the parties hold a discussion
20 among themselves.)

21 MR. BEARD: Let's go back on the record.

22 Why don't we do this.

23 Kent, could you summarize the result of the
24 discussions that you folks have had during that brief pause
25 and tell me how I should interpret this table on this

5-8 1 table on this drawing S-9N27, page 2?

2 MR. YARGER: We made the determination that on
3 a given input signal that would control the 601 relays, that
4 it would control all of the 600 series relays within that
5 given channel.

6 MR. JAIN: In other words, the 600 output on
7 E-18 would drive all of the relay driver boards on the
8 601 in that channel.

9 MR. YARGER: That is right.

10 MR. BEARD: Let me see if I can say that. On
11 E-18 where they reference something called system output
12 RCS-601 ---

13 (Mr. Rossi asked Mr. Beard if he could take
14 a short break.)

15 MR. BEARD: Yes. Give me a second.

16 Where drawing E-18 has an output called RCS-601,
17 and I understand RCS stands for rupture control system
18 anyway. All it is is the output of the SFRCS. That
19 conceptually could be viewed as -- that output is made up
20 of whatever relay drivers boards are necessary to drive
21 a family of relays, 601 A, B, C, D through whatever is
22 appropriate. Is that a fair statement?

23 MR. YARGER: Yes, sir.

24 MR. BEARD: Very good.

25 Now the only remaining question is over on the

Sim 5-9

1 right side of that table where it says output signal relays,
2 and you said these were the consolidated nomenclature
3 system?

4 MR. YARGER: Yes, sir.

5 MR. BEARD: Does that mean that if I go to
6 another drawing, a consolidated drawing, and it says relay
7 K-13-1, that if I then go to the plant and look for relay
8 K-13-1, I really should want to look for one that has a
9 label that says K-601-A?

10 MR. YARGER: No, sir. In the SFRCS cabinet
11 itself they will be labeled with Consolidated Control's
12 numbers on the relay panel. The relay status lights will
13 carry Toledo Edison's relay designations.

14 MR. BEARD: Okay. So if it is within the
15 physical walls of the cabinet, like if I look for a number
16 stenciled on a chassis some place for a relay, I would find
17 written there K-13-1?

18 MR. YARGER: That is right.

19 MR. BEARD: But the associated indicator light
20 on the outside of the cabinet, the outside surface of
21 the cabinet would be labeled K-601-A?

22 MR. YARGER: Yes, sir.

23 MR. BEARD: So all this table really does is
24 it tells us what driver boards are involved and the two
25 different nomenclature systems for one varmit, like one

Sim 5-10 1 relay.

2 MR. YARGER: Yes, sir.

3 MR. BEARD: Very good. Okay. With that, I
4 think I will be able to figure this thing out back at the
5 ranch tonight.

6 Is there anything else that you think we should
7 talk about?

8 MR. JAIN: Is there a way to tell, Kent, how
9 these 13's and 12's go to like this logic type -- this
10 CCC logic module?

11 MR. STALTER: If you look at the second page
12 of it, I think it tells you.

13 MR. YARGER: These output numbers here?

14 MR. JAIN: Do these numbers correspond to the
15 relays?

16 MR. YARGER: No. These output numbers follow
17 here.

18 MR. STALTER: The flags?

19 MR. BEARD: If you look on page 2 of S9N27 where
20 it shows the signal flow, if you will. But it does show
21 the interconnections from the logic module through the
22 relay drivers through cabling over to the various relays,
23 which I assume that is the part that is within the cabinet
24 we spoke about a minute ago, and it shows it driving an
25 assortment of relays like, for example, the one we happen

Sim 5-11 1 to be looking at now, K7-A2 up to K14-A2. So that family
2 of relays and that designation I believe should be the
3 second half of this table we have been talking about.

4 MR. YARGER: Yes.

5 MR. BEARD: Wonderful. Okay. Got it.

6 Since someone asked me to come out of the room
7 for another matter, I guess I will have to ask that we
8 take another brief recess.

9 (Recess taken.)

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1 MR. BEARD: We will continue then with our
2 discussion on the S FARCE, and I guess we should say that
3 Mr. Jain has provided us two copies of his copy of the
4 cartoons we passed out the other day that have his comments
5 on them, so we will get the benefit of those details.

6 And, did you want to say anything about the
7 actuation list?

8 MR. JAIN: I just wanted to clear the record that
9 the list in the Davis-Besse Emergency Procedure has been
10 reviewed and no significant errors found in relation to what
11 the actual S FARCE --

12 MR. BEARD: And it does appear to me that
13 looking at the corrections you put on it, things that were
14 left off, I remember some of them being on the original,
15 so I think the errors that we have could be largely typing
16 errors, omissions, rather than some misspelled words.

17 MR. JAIN: That is what it looks like.

18 MR. BEARD: Okay. Now, let me tell you what
19 the schedule looks like. At quarter to twelve we are going
20 to start a different meeting on a different subject, so
21 we have got thirteen minutes to wrap up this discussion,
22 and I think that we can finish it, and there is only one
23 area that I think is crucial that I would like to under-
24 stand, and then go from there.

25 What I would like to do -- I think we are at

1 the logical end of this previous discussion.

2 If we can spend this amount of time, Sushil,
3 on the close inhibit circuits associated with valves AF-608
4 and AF-599, I think -- can that be covered in like 15
5 minutes?

6 MR. JAIN: We will try.

7 MR. BEARD: Here we go, here we go. Here is
8 one -- it is the original, I don't know where the copies
9 are, but this is a simplified version that we had of AF-608.

10 MR. JAIN: I think we had modified this to
11 show the ceiling contacts.

12 MR. BEARD: Yes, that is correct, but this is
13 the original of what we started with. Maybe we can use this
14 to explain these close inhibit, I think, is the term you
15 used, contacts in the closing loop which are K-303B and
16 K-301B.

17 MR. JAIN: Correct.

18 MR. BEARD: That is the area I want to talk
19 about. And I think what would be the most helpful to me
20 is to ask if the relay which is shown open, the relay
21 contacts shown open, do we know if that is truly a normally
22 open contact when the relay is in the shelf condition, or
23 whether it is in some other --

24 MR. YARGER: Shelf condition.

25 MR. BEARD: This is shelf condition?

1 MR. YARGER: (Nods affirmatively.)

2 MR. BEARD: Okay. Now, when on E-18, I get
3 an actuation mark K-303, or RCS 303, would that mean that
4 this relay becomes energized or de-energized, or do we
5 know?

6 MR. YARGER: De-energized.

7 MR. BEARD: It would be de-energized. So that
8 when the functions like they are listed at the bottom of the
9 page show actuated, like example for K303, does this item
10 -- in other words, assuming these conditions that are listed,
11 like for example No. 1 steam generator not low pressure,
12 and low level on either steam generator, or Number 2 steam
13 generator low pressure; in other words, for those conditions
14 this contact will become de-energized, and therefore it
15 would be open as shown on the drawing?

16 Is that what you said?

17 MR. YARGER: B is de-energized by low steam
18 generator 1, 2 pressure.

19 MR. BEARD: Okay. So, that is one of the
20 conditions we have listed. So that suggests that it is
21 de-energized for the conditions that correspond to RCS 303?

22 MR. YARGER: (No response.)

23 MR. BEARD: Would you agree with what I said
24 or disagree?

25 MR. YARGER: I am sorry. I didn't catch it.

1 MR. BEARD: I think you read off your table
2 over there is that K-303 is de-energized for low steam
3 generator level?

4 MR. YARGER: Pressure.

5 MR. BEARD: Low steam generator pressure.

6 MR. YARGER: And level, and Delta-P.

7 MR. BEARD: Okay. Well, the only parts I am
8 really interested in right now are pressure and levels.

9 So, for the conditions that I have shown right
10 here, those are the conditions in which this contact would
11 be shown, and- the circuit would be open.

12 MR. YARGER: Yes.

13 MR. BEARD: Okay. Now, let me see if I can
14 walk through this. If that is the case, and that says
15 under the conditions shown at the bottom of the table, for
16 K203, that contact would become tripped, and hence closed,
17 -- this is a normally closed contact -- and to get the valve
18 to close, I also have to be not inhibited, which means I
19 cannot have the conditions that would cause K303 to be
20 de-energized to open the circuit; it has got to be
21 energized.

22 This is -- really, to make it close, I have
23 to have K303 and K301 not trip. It means I have to have
24 the opposite of what is shown at the bottom of the page
25 for the trip conditions.

1 MR. YARGER: Yes. What really happens, and I
2 think we proved that yesterday, was if you got 301 -- or
3 303B tripped, and a low steam generator 1, 1 trip comes
4 in, it resets the 301 relay.

5 MR. BEARD: I think what you said -- let me
6 see if I can say it right -- if you had -- say that again?

7 MR. YARGER: 301B and 303B relays are tripped,
8 on 1, 2 steam generator are low level, and then a 1, 1
9 low steam pressure comes in, you would de-energize the
10 201C and re-energize the 301 and B relays.

11 MR. BEARD: De-energize --

12 MR. YARGER: And 302.

13 MR. BEARD: You would trip 203 and cause 303
14 to close, so that you would then get closing action of the
15 MOV. Okay. Good.

16 And then for K303, not tripped. That is the
17 same as not of listed trip conditions.

18 Okay. And then the outputs of this circuit
19 would suggest, since they are parallel paths, would be that
20 Logic Channel 3 and Logic Channel 1 both have to be in that
21 condition, so that is the And function in combination with
22 the dual closing coils.

23 MR. YARGER: That's right.

24 MR. BEARD: Okay. Now, in general can you tell
25 me when you would want to use this close inhibit? I know I

1 can go through and work all these combinations, you know,
2 --

3 MR. YARGER : If you have a low level in
4 Steam Generator No. 1, and steam pressure then went close --
5 went low in No. 1, you would want to close the aux feedwater
6 block valve.

7 MR. BEARD: Okay.

8 MR. YARGER: Isolate the steam generator.

9 MR. BEARD: So, what you are saying is that
10 -- I guess all I am trying to understand is why do I need
11 close inhibit circuits, or why would one want close inhibit
12 circuits if the things up here that would just cause the
13 direct closing action are only low pressures.

14 In other words, the two contacts say that
15 generator has low pressure. Isn't that sufficient?

16 MR. YARGER: Well, for some reason they seem
17 to inhibit the closing of it unless you did have a low
18 steam pressure in that steam generator.

19 MR. BEARD: Because what I was trying to get
20 to is it seems like you have logic that doubles up and over-
21 laps itself.

22 You got a signal that if you ignore the inhibit
23 function for a moment, it says the only time it is going to
24 close is if you have low pressure, and then you have another
25 thing that says I will inhibit closing unless I have low

1 pressure.

2 Okay? So, it just seems like it is unnecessary
3 logic.

4 MR. YARGER: It is redundant.

5 MR. JAIN: We are having Bechtel look at the
6 logic on this drawing to make sure why he did it that way,
7 and whether it is adequate at the present time.

8 MR. BEARD: So, this might come out of there.

9 MR. STALTER: We are really not sure why this
10 is the way it is. We know that there was an SRN written,
11 that is a System Revision Notice, early in the game that
12 added this, these closing circuits in here, and we don't
13 know the reason behind that yet.

14 MR. BEARD: But I think the bottom line in the
15 one minute we have left is that, to the extent we understand
16 it, is the overall intent is to not operate the close
17 of that valve unless there really is low pressure on that
18 generator.

19 MR. YARGER: That's right.

20 MR. BEARD: I think I reasonably well understand
21 it. Unless there is some point you want to bring up that
22 you think that I need to know about.

23 MR. JAIN: We might have to clarify some of this
24 later once we have some more information.

25 MR. BEARD: Good. Okay. I think this has been

1 a very fruitful discussion. It has been interrupted several
2 times, but obviously that is the way business happens.

3 But I feel like at this point I have what I
4 would call a decent understanding of the way the system is
5 designed and in a way I should expect it to operate.

6 And, therefore, with that understanding, I
7 can look at this event and say: Did it operate the way
8 we would have expected, or did it operate differently, or
9 did something come in and confuse things, or whatever.

10 Okay? I certainly want to thank you for the
11 time you spent looking at these cartoons that I drew,
12 checked the accuracy of them.

13 MR. JAIN: I think it was a good exercise for
14 us. What is the schedule for this afternoon?

15 MR. BEARD: As far as I know, we have a
16 meeting in about one minute in here on a different
17 subject, and then no other meetings scheduled this
18 afternoon.

19 MR. JAIN: When would you want to discuss
20 the other equipment?

21 MR. BEARD: I think that we have probably gone
22 far enough. I know that I have looked at the MSIV, I
23 have a good understanding of it. I have looked at the
24 MOVs that we talked about, and the only one that was really
25 complicated is this one that has the close inhibit feature.

1 The rest of them are straight forward.

2 So, I am not sure that it is necessary to do
3 that. I think we can stop.

4 That is not to say there would never be a
5 question, but I don't think we have to sit down in a
6 transcribed meeting and discuss it, okay?

7 I would like to say that we are finished.

8 (Whereupon, at 11:45 a.m., the meeting
9 concluded, this same day.)

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CERTIFICATE OF PROCEEDINGS

This is to certify that the attached proceedings before the
XXXXXXXXXXXXXXXXX NRC 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

GARRETT J. WALSH, JR.
Official Reporter - Typed

Myrtle H. Walsh
Official Reporter - Sigt.

Garrett J. Walsh Jr.
Official Reporter - Signature

MARY SIMONS
Official Reporter - Typed

Mary Simons
Official Reporter - Signature