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Incident Investigation Team

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(Closed)

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ERRATA SHEET

ADDENDUM

Page	Line	Correction and Reason for Correction
5	14	Change short to source
6	4	change imposition to position
18	5	change course route to core shroud
20	4	change weight to wait
22	12	change AEOPs to EOPs
23	13	change incursion to excursion
23	14	change section L to scenario
31	13	Change SIVs to SRVs
38	10	Change Sham to shame
38	18	Change Ms. Herbert to Mr. Hodges
40	6&7	Change Conrad to Conran
40	13	Change Conrad. to Conran
40	13	Change Dennis Peace to Themis Speis

Note: There are several instances where words are not transcribed accurately but the errors are obvious. I have not attempted to alter these.

Date 9/26/94 Signature M. Wayne Hodges

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

INCIDENT INVESTIGATION TEAM

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In the Matter of: :

INTERVIEW OF: :

WAYNE HODGES :

(CLOSED) :

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Nuclear Regulatory Commission

Interview Room

Woodmont Building

8120 Woodmont Ave.

Bethesda, Maryland

Thursday, September 5, 1991

The above-entitled matter commenced at 12:22 o'clock p.m.

On behalf of the Incident Investigation Team:

JOHN ROSENTHAL, II Team Leader
MICHAEL JORDAN, NRC Region III, II Team Member
WILLIAM VATTER, INPO, II Team Member
WALTON JENSEN, Events Assessment Branch, II Team Member
JOHN KAUFFMAN, AEOD, II Team Member

Interviewee:

WAYNE HODGES
Deputy Director for Reactor Safety
U.S. Nuclear Regulatory Commission
Division I
Philadelphia, Pennsylvania

[Mr. Hodges was interviewed via telephone from Charlottesville, Virginia.]

PROCEEDINGS

[12:22 p.m.]

MR. JORDAN: Okay, Wayne, why don't we start?

I'll introduce myself. My name is Michael Jordan. I'm out of Region III, Wayne. I'm a Section Chief in Region III for Operating Licensing, and also in the room is also --

MR. KAUFFMAN: John Kauffman. I'm a Director of Systems Engineering in AEOD.

MR. JENSEN: Walton Jensen. I work in the Events Assessment Branch, but I used to work in Reactor Systems across the hall from you, Wayne.

MR. HODGES: Yes, I know you did, Walt.

MR. VATTER: I'm Bill Vatter. I'm from INPO, Wayne. You'll remember that we met in that IIT School earlier this year.

MR. HODGES: Right, right. I remember you.

MR. JORDAN: Okay. The event we're going to talk about, Wayne, happened on August the 13th at Nine Mile Point, Unit II, involving a site emergency because of a transient coupled with a loss of power of annunciators. That's why they had the site emergency. They lost a lot of balance-of-plant equipment, and they lost their full core display.

The reason why we're talking to you is, we're looking for information having to do with the development

and review of the BWR's EOPs.

And why don't we start out with the first we've got here, and we'll work our way through this thing. If you have any questions along the way, stop us and ask us.

MR. HODGES: Okay.

MR. JORDAN: Since we can't see you, we don't know what you're -- if you're having a problem or not.

With respect to the EOP parameters and instrumentation used during the operator implementation of the EOPs, how were the parameters related to the Reg Guide 197 instrumentation?

MR. HODGES: I didn't understand the question.

MR. JORDAN: Okay. 197 has got the list of instrumentation that's required to be operable EQ'd, et cetera, after an event -- EOP development.

Do you know of any -- how those 197 instrumentation were related to the EOP development?

MR. HODGES: Not directly. I mean, as far as the development of the list, the EOP was being developed concurrent with 197, and I know that Jack Rosenthal tried to incorporate EOP issues, but it was strictly 197, and which ones were required by 197, I don't know.

MR. JORDAN: Okay. So you don't know of any in the EOPs where portions of the EOPs require 197 in order to get through them?

MR. HODGES: Well, I would answer the question a little bit differently. Was there adequate instrumentation available with what they lost to make it through the event? And in this case, there was. And that was at least my opinion at the time the event was going on, and then that was later confirmed by Carl -- uh-oh.

MR. JORDAN: Sisco.

MR. HODGES: Carl Sisco when he looked at it up there as part of the AI team.

Recognize that you can use, you know, a myriad of things, and in this particular instance, they did have indications on the back panel that they APRMs were downscale. The power was down for most of the plant, but it was down in the short range.

MR. JORDAN: Well, they knew they were off 4 percent.

MR. HODGES: Right.

MR. JORDAN: And I guess the question is, is that is there any instrumentation that's EQ qualified to verify below the 4 percent, so they get out of that do loop that was part of the EOPs.

Are you familiar with the section of the EOPs that got them into a holding pattern?

MR. HODGES: I'm trying to recall. No, I'm not right off the top of my head, because you don't need -- if

the power instrumentation is not available, the power instrumentation is not available, there are steps in the EOP to determine where you are without using that instrumentation. It relies upon pressure or imposition of SRVs and those types of things.

So you can determine not the absolute power level, but you can tell -- you can determine that the reactor is shut down based upon the reactor pressure and the status of SRVs.

MR. JORDAN: Yes, but the problem is there is a section here that talks about you have to wait until all control rods are inserted to at least the 02 position.

MR. HODGES: Right.

MR. JORDAN: Okay. And do you know of any 1.97 material that allows them to go through that?

MR. HODGES: Again, I don't recall which is 197 and which is not. I haven't looked at a list of 197 instrumentation in a long time.

MR. JORDAN: Okay. Well, the reason I'm asking, Wayne, is that, you know, I'm looking at what they had, and since they didn't have the full core display -- they said they didn't have that. All rods are inserted to at least the 02 position. They felt the only way --

MR. HODGES: They did not have the rod position indication, is my understanding.

MR. JORDAN: That's correct. So they couldn't do that.

MR. HODGES: Right.

MR. JORDAN: And it says: Or the reactor will remain shut down without boron.

MR. HODGES: Right.

MR. JORDAN: Okay. What instrumentation would you expect them to use to verify that the reactor remained shut down?

MR. HODGES: I would use several things. One, I would use the back panel and see that the APRMs were downscale. That's an indication that they're down.

MR. JORDAN: Yes.

MR. HODGES: They also got the status of the SRVs and the pressure, and those would indicate the reactor was shut down. So there's adequate instrumentation from what they had to deduce that the reactor was shut down.

MR. JORDAN: But how do they know it's going to remain shut down, because the step was "will remain shut down without boron"?

MR. HODGES: Right. All that says is before you start to depressurize, you may have to worry about, for example, if you don't have rod position indication and you don't know -- all you know is that it's below a certain point, now you've got to -- you have to worry about some

rods being out, and you have to have some means of verifying the rod position. Otherwise you shouldn't cool down. That does not say you cannot maintain the plant in a stable condition.

And that's all the EOPs is trying to do, is keep you in a safe, stable condition. And a hot shutdown at full pressure but zero decay heat power is a safe, stable condition.

MR. KAUFFMAN: Okay. But if they were cooling down by, say, using RCIC to inject, that wouldn't meet the intent of that step there to not depressurize if they, in fact, did depressurize?

MR. HODGES: Well, I don't think they started that until after they got some instrumentation back. They got the instrumentation back in about 20 minutes.

I mean, if you're sitting there with, you know, the pressure between 800 and 1000 pounds, you're not depressurizing.

MR. JORDAN: Yes, but what they did, Wayne, in order to put water into the vessel --

MR. HODGES: Right.

MR. JORDAN: -- they used RCIC.

MR. HODGES: And that's going introduce some cold water, and that's going to drop the pressure a little bit.

MR. JORDAN: Right. And that dropped the

pressure.

MR. HODGES: But it's going to operate, is what's going to happen. Initially, RCIC won't be enough to take out the decay heat, and so it will maintain pressure. After a period of time, then RCIC will keep up with it. So it's an energy balance game.

MR. JORDAN: Yes, but I think what really happened, Wayne, is they didn't maintain the pressure. The RCIC drawing the steam off on the RCIC --

MR. HODGES: Right.

MR. JORDAN: -- actually reduced pressure.

MR. HODGES: Okay.

MR. JORDAN: You know.

MR. HODGES: But the also went to Level 8, which they didn't have to do, but it is routine to do that. But how far down did the pressure bring them?

MR. JORDAN: Down to about -- I think it was around, Walt, 500 pounds.

MR. JENSEN: Around 700. They went down to around 700 pounds, so that the condensate booster pumps started injecting into the vessel.

MR. HODGES: Okay.

MR. JENSEN: And that's when it went up to Level 8, when they dropped down below the booster pump pressure, and the booster pump started injecting into the reactor --

MR. HODGES: Okay.
MR. JENSEN: -- and brought the level up.
MR. HODGES: All right.
MR. JENSEN: It was about a little less than 700.
MR. HODGES: Did they see anything that would have indicated an increase in power while they were doing that, an increase in pressure or anything like that?
MR. JENSEN: No. The pressure was going down all the time they were having RCIC injection, and the --
MR. HODGES: The only thing you don't know is -- during that first 20 minutes until they got some power restored, is the absolute position of the rods.
MR. JENSEN: That's right.
MR. HODGES: You know the reactor was essentially shut down where you are.
MR. JORDAN: You know -- right. At each pressure point, you know you're shut down.
MR. HODGES: You don't know what will happen if you go lower.
MR. JORDAN: You don't know what will happen if you go lower.
MR. HODGES: That's the only concern there.
MR. JORDAN: But that says -- that's what that -- maybe understanding what the step is, but that, I thought, was what the wait step is for is so that you don't --

MR. HODGES: Yes. The step says that you should not, you know -- you should try to hold it in safe, stable condition until you can make that determination, basically is what that's saying.

MR. JORDAN: And the question I have is that other than the pressure, which is the 197 pressure, the PAM, the post-accident monitor records, and the APRMs and the back panels, did we look at any other method by which they could go through that step prior to depressurization using RCIC.

MR. HODGES: Well, be careful, because most of us did not even get to the Response Center until after they had restored power. So we were looking at everything after the fact at that point.

MR. JORDAN: No, but I'm looking at -- I'm questioning back on EOP development.

MR. HODGES: Right, right.

MR. JORDAN: Not when we showed up, not when we, the NRC, responded to the event.

MR. HODGES: When we were developing the EOPs, we did not say: Is this 197 or not 197? That was not a consideration in the development of EOPs.

The consideration is; do you have an instrument that will do that? And if you lose that instrument, do you have a backup? And there was no consideration of; is it safety related, is it 197? That was not part of the

discussion.

MR. KAUFFMAN: Was there a consideration given that at least instrument for that function would be, as you seemed to indicate before, not considered at all?

MR. HODGES: I'm sorry, the question again?

MR. KAUFFMAN: I guess you said it wasn't considered whether the instrument was Reg Guide 197 or not. My further question is, was there consideration given to the idea that for some functions, you would make sure you at least had one safety grade or one 197 instrument to look at that function?

MR. HODGES: There was no consideration of whether or not the instrumentation was safety grade of 197. The question was; did you have an instrument that, given the conditions that you had, you could have confidence in?

And you verified that by several means: one is, if you had similar instruments reading the same kind of thing, or if you had other parameters that were consistent with the reading that you have. But, I mean, whether it's a safety grade instrument or a non-safety grade instrument, you may have a problem.

Therefore, the EOPs do not consider whether it's a 197 or a safety related or anything else. They basically say, do you have an instrument you can rely upon to do the job? Well, the purpose of the 197 and the safety grade is

to try to assure a high level of reliability for a certain set of instruments. But that does not mean necessarily that those instruments are more reliable than some other instrument.

In fact, because of some of the criteria we put on them, they may, for some circumstances, be less reliable. But the point is that the operator should have some instrumentation that he can rely upon to draw his conclusions.

Now, beyond that, if, on a BWR, you lose all power indication, there are still -- I mean, power not reading, whether from the APRMs or source ranges or whatever, and you don't have a power reading, you can still deduce the power rating from the pressure and status of SRVs and MSIVs.

The EOPs allow that to occur. For example, if the pressure was going down -- you say down to 700 pounds --

MR. JORDAN: Right.

MR. HODGES: Then you're not at power, not with the kind of flow that you've got with RCIC, because RCIC can -- is a low capacity system that will, if my memory is right, is that it is equivalent to roughly five percent of power -- no, it's less than that 3 percent of power, which is identical to decay heat range and until -- and for the first five minutes or so, RCIC can't even keep up with decay

heat.

After that, it will start to do a little bit and could depressurize you. But RCIC is a low capacity system, and if that's what you're using and the pressure is going down, you can have a high confidence, even though you've got no direct power instrumentation, that the reactor is shut down.

MR. VATTER: Wayne, let me postulate for you --

MR. HODGES: Sorry. That was part of the philosophy in developing the EOPs.

MR. VATTER: Wayne, I'd like to postulate for you, a little bit different scenario.

MR. HODGES: Okay.

MR. VATTER: And perhaps you can tell me whether it's realistic or whether it's been considered.

MR. HODGES: Okay.

MR. VATTER: You get the scram but you don't get all the rods going in.

MR. HODGES: Right.

MR. VATTER: However, the operator doesn't know this.

MR. HODGES: Right.

MR. VATTER: And he is able to see that the reactor is shut down, but he doesn't know how much it's shut down.

MR. HODGES: Right.

MR. VATTER: And then, as he cools down, he has re-criticality.

MR. HODGES: Right.

MR. VATTER: And because of the rate of the cooldown, either through cold water addition or by depressurizing, the reactivity is added quick enough that before you get Doppler, or voids or something that could turn it, you get the reactor going on a power increase that's unacceptable. Maybe you get not prompt critical, but you get close enough to it that you have such a high power spike that you hurt the fuel?

MR. HODGES: Right. You can't do that with that kind of a cooldown. In fact, as you cool down and depressurize, if you start to generate some power, what you will do is, you will get some voiding and that will -- the voids that you depressurize will have a stronger effect than the cooldown. That was considered.

MR. VATTER: But you might shoot some cold water in there like condensate booster pumps. You might be cooling down real slowly or depressurizing real slowly.

MR. HODGES: If you get to the point where you -- and you get to a situation similar to what you're talking about, but you can't do it without boron in there. You can't have it both ways.

Either you're going to have -- as far as -- I suppose you could go -- you could go recritical. But you're not going to go on a prompt critical that's going to become exponential on you.

MR. VATTER: Is there some kind of analysis that's been done in that that we could study?

MR. HODGES: There were some analyses done. I don't have them. GE may have them. I'm not sure where they are right now.

MR. VATTER: Who is the person that we ought to talk to to find out more about that analysis?

MR. HODGES: Probably what I would do is go through the BWR Owners Group chairman and have him contact GE. The EOPs belong to the BWR Owners Group, not GE. They had some analyses done by GE and they had some analyses done by contractors. I think I would go through the BWR Owners Group and see what they've got.

MR. JORDAN: But you think there's analysis to show that with using -- without boron in the vessel, as long as you have a cooldown, that you can't go prompt critical and cause --

MR. HODGES: Well, I think that's true. Now, we even did some calculations at Brookhaven with boron in there that tended to show that that couldn't happen, but that tended -- that was where you were smearing the effects over

the whole core. I'm not so sure that if you localized it, you couldn't do something with it if you had boron in there.

But even that showed that if you -- as long as you weren't localizing -- and these were from calculations that were done under contract at Brookhaven by Dave Diamond -- again, I don't have any contract -- any reports on that, but they're probably retrievable from Brookhaven somehow.

MR. JENSEN: Wayne, would somebody in the Reactor Systems Branch maybe have those reports or be familiar with the calculations?

MR. HODGES: Well, we did at one time when I was down there. I don't know where they are now, Walt. Chuck Graves was involved with some of that. Whether he still has some, I don't know. It might wind up having to go back to the Brookhaven or someplace to try to get them, because they did the analysis.

MR. JORDAN: Did they do that for us or for somebody else?

MR. HODGES: They did that for us.

MR. KAUFFMAN: Who on our staff reviewed those types analysis?

MR. HODGES: I said Chuck Graves and I looked at that from the Brookhaven analyses. We were trying -- we were asking a slight different question. We were looking at it with boron in there, and we were concerned -- my concern

was at that time that if you had the reactor shut down and you injected, un-borated water, but it was shut down strictly on boron -- and we were looking at a BWR-5 or BWR-6 design where you injected the low pressure cooling injection system directly into the course route, could you get, you know, an excursion?

And their calculation showed no. My concern was, their model was not good enough to look at the local jetting effect of the cold water, the localized effect rather than the smeared effect across the core.

But for the kinds of things you're talking about where you're just injecting it in the feedwater lines and coming on down that way, that analysis would say, even with boron in there, you're not going to get that.

MR. KAUFFMAN: Did that analysis assume that you got, I guess we'll say, full rated condensate booster pumps? Because, what happened in this --

MR. HODGES: That analysis assumes all LPCI flow coming in cold. Basically, I think it assumed full LPCI flow coming in.

MR. JENSEN: Now, when you say that there was boron, is that assuming that the operator has injected the system?

MR. HODGES: That was taken as an assumption that you had an ATWS where no rods went in. You had shut the

reactor down using boron from the standby liquid control system. You had depressurized down to, you know, a low pressure system and then you got an inadvertent actuation of your LPCI to inject the full -- the LPCI flow which is like going to be roughly 20,000 gallons per minute -- 15-20,000 gallons per minute injected into a core that's shut down strictly with the boron which I think is probably a more valuable analysis than what you were asking for.

MR. JORDAN: Okay. Let me ask another question.

MR. HODGES: Okay.

MR. JORDAN: This is to the -- the previous questions were more generic with the EOPs. This is back to the specific event.

MR. HODGES: Okay.

MR. JORDAN: Okay, when the operators got to the point in their ATWS procedure that says wait until all rods are inserted at least the 02 position in the reactor or the reactor remains shut down without boron. I think they got into a stop statement, that they couldn't get through that, okay?

MR. HODGES: Okay.

MR. JORDAN: Now on the other one for the normal reactor vessel level control under pressure control, it says you don't start cooling down until all rods are inserted. The reactor remains shut down without boron, if boron is

being injected but a slick level is dropped to 900 gallons or the reactor is shut down and no boron has been injected.

MR. HODGES: All right.

MR. JORDAN: Okay. That's another weight statement.

MR. HODGES: Okay.

MR. JORDAN: Both of those are -- but they were in a situation that while they were using RCIC they were depressurizing.

MR. HODGES: Okay.

MR. JORDAN: And RCIC is allowed by the ATWS procedure as an injection source. By injecting with RCIC they reduce pressure.

MR. HODGES: Right.

MR. JORDAN: So is --

MR. HODGES: Well, that says the power is at least less than what RCIC is capable of.

MR. JORDAN: Okay.

MR. HODGES: And RCIC because they can take out and it's all between 2 and 3 percent power so you know it's less than that.

MR. JORDAN: Okay, so as far as the cooldown depressurization using RCIC, that's not allowed by the pressure -- you feel it's okay because it's allowed by the RCIC ATWS? You have a problem with --

MR. HODGES: Wait, let's back up a minute.

MR. JORDAN: Okay.

MR. HODGES: RCIC is maintained core covered.

MR. JORDAN: Right.

MR. HODGES: And that has got to be the first priority is that you maintain adequate coverage of the core.

MR. JORDAN: Okay.

MR. HODGES: All right? Now if in the process of doing that you have some depressurization, if it could be avoided you probably should, but if it is needed in order to maintain the core covered and adequate core cooling, the choice has got to be to go for the core cooling. There has to be a priority there.

MR. JORDAN: Okay. Okay, would you expect the reactor operators to close the MSIVs in order to maintain pressure up?

MR. HODGES: I would expect that they might want to try to control pressure with MSIVs so as not to cycle the SRVs and dump heat to the -- but I would expect them if the pressure is dropping to try to close them to let it come back up but I would expect they might try to use an MSIV as a pressure control mechanism.

MR. JORDAN: MSIVs are to control with pressure.

MR. HODGES: I understand that.

MR. JORDAN: They're either opened or closed.

MR. HODGES: It's either open or closed -- but MSIV is open and using a bypass or something to --

MR. JORDAN: -- need a bypass? By just using RCIC they were depressurizing.

MR. HODGES: Right.

MR. KAUFFMAN: Then there's steam auxiliaries.

MR. JORDAN: Then there are steam auxiliaries. Okay, the question I have is that would you have -- the EOPs don't tell them to do that --

MR. HODGES: Right.

MR. JORDAN: -- it just says you can't cool down--

MR. HODGES: But in fact I think the AEOPs would encourage them to keep the MSIVs open as a means of removing heat, particularly if there's a concern for an ATWS, because it is preferable to dump the heat to the condenser if you are going to have an ATWS going on than to dump it to the pool, where you start challenging your containment.

MR. VATTER: That's if you got power below 4 percent and you're concerned about recriticality, then maybe pressure control might come in.

MR. HODGES: The only thing -- what is the concern with recriticality? The concern is that if you've got a real skewed rod pattern that you might get boiling transition on a few rods and even though that would be a violation of the safety limit and it's something we'd

probably slap their hands for from a strict safety standpoint that ain't a big deal.

MR. VATTER: The other possibility is like we were talking that you get some power spike due to the reactivity going in there too quick.

MR. JENSEN: Like when you injected the condensate booster pumps pretty fast like they did at Nine Mile and then have some of the rods stuck out or they didn't know they weren't out --

MR. HODGES: Right.

MR. JENSEN: -- they weren't of course but they --

MR. HODGES: There is a possibility they would have gone critical but as far as an incursion I think it's a nigh unto impossibility for that kind of a Section L and part of that is based upon the Brookhaven analyses where we looked at roughly half the flow rate for that system with all the rods out and replacing -- see, you got, when the BWR is operating you have roughly eleven dollars of reactivity in the void, the steam, so if you shut the thing down and if you still have got some boiling going on, you have got some of that negative reactivity already.

When you shut down on boron and so that you've got the thing shut down basically we're saying in this case you have got all of the eleven dollars of that negative reactivity offset plus whatever else you need in order to

keep the thing shut down.

Now what you are talking about is as soon as you start to inject to this cold water, if you start generating power you also start generating void again and that's a very strong negative feedback and at low pressure the void offset the temperature effect, the void effects is much larger than the temperature effect and so we tend to shut the plant down, or at least not let it run away.

MR. JORDAN: Okay. Do you agree that the operators did correctly, by the weight statement?

MR. HODGES: I think that if I were in this situation -- until I got some indication back, I would try not to go all the way down. I would try to maintain some pressure there and wait. I think I would try to play it cautiously, yes.

Now, to me, the depressurizing the 700 pounds with RCIC is not going through a depressurization for cooldown. In a normal control, even for ATWS and other things like that, they talk about controlling it at 800 to a thousand or 800 to 1,100, something like that. They're supposed to specify a band. If you're a little bit outside the band they would specify. And so that may be a bit of no-no, but is it a safety problem? No.

MR. JORDAN: Okay.

MR. HODGES: Again, putting the priority on

maintaining the cooling.

MR. JORDAN: Maintaining water on the core?

MR. HODGES: Right.

MR. JORDAN: That's the priority?

MR. HODGES: Yes.

MR. JENSEN: Wayne?

MR. HODGES: Yes?

MR. JENSEN: Just after your reviewing the BWR guidelines, I was looking at the PWR guidelines. It seems like they were listing as their most critical safety function the shutdown of the reactor. They had their ATWS functional restoration -- they had a red line. They had that as the reddest most important thing they could do in a PWR.

MR. HODGES: Right.

MR. JENSEN: And then after that was core cooling.

MR. HODGES: If you look at the PRAs for BWR, ATWS is one of the big challengers. It's very critical, yes.

MR. JENSEN: Well, I was thinking -- I was wondering if you knew why they would have the -- the most critical safety function for a PWR being the ATWS, as opposed to core cooling, wherein BWR, the core cooling would take precedence over the ATWS?

MR. HODGES: I don't think that the PWR would tell you that ATWS takes precedent over core cooling. If you

don't keep the core cool, you've lost it. That's got to be your first priority -- one of the -- well, up to a point, that's got to be your first priority. If you decide, well, there ain't no way you're going to keep the core cooling anyhow, then you've got to go worry about the containment and try to protect it. But, otherwise, core cooling has got to be your first priority. If you can keep that core cool, then you can commit a lot of other sins and it won't catch up with you.

MR. JENSEN: Okay.

MR. JORDAN: Wayne, we've got a question here.

What was the scope of the ATWS analyses, were there different events, and what different events were considered?

On the ATWS, I guess what we're looking for, is that considered anywhere from, I guess, 4 percent power up to 100 percent power, or was it only considered at power in which it exceeded the decay heat such that the addition of RCIC would not depressurize the core?

MR. HODGES: It's going to test my memory a bit.

I know what was discussed. Now, how much analysis we had may be part of the problem. They did not have analyses for every situation. A lot of it was, given some limited analyses, now what could you extrapolate from and do?

So, did the BWR owners group have an analysis for an ATWS at, say, 10 percent power or 5 percent power or 3 percent power? My honest answer is no.

They analyses that we looked at for limiting things and then went back and tried to use some physics reasoning on some of the other stuff.

MR. JORDAN: Do you know, did we consider their analysis all-encompassing as far as the lower powers, as well as the upper powers?

MR. HODGES: I think, with the analyses, plus the discussions of the logic and the physics, I think we considered it covered the full range, yes.

I'm trying to think for a minute while we talk, too. There was -- that's still going to be fairly high power.

There were some analyses that were done in the last, oh, three or four years, again from the BWR owners group, looking at BWR stability, that got into some ATWS considerations, but they're starting from about the 40- to 50-percent power range.

Larry Phillips could probably tell you more about those.

MR. JORDAN: Okay. I'm just reading through some of these questions. I think you've answered some of these.

What happens if partial ATWS is followed by a

maximum credible reactivity addition from depressurization or cold water addition at a very low power?

You're saying -- in the source range level, you're saying you don't think that that -- that, if that happened, the core would go critical, but it would not cause fuel damage.

MR. HODGES: If you're talking about from -- you may have said a little bit more than I want to say.

MR. JORDAN: Okay.

MR. HODGES: If you're talking about a situation where you're not borated --

MR. JORDAN: Correct.

MR. HODGES: -- then the addition of the cold water won't result in what I would characterize as significant fuel damage.

The reason I hedge a bit is I think it's possible to get a localized relatively high power so that you might have some local clad failure on a few pins. I don't think that is a big safety issue.

It means you may get a little bit of radioactivity in the water, and if you've got a valve open that's going to go to the outside, you may release a little radioactivity. That's not a major fuel failure, though.

That's a localized fuel failure, as opposed to a core melt or something like a Chernobyl or something like

that.

So, you may, with that large cold water addition from low power, get -- for a PWR, you would call it DNB, and basically, you go to film boiling.

Then you have to say will that film boiling result in fuel failure? And there, it's possible but not necessary.

If we were doing a licensing analysis, we would assume it did. In real world, it doesn't necessary happen that way.

As a an example, there was a case in Sweden about four or five years ago where they made some mistakes in correlating and a few other things like that, and they actually operated the plant at full power with several bundles -- rods in several bundles in film boiling for periods of up to two weeks, and what they got was they failed a few pins, other pins has discoloration and didn't fail, and they didn't really even know they had that problem until they shut down.

You can damage the pins as far as some damage to the cladding, but not the extent you're talking about a massive safety problem. It's not something I would want to evacuate people for.

MR. JORDAN: Okay. You answered some of these questions we've got here. Let me run through them.

What would be the safety significance on an inadvertent criticality? While clearing down the plant, an analytical analysis, you say that as long as there is no boron, that you think it's going to have low safety significance.

MR. HODGES: Yes. I think there is some possibility -- I can't rule it out -- that you will have film boiling on some pins.

MR. JORDAN: And we've got some analytical analysis on, if the plant is boron, the consequences of a cold water injection.

MR. HODGES: Yes. And there again, you might get some film boiling on some pins, but you don't have massive fuel damage.

MR. JORDAN: Okay.

[Pause.]

MR. JENSEN: Wayne,

MR. HODGES: Yes.

MR. JENSEN: This comes from RSB days. Remember the Branch Technical Position 51?

MR. HODGES: Uh-huh.

MR. JENSEN: And that requires that plants be capable of achieving cold shutdown with safety-related equipment.

MR. HODGES: Right.

MR. JENSEN: And we were wondering how BWRs would show that, and if they needed to have safety-related equipment showing that either the rods were in or else they were in a shutdown condition. How was that done? How were they brought to cold shutdown with safety-related equipment, and would Nine Mile meet that?

MR. HODGES: Okay. I don't recall any analyses with that, considering a loss of all your power indication. That was really looking at -- could you cool the plant down and go on to shutdown cooling, using only safety-related equipment?

Typically, they demonstrated that they could do that they could do that by opening up the SIVs and depressurizing it in an injection through the LPSI system and providing cooling with the LPSI heat exchanger.

That was the method they used as a safety-related path to do that. That's not a path they would normally choose, in the few instances where I know of where they haven't been able to cooldown by the normal means, but that's not the path they've chosen.

MR. JENSEN: So, are you saying that they didn't look at the instrumentation when they did that? Are you just --

MR. HODGES: I did not look at the instrumentation when we did that. I don't think the question of the

instrumentation even came up at that point. I think single failure would limit you on that.

MR. JENSEN: Well that's nonsafety instrumentation.

MR. HODGES: Right.

MR. JENSEN: Did the instrument -- ICSB Branch help us review RSV51 and get into cold shutdown with safety-related equipment?

MR. HODGES: Not to my knowledge.

MR. JENSEN: Okay.

MR. JORDAN: Are we saying that the only thing that they looked at was the equipment, not the instrumentation?

MR. HODGES: I think that's probably true. I think that's probably true.

MR. JORDAN: Okay. All right. Let's go on and review the OPs in discussion with GE and licensee. Did they express a reservation about using SLC or implementation of the ELPs, and I do something contract -- do you know what that's asking?

MR. JENSEN: This next one was -- involves your discussions with General Electric and developing the emergency operating procedures.

MR. HODGES: Right.

MR. JENSEN: And probably applied those under

certain conditions they would inject SLC. I wondered if in any of these discussions did they mention any reservations to injecting SLC -- worry about getting the boron out or worrying about long-term effects on the plant? Did they express that they might be hesitant -- operators might be hesitant to inject SLC?

MR. HODGES: When we asked that question on numerous occasions, we always got the answer that they would not be hesitant to inject SLC. We never fully believed it. But that was usually -- that was always the answer they gave us.

MR. JORDAN: Do you know, Wayne, is SLC injection for reactivity or is SLC injection for containment protection? In other words, would you expect them, if they had an ATWS and they entered the ATWS procedure, would you expect them, even if they were in cold conditions, to initiate SLC as a precautionary measure?

MR. HODGES: Not necessarily.

MR. JORDAN: Okay. They --

MR. HODGES: Basically, the main reason -- well, SLC is there to satisfy two purposes. One is that you've got a regulation or the GDC that says that they've got to have diverse means of shutting the plant down. One is rods and the other is SLC, okay? So, it's there to satisfy that requirement.

From the ATWS world, it says if your MSIVs are closing and you're dumping all your heat into the suppression pool, you've got to get your power down and you've got to get it down in a hurry. The only thing you've got left at that point is SLC, in a worse case.

If you've got -- but the EOPs are specifically written that if they're not cycling the SRVs; in other words, if they're controlling pressure with the second SI by dumping heat to the condenser --

MR. JORDAN: Yes.

MR. HODGES: They don't have to inject it.

MR. JORDAN: Right. And that's so -- the EOPs looked at the containment, not at the first one, the diversification -- diversified method of shutting down?

MR. HODGES: That's right. It's there if you need it, and you can use it. But, basically, they really felt that you want an opportunity for the other means to work, if you don't have an urgency. If you're dumping the heat to the condenser, rather than to the suppression pool, you don't have the urgency, as I said, you've got to start the SLC right away.

Now, if you've tried everything else, driving the individual rods and resetting the scram, been doing all those other actions that are in there and nothing works, you're going to have to inject SLC to get the plant down.

But the idea was, if you can maintain the pressure below the SRVs so they're not cycling, that means one of several things. Either that you power down so that you don't have to worry about it, or that you're controlling pressure by another means, you're dumping the heat in the condenser, and you have the time to take -- which, from the plant standpoint, is a preferable action and safety is not threatened.

MR. JORDAN: Okay.

I guess I'm on to 15, unless there is some question you guys had earlier than that.

The next question, Wayne, we have is there has been a lot of loss of power to control room annunciators instrumentation.

MR. HODGES: Yes.

MR. JORDAN: Okay. And in fact, I guess there is an Information Notice 88-05 stating the lack of specific emergency procedures to address complete loss of annunciator systems.

Is NRC reviewing its position on power supplies to these equipments being non-safety-related grade? Do you know if there is an re-review of annunciator power?

MR. HODGES: Do I know if there is any?

MR. JORDAN: Yes.

MR. HODGES: Somebody at headquarters would be

better to answer that.

MR. JORDAN: That's probably an acceptable answer.

The question, I guess, then, also, is what do you feel -- based on your knowledge of the EOPs, do you think there's a need for a more reliable source of power to annunciators and instrumentation?

MR. HODGES: "Need" is a strong word. Is it desireable? Absolutely.

MR. JORDAN: Desireable. Okay.

MR. HODGES: Needed, that's debatable, and you would probably have to get into a cost-benefit argument that would -- it's hard to answer off the top of my head, but -- because you can shut the plant down without it, basically.

As long as you can do that, the cost-benefit argument gets to be a little bit harder to answer, and you've just got to go to the hard numbers.

MR. JORDAN: Maybe you can run through for me, on an ATWS, what instrumentation would we expect to be available for the operators to look at that's safety-related to validate that they are shut down?

MR. HODGES: That is safety-related?

MR. JORDAN: Yes.

MR. HODGES: Well, you would have -- I'm not sure whether the position indication on the SRVs is safety-related or not.

That is 197, I think, so it may be, but I'm not certain of that, but that's something you would need to know, and you need the reactor pressure, and that's really all you need if you don't have the power information.

MR. JORDAN: SRV positions?

MR. HODGES: How many are open or closed, and let's just assume that your secondary side is closed.

MR. JORDAN: Yes.

MR. HODGES: You also need to know whether your MSIVs or your bypass circuit is closed. If your top valve and bypass are closed, then you just roll back the SRVs, but again, you're relying upon some non-safety-related instrumentation there.

You're relying upon, for example, the -- if you assumed that the MSIV's are open, you're relying upon the position of the -- the bypass valve, which would be non-safety, I would think.

I think, almost any way you do it, you're going to have to bring in some non-safety instrumentation.

MR. JORDAN: What training requirements did we impose on the licensees dealing with loss of annunciators, or balance-of-plant instrumentation, in order to accomplish EOPs. Do you know of any?

MR. HODGES: On training requirement?

MR. JORDAN: Yes.

MR. HODGES: I think the answer there is none.

We have, first off, loss of annunciator is not necessarily covered by the EOPs. It could be covered by an normal shutdown procedure. And I think most utilities will have some training on loss of that. But I don't know of any particular event that we prescribe and say you have to have training on that event.

Now, we will go and test them on a wide range of events, and if they don't have some training on it, then sham on them. But I don't know if any, I don't know that we require them, for example, to have training on an ATWS. But they sure as hell know we're going to come test them on it.

MR. JORDAN: Yes. Being from the operator licensing examining section, you're right, that's what we do. I just wondered if we had any guidelines to them saying, other than a comment that we would come out and examine them in those areas.

MS. HERBERT: We have, the supplement to the NUREG 0737 I think it was, that talked about they had to have procedures dealing with a range of events, including multiple failures and operator errors. And we expect them to have procedures to deal with that stuff.

MR. JORDAN: Beyond the EOPs --

MR. HODGES: And we expect them to have a training program. But we don't require training on any specific

issues.

MR. JORDAN: Beyond the EOPs, are they required to have procedures, for multiple event failures?

MR. HODGES: We don't tell them what they've got to call them. We don't tell them they got to call them EOPs.

MR. JORDAN: Okay. But I mean, besides the EOPs, we would expect them to have additional procedures for like loss of annunciators; would we expect them to have them --

MR. HODGES: We would expect -- you're getting into a difference whether we require or expect.

MR. JORDAN: Okay.

MR. HODGES: Yes, I expect them to have that. Do we have a requirement that says they've got to have a loss of annunciator procedure? No, we do not have such a requirement. Do I expect that? Yes.

MR. JORDAN: Okay. Shortly after the TMI accident, the NRC staff encouraged the licensees to create a third classification scheme for equipment called "important to safety."

Can you identify any internal or external NRC document associated with that position? In particular, was there a generic letter issued in 1983 or '85 providing a legal group's challenge to the agency's position on "important to safety"? Do you know of any?

MR. HODGES: Yes. There was lots of stuff on that. I can't quote you documents and dates and stuff like that, but there was an old paper that was put together on that, and then what's his name that used to be on the staff for the CRGR, blonde guy?

MR. JORDAN: Conrad?

MR. HODGES: Yes, Conrad had written a position for --

MR. JORDAN: "Important to safety"?

MR. HODGES: Yes. He had written a thing on "important to safety" paper that was sent out. There was a lot of discussion of that at the hearings. We even had a panel composed of Conrad and Dennis Peace and Ashok Thadani and myself, and several others. I think there was a total of seven of us dealing with that particular issue. And then there was, I think there was an industry paper on it. So there's a lot of stuff. But I'll have trouble trying to quote you documents off the top of my head.

MR. JORDAN: Do you know if we had any regulatory basis for the "important to safety" classification?

MR. HODGES: Well, the concern, the problem was we've got conflicting uses of those terms. One part of our regulations will use "important to safety," another part will use "safety-related," and use those terms interchangeably. And the industry contention is they mean

the same thing, because we use them one way in one case, and basically we use both terms to mean essentially the same thing in our regulations. And I think that's true. But what we were trying to do is say there is a "safety-related" case and then there's "important to safety," which might be things like in a feedwater system that are not safety-related but are still important. And that's what we were trying to set up. But I think we finally gave up, because we were using the two terms too interchangeably in our regulations.

MR. JORDAN: Did we put something out to the industry telling them that they were synonymous, or did we just let it moot?

MR. HODGES: I think we finally let it mute. I don't know for sure, but I think we finally let it moot. I think we finally threw our hands up.

MR. JORDAN: Okay. I think that answers the next question there.

Were you in the region when this happened, Wayne?

MR. HODGES: Yes, I was.

MR. JORDAN: You were in the IRC when it happened?

MR. HODGES: Well, I came into the office about 20 after 7:00 and immediately went down there. So by the time I got there, they had restored power.

MR. JORDAN: Okay.

MR. HODGES: But after 7:00 in the morning until sometime much later, I was in there.

MR. JORDAN: Okay. So you're familiar with the event, then?

MR. HODGES: Yes.

MR. JORDAN: Okay. Are you familiar with the equipment that they did not have available to them?

MR. HODGES: Yes.

MR. JORDAN: Okay. Can we ask your opinion on equipment that they did not have available to them and whether or not you think it should be safety-related or not, or should it be non-safety-related, one of which is all control rod instrumentation in their power supplies?

MR. HODGES: My personal opinion is that should be safety-related. But you have to be a bit careful here, because it's also not safety-related on PWRs, you know.

MR. JORDAN: Okay.

MR. HODGES: But I am amazed that we have let that go by as not being safety-related. But there's a long history of it not being safety-related, and we would, I think, have a significant backfit issue to deal with that we probably couldn't justify on a cost-benefit basis to try to make it safety-related. But I think that's a shame on us.

MR. JORDAN: Okay. You're thinking that thee backup to the control room instrumentation and their power

supplies, particularly for, I guess it says all control room instrumentation and their power supplies. You think of it that, just that broad sense --

MR. HODGES: No, I think that's too broad.

MR. JORDAN: That's too broad. You feel that there's some instrumentation in the control room that should not be safety-related?

MR. HODGES: Yes. Yes.

MR. JORDAN: Okay. The rod position sensing elements, an indication in their power supplies, you feel maybe should be safety-related?

MR. HODGES: My personal opinion is we should make it safety-related.

MR. JORDAN: Okay. And you agree that this plant's having them non-safety-related --

MR. HODGES: I'm sorry. I was talking. I didn't hear you.

MR. JORDAN: This plant being, in other words, non-safety-related, you feel met what the industry requirements are?

MR. HODGES: I think it met what the NRC requirements were.

MR. JORDAN: But your own personal opinion is, you think it should be safety related?

MR. HODGES: My own personal opinion is it should

be safety related. I think there's a long history of NRC position that it does not have to be safety related.

MR. KAUFFMAN: What is your reason for thinking it should be safety related? Just good practice?

MR. HODGES: Yes, I take it -- yes, you've got basically, in a BWR in particular, about three pieces of instrumentation you really have to worry about, and one is water level. Another is power and another is pressure.

And I think those are the three major parameters and those ought to be safety related. Those ought to be gold-plated. That's my personal opinion.

MR. JORDAN: Okay, how about the APRM, IRM, SRM sensing elements, indicators including their drive motors? Do you want it broken up or whole?

MR. HODGES: The instrumentation, yes; the drive motors, I'm not so sure of.

MR. JORDAN: Why do you feel that the instrumentation should be, but the driver motors may not be?

MR. HODGES: I -- well, you've got to go in and say, what do you mean by safety related and what are you trying to do with it? You know, you want to put them in there and drive them in right away if you get a scram signal. And if you do that, then it's going to be doing that in the normal kind of environment because this stuff is outside of containment. You're not going to have to worry

about a harsh environment and a lot of other things with it.

Once it's in there, it's going to -- it may have to clear re-criticality, so it should be a very robust instrumentation. So, I think the challenges are different.

MR. JORDAN: Okay, but what happens if loss of offsite power -- if the drive motors are not safety related, they may not come off of the diesels and you may not be able to drive them in. They may be sensing external to the core, okay, but they may not be able to get them in.

I'm just asking you.

MR. HODGES: That's right, you have --

MR. JORDAN: You mentioned the fact that the indicators should be, but the drive motors may not be. Could you postulate, as a result of the indicators reading external to the core, what the core power is? Do we have the ability to do that?

MR. HODGES: I wouldn't want to try to do that. That would be too wild.

MR. JORDAN: Okay, how about all instrumentation used to verify reactor shutdown; do you feel that should be safety related, non-safety related or do you think the mix they have right now is okay?

MR. HODGES: Well, I'm not sure. When you say all, I just put the drive motors back in there. You know, I have trouble any time you want to try to use, "all" on me.

But I think, in general, the instrumentation used to verify shutdown should be safety related.

MR. JORDAN: You think they should have at least one system that's safety related to verify shutdown? If you don't say "all," should you have a system, whether it be rod positions or --

MR. HODGES: Yes.

MR. JORDAN: Or APRMs or IRMs or something?

MR. HODGES: Right, right.

MR. JORDAN: How about -- I guess shutdown is also a question. We're talking about here, cold shutdown versus hot shutdown.

MR. HODGES: Well, for example, the source range and the APRMs are not going to tell you much about whether you can be in cold shutdown if you're still in hot shutdown, and that's the question you need to answer. There, you're going to need rod position.

MR. JORDAN: So you feel they need some type of a rod position, and that should be some type of safety related backfit?

MR. HODGES: If I had my druthers, that's the way I would do it because if I have to justify it on a cost/benefit basis as a backfit, I doubt it.

MR. JORDAN: Okay. How about the plant computers, SPDS and their power supplies?

MR. HODGES: Plant computer, not necessarily; SPDS, yes.

MR. JORDAN: Why SPDS?

MR. HODGES: Because I think that you need -- again, highly desirable, need is probably the strongest.

MR. JORDAN: Okay.

MR. HODGES: Highly desirable for accident purposes. If you've got that, there are other things you could do without.

MR. JORDAN: Okay.

MR. HODGES: Again, this is my personal opinion.

MR. JORDAN: I understand.

Based on your knowledge of the EOPs for boilers and how they're developed and the use of the instrumentation in order to accomplish the EOPs is --

MR. HODGES: You can do the shutdown without the SPDS and all this other stuff --

THE REPORTER: Without these other things, and then you said what?

MR. HODGES: I say you could get the plant shut down to the safe condition with all of this other stuff but it's tough if you don't have it.

MR. JORDAN: It's tough if you don't have it, okay.

THE REPORTER: Thank you.

MR. JORDAN: Okay, how about safety-related for all EOP use parameters and indicators and equipment?

MR. HODGES: Nope.

MR. JORDAN: Okay. Should a black box for transient analysis be required and be classified safety-related?

What we're looking at, Wayne, is should they have some type of a -- like the airlines do, that no matter what happens when you're all done you can go back and via this black box evaluate the transient and what happened?

In this case with loss of the computer and loss of the alarm printer and loss of indication, it was hard to recreate with just level and pressure exactly what happened.

Do you think we should require the utilities to have some type of a black box transmitted analysis be required and be classified as safety-related, non-safety-related and if you say yes or no, why not?

Why or why not?

MR. HODGES: I don't think we can -- cost/benefit basis again.

I mean it would be a nice thing to have. We always like to be able to know what happened, but -- and because you want to apply that lesson to other plants or even this plant in the future, but I think what we have to focus on is if from a safety standpoint if we're able to get

through the event safely without that part in this case at this time thee is a fair chance if it occurs again -- we're going to learn something about what happened during the event. We won't be totally ignorant, so I think if you look at the cost of such an instrument versus the benefits that we get from it, we may have a hard time justifying it but it would be a very nice thing to have.

MR. JORDAN: Okay, on redundancy and diversity, do we expect, would you expect the utility to have diversity as well as redundancy in non-safety related applications?

MR. HODGES: Nice, but not necessary.

MR. JORDAN: Nice, but not necessary.

MR. HODGES: Right.

MR. JORDAN: And you are saying because of cost benefit or you just don't think as a regulator requirement we should be requiring that?

MR. HODGES: Well, if it is non-safety-related, we're already saying we don't require that it -- we don't have any requirements on them.

MR. JORDAN: How about safety-related?

MR. HODGES: I think there's some level of diversity we normally want but we don't always get it. All we get is redundancy. I don't think we need it.

For example, we have diverse ways of shutting the plant down and we have diverse systems for injecting water

and they are redundant among themselves. You need a certain amount of that.

MR. JORDAN: How about important to safety equipment?

MR. HODGES: I don't think, for example, we'd want to say you need both for example a centrifugal and a positive displacement pump to get diversity in the injection system. I think something like that would be kind of ridiculous.

If you got -- I think you have to temper the amount of diversity. I think there are situations where it's great. I think there's other situations where it doesn't buy you a lot.

MR. JORDAN: How about manufacturer, model types?

MR. HODGES: I think you have to look at again specific -- if I had manufacturer I had a high confidence in making my pumps I might prefer to stay with that rather than trying to split it up just for diversity's sake.

I think you have to temper some of that with reason is what I'm saying.

Across-the-board diversity is not necessarily good and there are problems with spare parts and other things as well, so a certain amount of diversity, across-the-board diversity may be bad for you.

MR. JORDAN: Okay.

Can you describe -- I think you already did a little bit -- any interfaces you have had with NRR branches in the review of the above areas?

In your experience, have you brought issues like this up, and has it been discussed and developed, and in what areas of NRR did you bring it up with?

MR. HODGES: Okay.

Well, obviously I was in NRR when I reviewed the EOPs.

MR. JORDAN: Okay.

MR. HODGES: And when I began, the branch chief was a supervisor, supervising the review of EOPs.

MR. KAUFFMAN: What revs were those?

MR. HODGES: Well, I actually did the review for Rev 2. Rev 3 was done in another organization, and then I did Rev 4 under my supervision.

MR. KAUFFMAN: Do you happen to know who did Rev 0 and Rev 1?

MR. HODGES: Rev 0 and Rev 1 were never approved by the NRC. We were doing a continual review up through Rev 2, and Rev 2 was the first one that an SER was written on.

So, I was involved all the way up through the writing of the SER for -- for Rev 2.

MR. KAUFFMAN: Okay.

MR. JORDAN: In your review of those, did you have

any interface with other NRR branches?

MR. HODGES: Oh, sure.

The -- it was the human factors division, and they -- in fact, they had an individual who did the human factors review while I was doing the systems review, and then I also interfaced with the instrumentation branch and the containment systems branch and -- those were the major ones.

Yes, there -- there was -- was interface with other -- other branches.

MR. JORDAN: What kind of interface did you have with instrumentation?

MR. HODGES: Basically, we talked about the kind of things -- what would be needed in an operator and that kind of stuff.

It was more on a consulting basis. They didn't actually do the review.

They were used as consultants, and pretty much the same with containment systems, although they were given some parts, say look at this and give me your opinion kind of thing, but I was responsible for the review, and I did the writeup. They acted as consultants to me.

MR. JORDAN: Did you ever ask instrumentation, you know, what instrumentation is going to be available or not available and whether or not they felt -- what their feelings were on instrumentation that was going to be needed

or they felt was needed?

MR. HODGES: We had a lot of discussions on what we would do under various circumstances. Did we ever contemplate something like happened at Nine Mile, where you lose five separate power supplies selectively, I'm not sure we got that detailed.

But we looked at loss of all instrumentation and all power or all DC power in the control room and those types of things and tried to say, okay, what do you need to deal with it?

But when you've got a mixture, I don't think we got into that kind of detail.

MR. JORDAN: Okay.

Well, let me go around the room here and see if there's any other questions. Then we'll ask you our final question.

You guys got anything else?

MR. KAUFFMAN: I had one.

Back when we were talking about EOPs and we're in two legs that basically told us to do different things --

MR. HODGES: Right.

MR. KAUFFMAN: -- we debated amongst ourselves here what should be done. Is that a good position, a fair position to put the operator in, that he has conflicting things and he doesn't have something to say that this one is

most important, it takes priority, do this?

I guess what I'm asking is the EOPs, was it intended that you would wind up in conflicting spots, or did this event show a glitch?

MR. HODGES: I think if you even look at our SER on the Rev 2 -- and I think some of the others were carried forward in our SER on Rev 4 -- it talks about where the priority should be put, and some of that should be in training.

You don't want to have everything in the EOPs themselves. Some of it is going to be left to training.

Where the focus should be on maintaining core cooling, for example, that's fairly clear that it's a priority, and my memory is a little dim on some of this, but I think the BWR information, the owners group information on that, also --

MR. JORDAN: Also what?

MR. HODGES: -- also has similar words on where to put the priorities, and also, there is -- see, in addition to just the -- the EOPs, there were appendices to that that got into how to develop these numbers that go into the EOPs and the philosophy behind what was being done, and then, that -- those appendices definitely put precedence on keeping the core cool.

MR. KAUFFMAN: So, in this event, the operators

really weren't sure which one was more important. They used their judgement and kind of picked one.

MR. HODGES: Well, I think their training, if it didn't tell them that the priority was on core cooling, should have.

So, there should not have been a big question mark for the operators, in my opinion. If it was, then that may signal a weakness in their training.

MR. KAUFFMAN: If I'm looking at this a human factors point of view, I might suggest something like that this leg, the most important leg, be in bigger print or darker or have a big "1" by it. Would something like that make sense?

MR. HODGES: I don't know. I'm not a human factors expert.

MR. KAUFFMAN: Because it's a stressful situation.

MR. HODGES: It's a stressful situation, but you're relying upon several things.

You're relying upon the procedures that tell you how to go through and do things.

You're relying upon training that tells you where to put your emphasis on things, what's important, how the plant behaves, you know, the physics of the plant, and I think that -- you don't put all that in the procedures either.

There's a lot of stuff you don't have in there explicitly. It's expected to be covered in training -- whether you should single out because this event happened to do that, I'm not sure.

MR. ROSENTHAL: Wayne, this is Jack Rosenthal. I just came in a few minutes ago from another meeting.

MR. HODGES: I can't repeat everything I've just said.

MR. ROSENTHAL: I don't expect you to. Number one, I wanted to say thank you.

MR. HODGES: Uh-huh.

MR. ROSENTHAL: But I do want to ask just a couple of questions. If it's been covered, you could just say, hey, it was covered.

I think that we, in reviewing the EOPs, we said, go ahead and put all the instruments in that you really need, whether they're safety-related or not, because we didn't want to have one set of EOPs that were the real EOPs, and another one that was just for the regulators. So, we told them that hey, if you put in the stuff, that means we won't turn around and make you make it all safety-related.

MR. HODGES: In essence, that's correct.

MR. ROSENTHAL: Okay. But I can't find that in writing any place. Do you know where that was ever formalized?

MR. HODGES: I don't know if we ever did formalize it.

MR. ROSENTHAL: Okay. Another issue that I've heard is that some people believe that if you needed to take action, it ought to be of the highest quality and redundancy, but if you need it for confirmation or verification, it could of a lower quality or level of redundancy. That was like a logic that was used. But I don't know where that's written down. Do you know anyplace where that's written down as a rationale?

MR. HODGES: No.

MR. ROSENTHAL: That was just the way people worked?

MR. HODGES: For the most part. But, again, we have one here like the control rod position, which really need to take an action, not just for confirmation. Because, you know, you need to know that before you could cooldown, and it's not safety-related. So, that's not an across-the-board truism.

MR. KAUFFMAN: I guess, in some of the interviews we had people said if it was to take credit for it, like in Chapter 15 FSAR, then it was safety-related.

MR. HODGES: That's not even true, sir. There are things that are taken credit for in the Chapter 15 FSARs that are not safety-related.

MR. ROSENTHAL: Especially for anticipated transients?

MR. HODGES: Oh, yes, absolutely. The only thing -- the only place where it's required to be safety-related is in dealing with LOCAs and such. Now, there you've got to have safety-related equipment to deal with it -- the oldest ECCS stuff. But if you're talking about turbine trips and things like that, you will rely upon nonsafety-related instrumentation, Chapter 15. And that's been common practice for both BWRs and PWRs.

MR. ROSENTHAL: Okay. Were you involved in the maintenance rule?

MR. HODGES: No.

MR. ROSENTHAL: Were you involved in importance of safety versus safety-related?

MR. HODGES: Uh, I've been involved with it for the Shoreham hearings. I had numerous discussions with -- again, I can't think of his name --

MR. ROSENTHAL: Conran?

MR. HODGES: -- he's from the CRGR staff.

MR. ROSENTHAL: Jim Conran?

MR. HODGES: Jim Conran. He and I had lots of discussions. We were on a panel together, on one of the contentions at Shoreham.

MR. ROSENTHAL: Well, we've interviewed Conran.

So, if we pumped him --

MR. HODGES: You've probably got the most knowledgeable person on it then, if you pumped him.

MR. ROSENTHAL: Okay. And you guys have been over the emergency procedures, I know.

I'm finished.

MR. JORDAN: Wayne, I personally thank you.

MR. HODGES: Okay.

MR. JORDAN: Someday you and I are going to have to meet each other face-to-face.

MR. HODGES: Right. I look forward to it.

MR. JORDAN: Okay, Wayne.

MR. HODGES: Take care.

MR. JORDAN: Thank you.

MR. ROSENTHAL: Thank you.

[Whereupon, at 1:39 o'clock p.m., the above-entitled interview was concluded.]

REPORTER'S CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission

in the matter of:

NAME OF PROCEEDING: Wayne Hodges

DOCKET NUMBER:

PLACE OF PROCEEDING: Bethesda, Maryland

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Mark Mahoney

Official Reporter
Ann Riley & Associates, Ltd.

07-521.B-91

OFFICIAL TRANSCRIPT OF PROCEEDINGS

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Incident Investigation Team

Title: Interivew of: Wayne Hodges
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ERRATA SHEET

ADDENDUM

Page	Line	Correction and Reason for Correction
5	14	Change Short to source
6	4	change imposition to position
18	5	change course route to core shroud
20	4	change weight to Wait
22	12	change AEOPs to EOPs
23	13	Change incursion to excursion
23	14	Change Section L to scenario
31	13	Change SIVs to SRVs
38	10	Change Sham to shame
38	18	Change Ms. Herbert to Mr. Hodges
40	6&7	Change Conrad to Conran
40	13	Change Conrad to Conran
40	13	Change Dennis Peace to Themis Speis

Note: There are several instances where words are not transcribed accurately but the errors are obvious. I have not attempted to alter these.

Date 9/26/91 Signature M. Wayne Hodges

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

INCIDENT INVESTIGATION TEAM

- - - - - - - - - - - - - - - - - - -X

In the Matter of: :

INTERVIEW OF: :

WAYNE HODGES :

(CLOSED) :

- - - - - - - - - - - - - - - - - - -X

Nuclear Regulatory Commission

Interview Room

Woodmont Building

8120 Woodmont Ave.

Bethesda, Maryland

Thursday, September 5, 1991

The above-entitled matter commenced at 12:22 o'clock p.m.

On behalf of the Incident Investigation Team:

JOHN ROSENTHAL, II Team Leader
MICHAEL JORDAN, NRC Region III, II Team Member
WILLIAM VATTER, INPO, II Team Member
WALTON JENSEN, Events Assessment Branch, II Team Member
JOHN KAUFFMAN, AEOD, II Team Member

Interviewee:

WAYNE HODGES
Deputy Director for Reactor Safety
U.S. Nuclear Regulatory Commission
Division I
Philadelphia, Pennsylvania

[Mr. Hodges was interviewed via telephone from Charlottesville, Virginia.]

PROCEEDINGS

[12:22 p.m.]

MR. JORDAN: Okay, Wayne, why don't we start?

I'll introduce myself. My name is Michael Jordan. I'm out of Region III, Wayne. I'm a Section Chief in Region III for Operating Licensing, and also in the room is also --

MR. KAUFFMAN: John Kauffman. I'm a Director of Systems Engineering in AEOD.

MR. JENSEN: Walton Jensen. I work in the Events Assessment Branch, but I used to work in Reactor Systems across the hall from you, Wayne.

MR. HODGES: Yes, I know you did, Walt.

MR. VATTER: I'm Bill Vatter. I'm from INPO, Wayne. You'll remember that we met in that IIT School earlier this year.

MR. HODGES: Right, right. I remember you.

MR. JORDAN: Okay. The event we're going to talk about, Wayne, happened on August the 13th at Nine Mile Point, Unit II, involving a site emergency because of a transient coupled with a loss of power of annunciators. That's why they had the site emergency. They lost a lot of balance-of-plant equipment, and they lost their full core display.

The reason why we're talking to you is, we're looking for information having to do with the development

and review of the BWR's EOPs.

And why don't we start out with the first we've got here, and we'll work our way through this thing. If you have any questions along the way, stop us and ask us.

MR. HODGES: Okay.

MR. JORDAN: Since we can't see you, we don't know what you're -- if you're having a problem or not.

With respect to the EOP parameters and instrumentation used during the operator implementation of the EOPs, how were the parameters related to the Reg Guide 197 instrumentation?

MR. HODGES: I didn't understand the question.

MR. JORDAN: Okay. 197 has got the list of instrumentation that's required to be operable EQ'd, et cetera, after an event -- EOP development.

Do you know of any -- how those 197 instrumentation were related to the EOP development?

MR. HODGES: Not directly. I mean, as far as the development of the list, the EOP was being developed concurrent with 197, and I know that Jack Rosenthal tried to incorporate EOP issues, but it was strictly 197, and which ones were required by 197, I don't know.

MR. JORDAN: Okay. So you don't know of any in the EOPs where portions of the EOPs require 197 in order to get through them?

MR. HODGES: Well, I would answer the question a little bit differently. Was there adequate instrumentation available with what they lost to make it through the event? And in this case, there was. And that was at least my opinion at the time the event was going on, and then that was later confirmed by Carl -- uh-oh.

MR. JORDAN: Sisco.

MR. HODGES: Carl Sisco when he looked at it up there as part of the AI team.

Recognize that you can use, you know, a myriad of things, and in this particular instance, they did have indications on the back panel that they APRMs were downscale. The power was down for most of the plant, but it was down in the short range.

MR. JORDAN: Well, they knew they were off 4 percent.

MR. HODGES: Right.

MR. JORDAN: And I guess the question is, is that is there any instrumentation that's EQ qualified to verify below the 4 percent, so they get out of that do loop that was part of the EOPs.

Are you familiar with the section of the EOPs that got them into a holding pattern?

MR. HODGES: I'm trying to recall. No, I'm not right off the top of my head, because you don't need -- if

the power instrumentation is not available, the power instrumentation is not available, there are steps in the EOP to determine where you are without using that instrumentation. It relies upon pressure or imposition of SRVs and those types of things.

So you can determine not the absolute power level, but you can tell -- you can determine that the reactor is shut down based upon the reactor pressure and the status of SRVs.

MR. JORDAN: Yes, but the problem is there is a section here that talks about you have to wait until all control rods are inserted to at least the 02 position.

MR. HODGES: Right.

MR. JORDAN: Okay. And do you know of any 1.97 material that allows them to go through that?

MR. HODGES: Again, I don't recall which is 197 and which is not. I haven't looked at a list of 197 instrumentation in a long time.

MR. JORDAN: Okay. Well, the reason I'm asking, Wayne, is that, you know, I'm looking at what they had, and since they didn't have the full core display -- they said they didn't have that. All rods are inserted to at least the 02 position. They felt the only way --

MR. HODGES: They did not have the rod position indication, is my understanding.

MR. JORDAN: That's correct. So they couldn't do that.

MR. HODGES: Right.

MR. JORDAN: And it says: Or the reactor will remain shut down without boron.

MR. HODGES: Right.

MR. JORDAN: Okay. What instrumentation would you expect them to use to verify that the reactor remained shut down?

MR. HODGES: I would use several things. One, I would use the back panel and see that the APRMs were downscale. That's an indication that they're down.

MR. JORDAN: Yes.

MR. HODGES: They also got the status of the SRVs and the pressure, and those would indicate the reactor was shut down. So there's adequate instrumentation from what they had to deduce that the reactor was shut down.

MR. JORDAN: But how do they know it's going to remain shut down, because the step was "will remain shut down without boron"?

MR. HODGES: Right. All that says is before you start to depressurize, you may have to worry about, for example, if you don't have rod position indication and you don't know -- all you know is that it's below a certain point, now you've got to -- you have to worry about some

rods being out, and you have to have some means of verifying the rod position. Otherwise you shouldn't cool down. That does not say you cannot maintain the plant in a stable condition.

And that's all the EOPs is trying to do, is keep you in a safe, stable condition. And a hot shutdown at full pressure but zero decay heat power is a safe, stable condition.

MR. KAUFFMAN: Okay. But if they were cooling down by, say, using RCIC to inject, that wouldn't meet the intent of that step there to not depressurize if they, in fact, did depressurize?

MR. HODGES: Well, I don't think they started that until after they got some instrumentation back. They got the instrumentation back in about 20 minutes.

I mean, if you're sitting there with, you know, the pressure between 800 and 1000 pounds, you're not depressurizing.

MR. JORDAN: Yes, but what they did, Wayne, in order to put water into the vessel --

MR. HODGES: Right.

MR. JORDAN: -- they used RCIC.

MR. HODGES: And that's going introduce some cold water, and that's going to drop the pressure a little bit.

MR. JORDAN: Right. And that dropped the

pressure.

MR. HODGES: But it's going to operate, is what's going to happen. Initially, RCIC won't be enough to take out the decay heat, and so it will maintain pressure. After a period of time, then RCIC will keep up with it. So it's an energy balance game.

MR. JORDAN: Yes, but I think what really happened, Wayne, is they didn't maintain the pressure. The RCIC drawing the steam off on the RCIC --

MR. HODGES: Right.

MR. JORDAN: -- actually reduced pressure.

MR. HODGES: Okay.

MR. JORDAN: You know.

MR. HODGES: But the also went to Level 8, which they didn't have to do, but it is routine to do that. But how far down did the pressure bring them?

MR. JORDAN: Down to about -- I think it was around, Walt, 500 pounds.

MR. JENSEN: Around 700. They went down to around 700 pounds, so that the condensate booster pumps started injecting into the vessel.

MR. HODGES: Okay.

MR. JENSEN: And that's when it went up to Level 8, when they dropped down below the booster pump pressure, and the booster pump started injecting into the reactor --

MR. HODGES: Okay.
MR. JENSEN: -- and brought the level up.
MR. HODGES: All right.
MR. JENSEN: It was about a little less than 700.
MR. HODGES: Did they see anything that would have indicated an increase in power while they were doing that, an increase in pressure or anything like that?
MR. JENSEN: No. The pressure was going down all the time they were having RCIC injection, and the --
MR. HODGES: The only thing you don't know is -- during that first 20 minutes until they got some power restored, is the absolute position of the rods.
MR. JENSEN: That's right.
MR. HODGES: You know the reactor was essentially shut down where you are.
MR. JORDAN: You know -- right. At each pressure point, you know you're shut down.
MR. HODGES: You don't know what will happen if you go lower.
MR. JORDAN: You don't know what will happen if you go lower.
MR. HODGES: That's the only concern there.
MR. JORDAN: But that says -- that's what that -- maybe understanding what the step is, but that, I thought, was what the wait step is for is so that you don't --

MR. HODGES: Yes. The step says that you should not, you know -- you should try to hold it in safe, stable condition until you can make that determination, basically is what that's saying.

MR. JORDAN: And the question I have is that other than the pressure, which is the 197 pressure, the PAM, the post-accident monitor records, and the APRMs and the back panels, did we look at any other method by which they could go through that step prior to depressurization using RCIC.

MR. HODGES: Well, be careful, because most of us did not even get to the Response Center until after they had restored power. So we were looking at everything after the fact at that point.

MR. JORDAN: No, but I'm looking at -- I'm questioning back on EOP development.

MR. HODGES: Right, right.

MR. JORDAN: Not when we showed up, not when we, the NRC, responded to the event.

MR. HODGES: When we were developing the EOPs, we did not say: Is this 197 or not 197? That was not a consideration in the development of EOPs.

The consideration is; do you have an instrument that will do that? And if you lose that instrument, do you have a backup? And there was no consideration of; is it safety related, is it 197? That was not part of the

discussion.

MR. KAUFFMAN: Was there a consideration given that at least instrument for that function would be, as you seemed to indicate before, not considered at all?

MR. HODGES: I'm sorry, the question again?

MR. KAUFFMAN: I guess you said it wasn't considered whether the instrument was Reg Guide 197 or not. My further question is, was there consideration given to the idea that for some functions, you would make sure you at least had one safety grade or one 197 instrument to look at that function?

MR. HODGES: There was no consideration of whether or not the instrumentation was safety grade of 197. The question was; did you have an instrument that, given the conditions that you had, you could have confidence in?

And you verified that by several means: one is, if you had similar instruments reading the same kind of thing, or if you had other parameters that were consistent with the reading that you have. But, I mean, whether it's a safety grade instrument or a non-safety grade instrument, you may have a problem.

Therefore, the EOPs do not consider whether it's a 197 or a safety related or anything else. They basically say, do you have an instrument you can rely upon to do the job? Well, the purpose of the 197 and the safety grade is

to try to assure a high level of reliability for a certain set of instruments. But that does not mean necessarily that those instruments are more reliable than some other instrument.

In fact, because of some of the criteria we put on them, they may, for some circumstances, be less reliable. But the point is that the operator should have some instrumentation that he can rely upon to draw his conclusions.

Now, beyond that, if, on a BWR, you lose all power indication, there are still -- I mean, power not reading, whether from the APRMs or source ranges or whatever, and you don't have a power reading, you can still deduce the power rating from the pressure and status of SRVs and MSIVs.

The EOPs allow that to occur. For example, if the pressure was going down -- you say down to 700 pounds --

MR. JORDAN: Right.

MR. HODGES: Then you're not at power, not with the kind of flow that you've got with RCIC, because RCIC can -- is a low capacity system that will, if my memory is right, is that it is equivalent to roughly five percent of power -- no, it's less than that 3 percent of power, which is identical to decay heat range and until -- and for the first five minutes or so, RCIC can't even keep up with decay

heat.

After that, it will start to do a little bit and could depressurize you. But RCIC is a low capacity system, and if that's what you're using and the pressure is going down, you can have a high confidence, even though you've got no direct power instrumentation, that the reactor is shut down.

MR. VATTER: Wayne, let me postulate for you --

MR. HODGES: Sorry. That was part of the philosophy in developing the EOPs.

MR. VATTER: Wayne, I'd like to postulate for you, a little bit different scenario.

MR. HODGES: Okay.

MR. VATTER: And perhaps you can tell me whether it's realistic or whether it's been considered.

MR. HODGES: Okay.

MR. VATTER: You get the scram but you don't get all the rods going in.

MR. HODGES: Right.

MR. VATTER: However, the operator doesn't know this.

MR. HODGES: Right.

MR. VATTER: And he is able to see that the reactor is shut down, but he doesn't know how much it's shut down.

MR. HODGES: Right.

MR. VATTER: And then, as he cools down, he has re-criticality.

MR. HODGES: Right.

MR. VATTER: And because of the rate of the cooldown, either through cold water addition or by depressurizing, the reactivity is added quick enough that before you get Doppler, or voids or something that could turn it, you get the reactor going on a power increase that's unacceptable. Maybe you get not prompt critical, but you get close enough to it that you have such a high power spike that you hurt the fuel?

MR. HODGES: Right. You can't do that with that kind of a cooldown. In fact, as you cool down and depressurize, if you start to generate some power, what you will do is, you will get some voiding and that will -- the voids that you depressurize will have a stronger effect than the cooldown. That was considered.

MR. VATTER: But you might shoot some cold water in there like condensate booster pumps. You might be cooling down real slowly or depressurizing real slowly.

MR. HODGES: If you get to the point where you -- and you get to a situation similar to what you're talking about, but you can't do it without boron in there. You can't have it both ways.

Either you're going to have -- as far as -- I suppose you could go -- you could go recritical. But you're not going to go on a prompt critical that's going to become exponential on you.

MR. VATTER: Is there some kind of analysis that's been done in that that we could study?

MR. HODGES: There were some analyses done. I don't have them. GE may have them. I'm not sure where they are right now.

MR. VATTER: Who is the person that we ought to talk to to find out more about that analysis?

MR. HODGES: Probably what I would do is go through the BWR Owners Group chairman and have him contact GE. The EOPs belong to the BWR Owners Group, not GE. They had some analyses done by GE and they had some analyses done by contractors. I think I would go through the BWR Owners Group and see what they've got.

MR. JORDAN: But you think there's analysis to show that with using -- without boron in the vessel, as long as you have a cooldown, that you can't go prompt critical and cause --

MR. HODGES: Well, I think that's true. Now, we even did some calculations at Brookhaven with boron in there that tended to show that that couldn't happen, but that tended -- that was where you were smearing the effects over

the whole core. I'm not so sure that if you localized it, you couldn't do something with it if you had boron in there.

But even that showed that if you -- as long as you weren't localizing -- and these were from calculations that were done under contract at Brookhaven by Dave Diamond -- again, I don't have any contract -- any reports on that, but they're probably retrievable from Brookhaven somehow.

MR. JENSEN: Wayne, would somebody in the Reactor Systems Branch maybe have those reports or be familiar with the calculations?

MR. HODGES: Well, we did at one time when I was down there. I don't know where they are now, Walt. Chuck Graves was involved with some of that. Whether he still has some, I don't know. It might wind up having to go back to the Brookhaven or someplace to try to get them, because they did the analysis.

MR. JORDAN: Did they do that for us or for somebody else?

MR. HODGES: They did that for us.

MR. KAUFFMAN: Who on our staff reviewed those types analysis?

MR. HODGES: I said Chuck Graves and I looked at that from the Brookhaven analyses. We were trying -- we were asking a slight different question. We were looking at it with boron in there, and we were concerned -- my concern

was at that time that if you had the reactor shut down and you injected, un-borated water, but it was shut down strictly on boron -- and we were looking at a BWR-5 or BWR-6 design where you injected the low pressure cooling injection system directly into the course route, could you get, you know, an excursion?

And their calculation showed no. My concern was, their model was not good enough to look at the local jetting effect of the cold water, the localized effect rather than the smeared effect across the core.

But for the kinds of things you're talking about where you're just injecting it in the feedwater lines and coming on down that way, that analysis would say, even with boron in there, you're not going to get that.

MR. KAUFFMAN: Did that analysis assume that you got, I guess we'll say, full rated condensate booster pumps? Because, what happened in this --

MR. HODGES: That analysis assumes all LPCI flow coming in cold. Basically, I think it assumed full LPCI flow coming in.

MR. JENSEN: Now, when you say that there was boron, is that assuming that the operator has injected the system?

MR. HODGES: That was taken as an assumption that you had an ATWS where no rods went in. You had shut the

reactor down using boron from the standby liquid control system. You had depressurized down to, you know, a low pressure system and then you got an inadvertent actuation of your LPCI to inject the full -- the LPCI flow which is like going to be roughly 20,000 gallons per minute -- 15-20,000 gallons per minute injected into a core that's shut down strictly with the boron which I think is probably a more valuable analysis than what you were asking for.

MR. JORDAN: Okay. Let me ask another question.

MR. HODGES: Okay.

MR. JORDAN: This is to the -- the previous questions were more generic with the EOPs. This is back to the specific event.

MR. HODGES: Okay.

MR. JORDAN: Okay, when the operators got to the point in their ATWS procedure that says wait until all rods are inserted at least the 02 position in the reactor or the reactor remains shut down without boron. I think they got into a stop statement, that they couldn't get through that, okay?

MR. HODGES: Okay.

MR. JORDAN: Now on the other one for the normal reactor vessel level control under pressure control, it says you don't start cooling down until all rods are inserted. The reactor remains shut down without boron, if boron is

being injected but a slick level is dropped to 900 gallons or the reactor is shut down and no boron has been injected.

MR. HODGES: All right.

MR. JORDAN: Okay. That's another weight statement.

MR. HODGES: Okay.

MR. JORDAN: Both of those are -- but they were in a situation that while they were using RCIC they were depressurizing.

MR. HODGES: Okay.

MR. JORDAN: And RCIC is allowed by the ATWS procedure as an injection source. By injecting with RCIC they reduce pressure.

MR. HODGES: Right.

MR. JORDAN: So is --

MR. HODGES: Well, that says the power is at least less than what RCIC is capable of.

MR. JORDAN: Okay.

MR. HODGES: And RCIC because they can take out and it's all between 2 and 3 percent power so you know it's less than that.

MR. JORDAN: Okay, so as far as the cooldown depressurization using RCIC, that's not allowed by the pressure -- you feel it's okay because it's allowed by the RCIC ATWS? You have a problem with --

MR. HODGES: Wait, let's back up a minute.
MR. JORDAN: Okay.
MR. HODGES: RCIC is maintained core covered.
MR. JORDAN: Right.
MR. HODGES: And that has got to be the first priority is that you maintain adequate coverage of the core.
MR. JORDAN: Okay.
MR. HODGES: All right? Now if in the process of doing that you have some depressurization, if it could be avoided you probably should, but if it is needed in order to maintain the core covered and adequate core cooling, the choice has got to be to go for the core cooling. There has to be a priority there.
MR. JORDAN: Okay. Okay, would you expect the reactor operators to close the MSIVs in order to maintain pressure up?
MR. HODGES: I would expect that they might want to try to control pressure with MSIVs so as not to cycle the SRVs and dump heat to the -- but I would expect them if the pressure is dropping to try to close them to let it come back up but I would expect they might try to use an MSIV as a pressure control mechanism.
MR. JORDAN: MSIVs are to control with pressure.
MR. HODGES: I understand that.
MR. JORDAN: They're either opened or closed.

MR. HODGES: It's either open or closed -- but MSIV is open and using a bypass or something to --

MR. JORDAN: -- need a bypass? By just using RCIC they were depressurizing.

MR. HODGES: Right.

MR. KAUFFMAN: Then there's steam auxiliaries.

MR. JORDAN: Then there are steam auxiliaries. Okay, the question I have is that would you have -- the EOPs don't tell them to do that --

MR. HODGES: Right.

MR. JORDAN: -- it just says you can't cool down--

MR. HODGES: But in fact I think the AEOPs would encourage them to keep the MSIVs open as a means of removing heat, particularly if there's a concern for an ATWS, because it is preferable to dump the heat to the condenser if you are going to have an ATWS going on than to dump it to the pool, where you start challenging your containment.

MR. VATTER: That's if you got power below 4 percent and you're concerned about recriticality, then maybe pressure control might come in.

MR. HODGES: The only thing -- what is the concern with recriticality? The concern is that if you've got a real skewed rod pattern that you might get boiling transition on a few rods and even though that would be a violation of the safety limit and it's something we'd

probably slap their hands for from a strict safety standpoint that ain't a big deal.

MR. VATTER: The other possibility is like we were talking that you get some power spike due to the reactivity going in there too quick.

MR. JENSEN: Like when you injected the condensate booster pumps pretty fast like they did at Nine Mile and then have some of the rods stuck out or they didn't know they weren't out --

MR. HODGES: Right.

MR. JENSEN: -- they weren't of course but they --

MR. HODGES: There is a possibility they would have gone critical but as far as an incursion I think it's a nigh unto impossibility for that kind of a Section L and part of that is based upon the Brookhaven analyses where we looked at roughly half the flow rate for that system with all the rods out and replacing -- see, you got, when the BWR is operating you have roughly eleven dollars of reactivity in the void, the steam, so if you shut the thing down and if you still have got some boiling going on, you have got some of that negative reactivity already.

When you shut down on boron and so that you've got the thing shut down basically we're saying in this case you have got all of the eleven dollars of that negative reactivity offset plus whatever else you need in order to

keep the thing shut down.

Now what you are talking about is as soon as you start to inject to this cold water, if you start generating power you also start generating void again and that's a very strong negative feedback and at low pressure the void offset the temperature effect, the void effects is much larger than the temperature effect and so we tend to shut the plant down, or at least not let it run away.

MR. JORDAN: Okay. Do you agree that the operators did correctly, by the weight statement?

MR. HODGES: I think that if I were in this situation -- until I got some indication back, I would try not to go all the way down. I would try to maintain some pressure there and wait. I think I would try to play it cautiously, yes.

Now, to me, the depressurizing the 700 pounds with RCIC is not going through a depressurization for cooldown. In a normal control, even for ATWS and other things like that, they talk about controlling it at 800 to a thousand or 800 to 1,100, something like that. They're supposed to specify a band. If you're a little bit outside the band they would specify. And so that may be a bit of no-no, but is it a safety problem? No.

MR. JORDAN: Okay.

MR. HODGES: Again, putting the priority on

maintaining the cooling.

MR. JORDAN: Maintaining water on the core?

MR. HODGES: Right.

MR. JORDAN: That's the priority?

MR. HODGES: Yes.

MR. JENSEN: Wayne?

MR. HODGES: Yes?

MR. JENSEN: Just after your reviewing the BWR guidelines, I was looking at the PWR guidelines. It seems like they were listing as their most critical safety function the shutdown of the reactor. They had their ATWS functional restoration -- they had a red line. They had that as the reddest most important thing they could do in a PWR.

MR. HODGES: Right.

MR. JENSEN: And then after that was core cooling.

MR. HODGES: If you look at the PRAs for BWR, ATWS is one of the big challengers. It's very critical, yes.

MR. JENSEN: Well, I was thinking -- I was wondering if you knew why they would have the -- the most critical safety function for a PWR being the ATWS, as opposed to core cooling, wherein BWR, the core cooling would take precedence over the ATWS?

MR. HODGES: I don't think that the PWR would tell you that ATWS takes precedent over core cooling. If you

don't keep the core cool, you've lost it. That's got to be your first priority -- one of the -- well, up to a point, that's got to be your first priority. If you decide, well, there ain't no way you're going to keep the core cooling anyhow, then you've got to go worry about the containment and try to protect it. But, otherwise, core cooling has got to be your first priority. If you can keep that core cool, then you can commit a lot of other sins and it won't catch up with you.

MR. JENSEN: Okay.

MR. JORDAN: Wayne, we've got a question here.

What was the scope of the ATWS analyses, were there different events, and what different events were considered?

On the ATWS, I guess what we're looking for, is that considered anywhere from, I guess, 4 percent power up to 100 percent power, or was it only considered at power in which it exceeded the decay heat such that the addition of RCIC would not depressurize the core?

MR. HODGES: It's going to test my memory a bit.

I know what was discussed. Now, how much analysis we had may be part of the problem. They did not have analyses for every situation. A lot of it was, given some limited analyses, now what could you extrapolate from and do?

So, did the BWR owners group have an analysis for an ATWS at, say, 10 percent power or 5 percent power or 3 percent power? My honest answer is no.

They analyses that we looked at for limiting things and then went back and tried to use some physics reasoning on some of the other stuff.

MR. JORDAN: Do you know, did we consider their analysis all-encompassing as far as the lower powers, as well as the upper powers?

MR. HODGES: I think, with the analyses, plus the discussions of the logic and the physics, I think we considered it covered the full range, yes.

I'm trying to think for a minute while we talk, too. There was -- that's still going to be fairly high power.

There were some analyses that were done in the last, oh, three or four years, again from the BWR owners group, looking at BWR stability, that got into some ATWS considerations, but they're starting from about the 40- to 50-percent power range.

Larry Phillips could probably tell you more about those.

MR. JORDAN: Okay. I'm just reading through some of these questions. I think you've answered some of these.

What happens if partial ATWS is followed by a

maximum credible reactivity addition from depressurization or cold water addition at a very low power?

You're saying -- in the source range level, you're saying you don't think that that -- that, if that happened, the core would go critical, but it would not cause fuel damage.

MR. HODGES: If you're talking about from -- you may have said a little bit more than I want to say.

MR. JORDAN: Okay.

MR. HODGES: If you're talking about a situation where you're not borated --

MR. JORDAN: Correct.

MR. HODGES: -- then the addition of the cold water won't result in what I would characterize as significant fuel damage.

The reason I hedge a bit is I think it's possible to get a localized relatively high power so that you might have some local clad failure on a few pins. I don't think that is a big safety issue.

It means you may get a little bit of radioactivity in the water, and if you've got a valve open that's going to go to the outside, you may release a little radioactivity. That's not a major fuel failure, though.

That's a localized fuel failure, as opposed to a core melt or something like a Chernobyl or something like

that.

So, you may, with that large cold water addition from low power, get -- for a PWR, you would call it DNB, and basically, you go to film boiling.

Then you have to say will that film boiling result in fuel failure? And there, it's possible but not necessary.

If we were doing a licensing analysis, we would assume it did. In real world, it doesn't necessary happen that way.

As a an example, there was a case in Sweden about four or five years ago where they made some mistakes in correlating and a few other things like that, and they actually operated the plant at full power with several bundles -- rods in several bundles in film boiling for periods of up to two weeks, and what they got was they failed a few pins, other pins has discoloration and didn't fail, and they didn't really even know they had that problem until they shut down.

You can damage the pins as far as some damage to the cladding, but not the extent you're talking about a massive safety problem. It's not something I would want to evacuate people for.

MR. JORDAN: Okay. You answered some of these questions we've got here. Let me run through them.

What would be the safety significance on an inadvertent criticality? While clearing down the plant, an analytical analysis, you say that as long as there is no boron, that you think it's going to have low safety significance.

MR. HODGES: Yes. I think there is some possibility -- I can't rule it out -- that you will have film boiling on some pins.

MR. JORDAN: And we've got some analytical analysis on, if the plant is boron, the consequences of a cold water injection.

MR. HODGES: Yes. And there again, you might get some film boiling on some pins, but you don't have massive fuel damage.

MR. JORDAN: Okay.

[Pause.]

MR. JENSEN: Wayne,

MR. HODGES: Yes.

MR. JENSEN: This comes from RSB days. Remember the Branch Technical Position 51?

MR. HODGES: Uh-huh.

MR. JENSEN: And that requires that plants be capable of achieving cold shutdown with safety-related equipment.

MR. HODGES: Right.

MR. JENSEN: And we were wondering how BWRs would show that, and if they needed to have safety-related equipment showing that either the rods were in or else they were in a shutdown condition. How was that done? How were they brought to cold shutdown with safety-related equipment, and would Nine Mile meet that?

MR. HODGES: Okay. I don't recall any analyses with that, considering a loss of all your power indication. That was really looking at -- could you cool the plant down and go on to shutdown cooling, using only safety-related equipment?

Typically, they demonstrated that they could do that they could do that by opening up the SIVs and depressurizing it in an injection through the LPSI system and providing cooling with the LPSI heat exchanger.

That was the method they used as a safety-related path to do that. That's not a path they would normally choose, in the few instances where I know of where they haven't been able to cooldown by the normal means, but that's not the path they've chosen.

MR. JENSEN: So, are you saying that they didn't look at the instrumentation when they did that? Are you just --

MR. HODGES: I did not look at the instrumentation when we did that. I don't think the question of the

instrumentation even came up at that point. I think single failure would limit you on that.

MR. JENSEN: Well that's nonsafety instrumentation.

MR. HODGES: Right.

MR. JENSEN: Did the instrument -- ICSB Branch help us review RSV51 and get into cold shutdown with safety-related equipment?

MR. HODGES: Not to my knowledge.

MR. JENSEN: Okay.

MR. JORDAN: Are we saying that the only thing that they looked at was the equipment, not the instrumentation?

MR. HODGES: I think that's probably true. I think that's probably true.

MR. JORDAN: Okay. All right. Let's go on and review the OPs in discussion with GE and licensee. Did they express a reservation about using SLC or implementation of the ELPs, and I do something contract -- do you know what that's asking?

MR. JENSEN: This next one was -- involves your discussions with General Electric and developing the emergency operating procedures.

MR. HODGES: Right.

MR. JENSEN: And probably applied those under

certain conditions they would inject SLC. I wondered if in any of these discussions did they mention any reservations to injecting SLC -- worry about getting the boron out or worrying about long-term effects on the plant? Did they express that they might be hesitant -- operators might be hesitant to inject SLC?

MR. HODGES: When we asked that question on numerous occasions, we always got the answer that they would not be hesitant to inject SLC. We never fully believed it. But that was usually -- that was always the answer they gave us.

MR. JORDAN: Do you know, Wayne, is SLC injection for reactivity or is SLC injection for containment protection? In other words, would you expect them, if they had an ATWS and they entered the ATWS procedure, would you expect them, even if they were in cold conditions, to initiate SLC as a precautionary measure?

MR. HODGES: Not necessarily.

MR. JORDAN: Okay. They --

MR. HODGES: Basically, the main reason -- well, SLC is there to satisfy two purposes. One is that you've got a regulation or the GDC that says that they've got to have diverse means of shutting the plant down. One is rods and the other is SLC, okay? So, it's there to satisfy that requirement.

From the ATWS world, it says if your MSIVs are closing and you're dumping all your heat into the suppression pool, you've got to get your power down and you've got to get it down in a hurry. The only thing you've got left at that point is SLC, in a worse case.

If you've got -- but the EOPs are specifically written that if they're not cycling the SRVs; in other words, if they're controlling pressure with the second SI by dumping heat to the condenser --

MR. JORDAN: Yes.

MR. HODGES: They don't have to inject it.

MR. JORDAN: Right. And that's so -- the EOPs looked at the containment, not at the first one, the diversification -- diversified method of shutting down?

MR. HODGES: That's right. It's there if you need it, and you can use it. But, basically, they really felt that you want an opportunity for the other means to work, if you don't have an urgency. If you're dumping the heat to the condenser, rather than to the suppression pool, you don't have the urgency, as I said, you've got to start the SLC right away.

Now, if you've tried everything else, driving the individual rods and resetting the scram, been doing all those other actions that are in there and nothing works, you're going to have to inject SLC to get the plant down.

But the idea was, if you can maintain the pressure below the SRVs so they're not cycling, that means one of several things. Either that you power down so that you don't have to worry about it, or that you're controlling pressure by another means, you're dumping the heat in the condenser, and you have the time to take -- which, from the plant standpoint, is a preferable action and safety is not threatened.

MR. JORDAN: Okay.

I guess I'm on to 15, unless there is some question you guys had earlier than that.

The next question, Wayne, we have is there has been a lot of loss of power to control room annunciators instrumentation.

MR. HODGES: Yes.

MR. JORDAN: Okay. And in fact, I guess there is an Information Notice 88-05 stating the lack of specific emergency procedures to address complete loss of annunciator systems.

Is NRC reviewing its position on power supplies to these equipments being non-safety-related grade? Do you know if there is an re-review of annunciator power?

MR. HODGES: Do I know if there is any?

MR. JORDAN: Yes.

MR. HODGES: Somebody at headquarters would be

better to answer that.

MR. JORDAN: That's probably an acceptable answer.

The question, I guess, then, also, is what do you feel -- based on your knowledge of the EOPs, do you think there's a need for a more reliable source of power to annunciators and instrumentation?

MR. HODGES: "Need" is a strong word. Is it desireable? Absolutely.

MR. JORDAN: Desireable. Okay.

MR. HODGES: Needed, that's debatable, and you would probably have to get into a cost-benefit argument that would -- it's hard to answer off the top of my head, but -- because you can shut the plant down without it, basically.

As long as you can do that, the cost-benefit argument gets to be a little bit harder to answer, and you've just got to go to the hard numbers.

MR. JORDAN: Maybe you can run through for me, on an ATWS, what instrumentation would we expect to be available for the operators to look at that's safety-related to validate that they are shut down?

MR. HODGES: That is safety-related?

MR. JORDAN: Yes.

MR. HODGES: Well, you would have -- I'm not sure whether the position indication on the SRVs is safety-related or not.

That is 197, I think, so it may be, but I'm not certain of that, but that's something you would need to know, and you need the reactor pressure, and that's really all you need if you don't have the power information.

MR. JORDAN: SRV positions?

MR. HODGES: How many are open or closed, and let's just assume that your secondary side is closed.

MR. JORDAN: Yes.

MR. HODGES: You also need to know whether your MSIVs or your bypass circuit is closed. If your top valve and bypass are closed, then you just roll back the SRVs, but again, you're relying upon some non-safety-related instrumentation there.

You're relying upon, for example, the -- if you assumed that the MSIV's are open, you're relying upon the position of the -- the bypass valve, which would be non-safety, I would think.

I think, almost any way you do it, you're going to have to bring in some non-safety instrumentation.

MR. JORDAN: What training requirements did we impose on the licensees dealing with loss of annunciators, or balance-of-plant instrumentation, in order to accomplish EOPs. Do you know of any?

MR. HODGES: On training requirement?

MR. JORDAN: Yes.

MR. HODGES: I think the answer there is none.

We have, first off, loss of annunciator is not necessarily covered by the EOPs. It could be covered by an normal shutdown procedure. And I think most utilities will have some training on loss of that. But I don't know of any particular event that we prescribe and say you have to have training on that event.

Now, we will go and test them on a wide range of events, and if they don't have some training on it, then sham on them. But I don't know if any, I don't know that we require them, for example, to have training on an ATWS. But they sure as hell know we're going to come test them on it.

MR. JORDAN: Yes. Being from the operator licensing examining section, you're right, that's what we do. I just wondered if we had any guidelines to them saying, other than a comment that we would come out and examine them in those areas.

MS. HERBERT: We have, the supplement to the NUREG 0737 I think it was, that talked about they had to have procedures dealing with a range of events, including multiple failures and operator errors. And we expect them to have procedures to deal with that stuff.

MR. JORDAN: Beyond the EOPs --

MR. HODGES: And we expect them to have a training program. But we don't require training on any specific

issues.

MR. JORDAN: Beyond the EOPs, are they required to have procedures, for multiple event failures?

MR. HODGES: We don't tell them what they've got to call them. We don't tell them they got to call them EOPs.

MR. JORDAN: Okay. But I mean, besides the EOPs, we would expect them to have additional procedures for like loss of annunciators; would we expect them to have them --

MR. HODGES: We would expect -- you're getting into a difference whether we require or expect.

MR. JORDAN: Okay.

MR. HODGES: Yes, I expect them to have that. Do we have a requirement that says they've got to have a loss of annunciator procedure? No, we do not have such a requirement. Do I expect that? Yes.

MR. JORDAN: Okay. Shortly after the TMI accident, the NRC staff encouraged the licensees to create a third classification scheme for equipment called "important to safety."

Can you identify any internal or external NRC document associated with that position? In particular, was there a generic letter issued in 1983 or '85 providing a legal group's challenge to the agency's position on "important to safety"? Do you know of any?

MR. HODGES: Yes. There was lots of stuff on that. I can't quote you documents and dates and stuff like that, but there was an old paper that was put together on that, and then what's his name that used to be on the staff for the CRGR, blonde guy?

MR. JORDAN: Conrad?

MR. HODGES: Yes, Conrad had written a position for --

MR. JORDAN: "Important to safety"?

MR. HODGES: Yes. He had written a thing on "important to safety" paper that was sent out. There was a lot of discussion of that at the hearings. We even had a panel composed of Conrad and Dennis Peace and Ashok Thadani and myself, and several others. I think there was a total of seven of us dealing with that particular issue. And then there was, I think there was an industry paper on it. So there's a lot of stuff. But I'll have trouble trying to quote you documents off the top of my head.

MR. JORDAN: Do you know if we had any regulatory basis for the "important to safety" classification?

MR. HODGES: Well, the concern, the problem was we've got conflicting uses of those terms. One part of our regulations will use "important to safety," another part will use "safety-related," and use those terms interchangeably. And the industry contention is they mean

the same thing, because we use them one way in one case, and basically we use both terms to mean essentially the same thing in our regulations. And I think that's true. But what we were trying to do is say there is a "safety-related" case and then there's "important to safety," which might be things like in a feedwater system that are not safety-related but are still important. And that's what we were trying to set up. But I think we finally gave up, because we were using the two terms too interchangeably in our regulations.

MR. JORDAN: Did we put something out to the industry telling them that they were synonymous, or did we just let it moot?

MR. HODGES: I think we finally let it mute. I don't know for sure, but I think we finally let it moot. I think we finally threw our hands up.

MR. JORDAN: Okay. I think that answers the next question there.

Were you in the region when this happened, Wayne?

MR. HODGES: Yes, I was.

MR. JORDAN: You were in the IRC when it happened?

MR. HODGES: Well, I came into the office about 20 after 7:00 and immediately went down there. So by the time I got there, they had restored power.

MR. JORDAN: Okay.

MR. HODGES: But after 7:00 in the morning until sometime much later, I was in there.

MR. JORDAN: Okay. So you're familiar with the event, then?

MR. HODGES: Yes.

MR. JORDAN: Okay. Are you familiar with the equipment that they did not have available to them?

MR. HODGES: Yes.

MR. JORDAN: Okay. Can we ask your opinion on equipment that they did not have available to them and whether or not you think it should be safety-related or not, or should it be non-safety-related, one of which is all control rod instrumentation in their power supplies?

MR. HODGES: My personal opinion is that should be safety-related. But you have to be a bit careful here, because it's also not safety-related on PWRs, you know.

MR. JORDAN: Okay.

MR. HODGES: But I am amazed that we have let that go by as not being safety-related. But there's a long history of it not being safety-related, and we would, I think, have a significant backfit issue to deal with that we probably couldn't justify on a cost-benefit basis to try to make it safety-related. But I think that's a shame on us.

MR. JORDAN: Okay. You're thinking that thee backup to the control room instrumentation and their power

supplies, particularly for, I guess it says all control room instrumentation and their power supplies. You think of it that, just that broad sense --

MR. HODGES: No, I think that's too broad.

MR. JORDAN: That's too broad. You feel that there's some instrumentation in the control room that should not be safety-related?

MR. HODGES: Yes. Yes.

MR. JORDAN: Okay. The rod position sensing elements, an indication in their power supplies, you feel maybe should be safety-related?

MR. HODGES: My personal opinion is we should make it safety-related.

MR. JORDAN: Okay. And you agree that this plant's having them non-safety-related --

MR. HODGES: I'm sorry. I was talking. I didn't hear you.

MR. JORDAN: This plant being, in other words, non-safety-related, you feel met what the industry requirements are?

MR. HODGES: I think it met what the NRC requirements were.

MR. JORDAN: But your own personal opinion is, you think it should be safety related?

MR. HODGES: My own personal opinion is it should

be safety related. I think there's a long history of NRC position that it does not have to be safety related.

MR. KAUFFMAN: What is your reason for thinking it should be safety related? Just good practice?

MR. HODGES: Yes, I take it -- yes, you've got basically, in a BWR in particular, about three pieces of instrumentation you really have to worry about, and one is water level. Another is power and another is pressure.

And I think those are the three major parameters and those ought to be safety related. Those ought to be gold-plated. That's my personal opinion.

MR. JORDAN: Okay, how about the APRM, IRM, SRM sensing elements, indicators including their drive motors? Do you want it broken up or whole?

MR. HODGES: The instrumentation, yes; the drive motors, I'm not so sure of.

MR. JORDAN: Why do you feel that the instrumentation should be, but the driver motors may not be?

MR. HODGES: I -- well, you've got to go in and say, what do you mean by safety related and what are you trying to do with it? You know, you want to put them in there and drive them in right away if you get a scram signal. And if you do that, then it's going to be doing that in the normal kind of environment because this stuff is outside of containment. You're not going to have to worry

about a harsh environment and a lot of other things with it.

Once it's in there, it's going to -- it may have to clear re-criticality, so it should be a very robust instrumentation. So, I think the challenges are different.

MR. JORDAN: Okay, but what happens if loss of offsite power -- if the drive motors are not safety related, they may not come off of the diesels and you may not be able to drive them in. They may be sensing external to the core, okay, but they may not be able to get them in.

I'm just asking you.

MR. HODGES: That's right, you have --

MR. JORDAN: You mentioned the fact that the indicators should be, but the drive motors may not be. Could you postulate, as a result of the indicators reading external to the core, what the core power is? Do we have the ability to do that?

MR. HODGES: I wouldn't want to try to do that. That would be too wild.

MR. JORDAN: Okay, how about all instrumentation used to verify reactor shutdown; do you feel that should be safety related, non-safety related or do you think the mix they have right now is okay?

MR. HODGES: Well, I'm not sure. When you say all, I just put the drive motors back in there. You know, I have trouble any time you want to try to use, "all" on me.

But I think, in general, the instrumentation used to verify shutdown should be safety related.

MR. JORDAN: You think they should have at least one system that's safety related to verify shutdown? If you don't say "all," should you have a system, whether it be rod positions or --

MR. HODGES: Yes.

MR. JORDAN: Or APRMs or IRMs or something?

MR. HODGES: Right, right.

MR. JORDAN: How about -- I guess shutdown is also a question. We're talking about here, cold shutdown versus hot shutdown.

MR. HODGES: Well, for example, the source range and the APRMs are not going to tell you much about whether you can be in cold shutdown if you're still in hot shutdown, and that's the question you need to answer. There, you're going to need rod position.

MR. JORDAN: So you feel they need some type of a rod position, and that should be some type of safety related backfit?

MR. HODGES: If I had my druthers, that's the way I would do it because if I have to justify it on a cost/benefit basis as a backfit, I doubt it.

MR. JORDAN: Okay. How about the plant computers, SPDS and their power supplies?

MR. HODGES: Plant computer, not necessarily; SPDS, yes.

MR. JORDAN: Why SPDS?

MR. HODGES: Because I think that you need -- again, highly desirable, need is probably the strongest.

MR. JORDAN: Okay.

MR. HODGES: Highly desirable for accident purposes. If you've got that, there are other things you could do without.

MR. JORDAN: Okay.

MR. HODGES: Again, this is my personal opinion.

MR. JORDAN: I understand.

Based on your knowledge of the EOPs for boilers and how they're developed and the use of the instrumentation in order to accomplish the EOPs is --

MR. HODGES: You can do the shutdown without the SPDS and all this other stuff --

THE REPORTER: Without these other things, and then you said what?

MR. HODGES: I say you could get the plant shut down to the safe condition with all of this other stuff but it's tough if you don't have it.

MR. JORDAN: It's tough if you don't have it, okay.

THE REPORTER: Thank you.

MR. JORDAN: Okay, how about safety-related for all EOP use parameters and indicators and equipment?

MR. HODGES: Nope.

MR. JORDAN: Okay. Should a black box for transient analysis be required and be classified safety-related?

What we're looking at, Wayne, is should they have some type of a -- like the airlines do, that no matter what happens when you're all done you can go back and via this black box evaluate the transient and what happened?

In this case with loss of the computer and loss of the alarm printer and loss of indication, it was hard to recreate with just level and pressure exactly what happened.

Do you think we should require the utilities to have some type of a black box transmitted analysis be required and be classified as safety-related, non-safety-related and if you say yes or no, why not?

Why or why not?

MR. HODGES: I don't think we can -- cost/benefit basis again.

I mean it would be a nice thing to have. We always like to be able to know what happened, but -- and because you want to apply that lesson to other plants or even this plant in the future, but I think what we have to focus on is if from a safety standpoint if we're able to get

through the event safely without that part in this case at this time thee is a fair chance if it occurs again -- we're going to learn something about what happened during the event. We won't be totally ignorant, so I think if you look at the cost of such an instrument versus the benefits that we get from it, we may have a hard time justifying it but it would be a very nice thing to have.

MR. JORDAN: Okay, on redundancy and diversity, do we expect, would you expect the utility to have diversity as well as redundancy in non-safety related applications?

MR. HODGES: Nice, but not necessary.

MR. JORDAN: Nice, but not necessary.

MR. HODGES: Right.

MR. JORDAN: And you are saying because of cost benefit or you just don't think as a regulator requirement we should be requiring that?

MR. HODGES: Well, if it is non-safety-related, we're already saying we don't require that it -- we don't have any requirements on them.

MR. JORDAN: How about safety-related?

MR. HODGES: I think there's some level of diversity we normally want but we don't always get it. All we get is redundancy. I don't think we need it.

For example, we have diverse ways of shutting the plant down and we have diverse systems for injecting water

and they are redundant among themselves. You need a certain amount of that.

MR. JORDAN: How about important to safety equipment?

MR. HODGES: I don't think, for example, we'd want to say you need both for example a centrifugal and a positive displacement pump to get diversity in the injection system. I think something like that would be kind of ridiculous.

If you got -- I think you have to temper the amount of diversity. I think there are situations where it's great. I think there's other situations where it doesn't buy you a lot.

MR. JORDAN: How about manufacturer, model types?

MR. HODGES: I think you have to look at again specific -- if I had manufacturer I had a high confidence in making my pumps I might prefer to stay with that rather than trying to split it up just for diversity's sake.

I think you have to temper some of that with reason is what I'm saying.

Across-the-board diversity is not necessarily good and there are problems with spare parts and other things as well, so a certain amount of diversity, across-the-board diversity may be bad for you.

MR. JORDAN: Okay.

Can you describe -- I think you already did a little bit -- any interfaces you have had with NRR branches in the review of the above areas?

In your experience, have you brought issues like this up, and has it been discussed and developed, and in what areas of NRR did you bring it up with?

MR. HODGES: Okay.

Well, obviously I was in NRR when I reviewed the EOPs.

MR. JORDAN: Okay.

MR. HODGES: And when I began, the branch chief was a supervisor, supervising the review of EOPs.

MR. KAUFFMAN: What revs were those?

MR. HODGES: Well, I actually did the review for Rev 2. Rev 3 was done in another organization, and then I did Rev 4 under my supervision.

MR. KAUFFMAN: Do you happen to know who did Rev 0 and Rev 1?

MR. HODGES: Rev 0 and Rev 1 were never approved by the NRC. We were doing a continual review up through Rev 2, and Rev 2 was the first one that an SER was written on.

So, I was involved all the way up through the writing of the SER for -- for Rev 2.

MR. KAUFFMAN: Okay.

MR. JORDAN: In your review of those, did you have

any interface with other NRR branches?

MR. HODGES: Oh, sure.

The -- it was the human factors division, and they -- in fact, they had an individual who did the human factors review while I was doing the systems review, and then I also interfaced with the instrumentation branch and the containment systems branch and -- those were the major ones.

Yes, there -- there was -- was interface with other -- other branches.

MR. JORDAN: What kind of interface did you have with instrumentation?

MR. HODGES: Basically, we talked about the kind of things -- what would be needed in an operator and that kind of stuff.

It was more on a consulting basis. They didn't actually do the review.

They were used as consultants, and pretty much the same with containment systems, although they were given some parts, say look at this and give me your opinion kind of thing, but I was responsible for the review, and I did the writeup. They acted as consultants to me.

MR. JORDAN: Did you ever ask instrumentation, you know, what instrumentation is going to be available or not available and whether or not they felt -- what their feelings were on instrumentation that was going to be needed

or they felt was needed?

MR. HODGES: We had a lot of discussions on what we would do under various circumstances. Did we ever contemplate something like happened at Nine Mile, where you lose five separate power supplies selectively, I'm not sure we got that detailed.

But we looked at loss of all instrumentation and all power or all DC power in the control room and those types of things and tried to say, okay, what do you need to deal with it?

But when you've got a mixture, I don't think we got into that kind of detail.

MR. JORDAN: Okay.

Well, let me go around the room here and see if there's any other questions. Then we'll ask you our final question.

You guys got anything else?

MR. KAUFFMAN: I had one.

Back when we were talking about EOPs and we're in two legs that basically told us to do different things --

MR. HODGES: Right.

MR. KAUFFMAN: -- we debated amongst ourselves here what should be done. Is that a good position, a fair position to put the operator in, that he has conflicting things and he doesn't have something to say that this one is

most important, it takes priority, do this?

I guess what I'm asking is the EOPs, was it intended that you would wind up in conflicting spots, or did this event show a glitch?

MR. HODGES: I think if you even look at our SER on the Rev 2 -- and I think some of the others were carried forward in our SER on Rev 4 -- it talks about where the priority should be put, and some of that should be in training.

You don't want to have everything in the EOPs themselves. Some of it is going to be left to training.

Where the focus should be on maintaining core cooling, for example, that's fairly clear that it's a priority, and my memory is a little dim on some of this, but I think the BWR information, the owners group information on that, also --

MR. JORDAN: Also what?

MR. HODGES: -- also has similar words on where to put the priorities, and also, there is -- see, in addition to just the -- the EOPs, there were appendices to that that got into how to develop these numbers that go into the EOPs and the philosophy behind what was being done, and then, that -- those appendices definitely put precedence on keeping the core cool.

MR. KAUFFMAN: So, in this event, the operators

really weren't sure which one was more important. They used their judgement and kind of picked one.

MR. HODGES: Well, I think their training, if it didn't tell them that the priority was on core cooling, should have.

So, there should not have been a big question mark for the operators, in my opinion. If it was, then that may signal a weakness in their training.

MR. KAUFFMAN: If I'm looking at this a human factors point of view, I might suggest something like that this leg, the most important leg, be in bigger print or darker or have a big "1" by it. Would something like that make sense?

MR. HODGES: I don't know. I'm not a human factors expert.

MR. KAUFFMAN: Because it's a stressful situation.

MR. HODGES: It's a stressful situation, but you're relying upon several things.

You're relying upon the procedures that tell you how to go through and do things.

You're relying upon training that tells you where to put your emphasis on things, what's important, how the plant behaves, you know, the physics of the plant, and I think that -- you don't put all that in the procedures either.

There's a lot of stuff you don't have in there explicitly. It's expected to be covered in training -- whether you should single out because this event happened to do that, I'm not sure.

MR. ROSENTHAL: Wayne, this is Jack Rosenthal. I just came in a few minutes ago from another meeting.

MR. HODGES: I can't repeat everything I've just said.

MR. ROSENTHAL: I don't expect you to. Number one, I wanted to say thank you.

MR. HODGES: Uh-huh.

MR. ROSENTHAL: But I do want to ask just a couple of questions. If it's been covered, you could just say, hey, it was covered.

I think that we, in reviewing the EOPs, we said, go ahead and put all the instruments in that you really need, whether they're safety-related or not, because we didn't want to have one set of EOPs that were the real EOPs, and another one that was just for the regulators. So, we told them that hey, if you put in the stuff, that means we won't turn around and make you make it all safety-related.

MR. HODGES: In essence, that's correct.

MR. ROSENTHAL: Okay. But I can't find that in writing any place. Do you know where that was ever formalized?

MR. HODGES: I don't know if we ever did formalize it.

MR. ROSENTHAL: Okay. Another issue that I've heard is that some people believe that if you needed to take action, it ought to be of the highest quality and redundancy, but if you need it for confirmation or verification, it could of a lower quality or level of redundancy. That was like a logic that was used. But I don't know where that's written down. Do you know anyplace where that's written down as a rationale?

MR. HODGES: No.

MR. ROSENTHAL: That was just the way people worked?

MR. HODGES: For the most part. But, again, we have one here like the control rod position, which really need to take an action, not just for confirmation. Because, you know, you need to know that before you could cooldown, and it's not safety-related. So, that's not an across-the-board truism.

MR. KAUFFMAN: I guess, in some of the interviews we had people said if it was to take credit for it, like in Chapter 15 FSAR, then it was safety-related.

MR. HODGES: That's not even true, sir. There are things that are taken credit for in the Chapter 15 FSARs that are not safety-related.

MR. ROSENTHAL: Especially for anticipated transients?

MR. HODGES: Oh, yes, absolutely. The only thing -- the only place where it's required to be safety-related is in dealing with LOCAs and such. Now, there you've got to have safety-related equipment to deal with it -- the oldest ECCS stuff. But if you're talking about turbine trips and things like that, you will rely upon nonsafety-related instrumentation, Chapter 15. And that's been common practice for both BWRs and PWRs.

MR. ROSENTHAL: Okay. Were you involved in the maintenance rule?

MR. HODGES: No.

MR. ROSENTHAL: Were you involved in importance of safety versus safety-related?

MR. HODGES: Uh, I've been involved with it for the Shoreham hearings. I had numerous discussions with -- again, I can't think of his name --

MR. ROSENTHAL: Conran?

MR. HODGES: -- he's from the CRGR staff.

MR. ROSENTHAL: Jim Conran?

MR. HODGES: Jim Conran. He and I had lots of discussions. We were on a panel together, on one of the contentions at Shoreham.

MR. ROSENTHAL: Well, we've interviewed Conran.

So, if we pumped him --

MR. HODGES: You've probably got the most knowledgeable person on it then, if you pumped him.

MR. ROSENTHAL: Okay. And you guys have been over the emergency procedures, I know.

I'm finished.

MR. JORDAN: Wayne, I personally thank you.

MR. HODGES: Okay.

MR. JORDAN: Someday you and I are going to have to meet each other face-to-face.

MR. HODGES: Right. I look forward to it.

MR. JORDAN: Okay, Wayne.

MR. HODGES: Take care.

MR. JORDAN: Thank you.

MR. ROSENTHAL: Thank you.

[Whereupon, at 1:39 o'clock p.m., the above-entitled interview was concluded.]

REPORTER'S CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission

in the matter of:

NAME OF PROCEEDING: Wayne Hodges

DOCKET NUMBER:

PLACE OF PROCEEDING: Bethesda, Maryland

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Mark Mahoney

Official Reporter
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