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**Agency:** Nuclear Regulatory Commission
Incident Investigation Team

**Title:** Interview of Bob Jones

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

INCIDENT INVESTIGATION TEAM

INTERVIEW OF )
)
BOB JONES )
)

Nuclear Regulatory Commission
The Woodmont Building
8120 Woodmont Avenue
Bethesda, Maryland

Friday, August 30, 1991

The above-entitled interview convened, pursuant to notice, in closed session at 2:05 p.m.

PARTICIPANTS:

JOHN KAUFFMAN, NRC/IIT Team
WALTER JENSEN, NRC/IIT Team

PROCEEDINGS

MR. KAUFFMAN: It is August 30th, 1991, at approximately 2:05 in the afternoon. We're in the Woodmont Building, Bethesda, Maryland, conducting an interview of Bob Jones as part of our incident investigation of a Nine Mile Point Unit 2 event of August 13th, 1991.

I'm John Kauffman out of NRC Headquarters, AEOD.

MR. JENSEN: I'm Walt Jensen out of NRC Headquarters, plant assessment branch.

MR. JONES: I am Bob Jones, chief of the reactor systems branch.

MR. KAUFFMAN: Bob, at this time will you tell us a little bit about your previous background and work experience and education?

MR. JONES: I graduated from the Pennsylvania State University with a bachelors of science in nuclear engineering in 1971. From there I went on to the Babcock and Wilcox Company in Lynchburg, Virginia, where I worked until October of 1983, culminating my career there as the unit manager of the transient and accident analysis section.

I came to NRC in October of '83 in the reactor systems branch as an engineer, have progressed through three organizations or reorganizations to become now the chief of the reactor systems branch in the division of systems technology and I've been in that position for approximately

two years.

MR. JENSEN: Okay, Bob. Can you tell us about any involvement you've had in the review of the Nine Mile 2 event of August 13th?

MR. JONES: I have had no involvement in the Nine Mile 2 event of August 13th other than seeing the morning reports that come out and those types of general items.

MR. JENSEN: Okay, and you've have had no involvement in the original licensing of Nine Mile 2?

MR. JONES: That's correct.

MR. JENSEN: What about the review of the instrumentation that's included on Reg Guide 1.97, the instrumentation that's important to diagnosing severe accidents?

MR. JONES: I don't remember anything specifically for Nine Mile 2 in the last few years. About the only item that's come that would be arguably applicable to Nine Mile 2 would be neutron flux monitoring instrumentation which the BWR owners group appealed within the last -- I'm not sure exactly when this came in but we went through an appeal process on that, both my branch and the instrumentation and control system branch reviewed and prepared material for the appeal process.

MR. KAUFFMAN: And what was that issue?

MR. JONES: The basic issue was, as I try to

paraphrase it, when Reg Guide 1.97 was issued one of the instrumentation items that was listed to be safety grade class one or category one instrumentation for Reg Guide 1.97 -- I'm not that familiar with the categorizations but the highest level of instrumentation. That's an instrumentation issue.

That instrumentation, one of them was the neutron flux monitoring instrumentation and part of that included capability to detect neutron flux down to one times ten to the minus six count, one times ten to the minus six power range, need to be environmentally qualified and such items as that.

As just generically as instrumentation came through on the Reg Guide 1.97 for the boilers, it was recognized that there was no qualified neutron flux monitoring instrument generically available.

As a result, essentially all of the SERs that were issued blessed the adequacy of the existing instrumentation that was in the plants with a statement that should such instrumentation become available or they were to continue to pursue the development of such instrumentation capability and then would subsequently place that in their plants.

The owners group appeal basically came about because such instrumentation has become available in recent years by two companies and we were starting to impose that

back on the industry, the GE industry, the boilers, to start pursuing that, putting in that instrumentation and they were arguing that the existing instrumentation was effective.

We put together arguments for our management on it. It was a very tough issue to resolve because you do have flux monitoring instrumentation. The biggest issue was what do you qualify it to.

We went through the appeal process and the director issued a decision which was that they did not need to upgrade such instrumentation, that the instrumentation in place was adequate, that the current source ranges were at normal power.

MR. KAUFFMAN: Were adequate or could be backfit justified or --

MR. JONES: That it was adequate for Reg Guide 1.97 purposes and we were given directions for future plants to have them use such instrumentation.

We are still working through the mechanics of how to implement the director's decision because there is some guidance that we have to put together about severe accident mitigation and following severe accidents, core melt type events or accident management issues.

MR. JENSEN: Was the issue more as to whether the environmental qualification of the instrument or as to the quality of the power supply?

MR. JONES: It was a combination, I believe. There were arguments made about the environmental qualifications of the instrument, but one of the issues was the power supply because you have to drive in, at least generically in most boilers, the SRMs into the core using your -- because they were retractable so you would have to drive them in so therefore you had an electrical power supply issue as one of the issues.

MR. JENSEN: Do you know which nuclear instrumentation is supplied with vital power as opposed to that which is supplied with control grade power?

MR. JONES: I believe it's the APRMs, which is some combination of the LPRMs, so those must also have some -- I'm not sure about the classification of those but the APRMs must be because they provide trip signals for the reactor. I'm not that well versed in the power supply issues.

MR. JENSEN: What about the rod position indication? Was there any discussion over whether or not the rod position indication should be supplied with vital power?

MR. JONES: That was one of the arguments as I remember it in the owners group appeal, that you had that available to you generally speaking to monitor whether or not the rods were -- one of the issues was to use the reed

switches for the rod position indicators.

Again, when we put together our arguments, we recognized that it was a qualified safety grade type instrumentation, a recognized position but, as I said, we lost our appeal.

We argued to upgrade and when we went through the appeal process and we revisited the issue, we continued to push to upgrade the instrumentation.

MR. JENSEN: Did that include the rod position instrumentation for vital power as well as --

MR. JONES: No, we did not. We were looking at it primarily from the standpoint of just putting in the available instruments which were on the street, which were the Gammametrics in-core system and somebody had an ex-core system. We were not looking at specifically upgrading the position indication system.

MR. JENSEN: In the EOPs, one of the vital safety functions is to have the reactor shut down.

Do you remember which -- what kinds of instrumentation are required to assure reactor safe shutdown, the neutrons being absorbed?

MR. JONES: Well, you would have the APRMs, LPRMs go off scale, down scale. You would then drive in your SRMs. You would monitor through that whether or not you were at decay. You would also have your reed switches for your

rods, whether they were in or not. You would look at those indications. If they were bottomed out you would push them in, so to speak.

MR. KAUFFMAN: May I interrupt?

MR. JENSEN: Sure.

MR. KAUFFMAN: How would you feel if I said I had an event where I lost my reed switches, I lost my rod minimizer, I lost my rod sequence control system indications on rods and I couldn't tell the position of control rods although I did have APRM flux indication.

Would you think that's a significant event or would you say that's something that's covered by our guide -- our guidance recognized that that might happen and that's okay, or would you say that's reason to go back and reconsider our decision on upgrading our detectors and maybe making safety grade some of these power supplies?

MR. JONES: My reaction is one of I would feel uncomfortable in such a situation. I clearly would like to know that the reactor is fully shut down and be able to monitor it.

There are varied ways you could operate so I'm not sure whether I would say you would necessarily have to go back and look at it from the Reg Guide 1.97 point of view we were using when we looked at the appeal because we were looking for full-range environmental qualified for LOCA and

non LOCA transients, et cetera, going to a fairly extensive upgrade of the monitoring capability.

Arguably, you could upgrade power supplies, for example,, through reed switches would be one way of taking care of that.

MR. KAUFFMAN: Do you think that would be a hard fix, an expensive fix, or is that something that you think would be easy to do? I don't know, that's why --

MR. JONES: I don't know, either, and I would suggest you ask an instrumentation type on that.

Again, I think there are various options available to you. There are fixed core neutron systems, for example, that you could put in as one possibility, fixed core source range system which is similar to what we are looking at as one of the systems for the upgrade of the flux monitoring system. Limited capability there could be of use. What its relative cost is, I don't know.

MR. KAUFFMAN: I'm not familiar with what fixed core means.

MR. JONES: Unlike the APRMs which are in-core and stay in-core at all kinds, unlike the SRMs which are inserted and withdrawn. One of the neutron flux systems which we're looking at was a fixed in-core system. There are probably various ways of getting such information.

MR. JENSEN: So under the condition that the APRMs

and the LPRMs were both indicating that reactor power had been shut down but control rod indication was not available or indicated that some or all of the rods may be still out of the core, should an operator go to his ATWS EOPs or should he believe his nuclear instrumentation and believe the reactor is shut down, being that the nuclear information may be safety grade and the rod position --

MR. KAUFFMAN: Also considering you may be shut down now but if you cool down on Xenon fills in and burns out you may get positive reactivity.

MR. JONES: I'm not sure what you get necessarily by going to the ATWS procedures. One of the problems you end up with in the ATWS procedures which basically I think asks do you inject SLCS -- standby liquid control system -- which is really what you're looking for when you go to the ATWS procedure and initiate a short shutdown.

The ATWS procedures do not necessarily require you to initiate SLCS, depending on whether you are isolated or not isolated event. If you haven't isolated during this IVs, for example, then you would not be injecting SLCS and I'm not sure what the circumstances were at Nine Mile.

So if you went to the ATWS procedures, depending on the circumstances of the event, you may or may not -- it may or may not have helped you. You're not coming up tomorrow so cleanup is not a problem.

MR. KAUFFMAN: We may revisit that but at Nine Mile they did not get to their SLCS injection criteria which comes up suppression full temperature. They got hung up in the loop on procedure telling them to stay where they are, not depressurize and in the meantime they have to maintain level, they're running RCIC so they are depressurizing.

They basically got into one step said don't depressurize, the other one said if you can stay shut down while you're depressurizing then you can depressurize and there were some contradictions and some confusions in the EOPs so we're going to want to talk about EOPs.

We can start that now just generally on what your branch, what your involvement is in EOPs.

MR. JONES: Generally in the EOPs, and I'll go back a step.

We start at the EPGs or the emergency procedure guideline stage, which is the generic stage, the vendor generic guidelines, and we would review technically those procedures, the analyses that form the basis for those procedures and in conjunction with other branches would look at the overall accident mitigation strategies and approach steps, appropriateness of the steps to assure that it could deal with wide contingencies, wide range of events that we could postulate, and that means not just the standard design basis but also beyond design basis multiple failure events.

Typically, the branch we interface with especially on the boilers would be the plant systems branch which is the containment functions so we're very heavily intertwined with them.

We have overall control of that review. That is, we have the lead role.

Now from there, in the implementation and the EOPs, our role diminishes. The process to turn them into EOPs is each utility has their own plant specific technical guidelines and other processes, writers guides, et cetera, that they go through to develop their own EOPs, which accounts for the plant-unique conditions and such.

We get involved at times in deviations taken from the generic guidelines to come up with the plant-specific procedures. That would come about when we would have either an EOP inspection, which we may or may not be involved in that inspection program. We've done so with the boilers, I don't remember which ones anymore. We went through a few of them. We did not go on all of them but we have been involved in EOP deviations which have popped out of several of those reviews.

MR. JENSEN: Would the generic EOPs that you reviewed be specific enough to tell the operator as to whether he's allowed to cool the plant down without rod position indication, or require him to inject boron before

he cooled down? Would they give general guidance?

MR. JONES: It's difficult for me to answer that on the specifics on the rod position indication. I would say that generally though I know there are lots of steps within the guidelines and I don't know the ins and outs and all the details of the boiler guidelines but I know there are several areas in the boiler guidelines where you look at things like is the reactor shut down, do you believe you will maintain it shut down as you go through with depressurization, those kinds of steps are in the guidelines and have been discussed in our SERs.

Whether it specifically says by rod position indicators, I'm not sure it gets necessarily that specific, but it will probably lay out a series of options available to you, by rod positions or by flux or by this or by that so they will lay out several options and each utility can use a combination thereof.

MR. JENSEN: So it would be up to the utility to decide which instrumentation he would use to determine whether he would shut down the nuclear reaction or not and cold cool safely down to cold shutdown?

MR. JONES: I would say generally he would already have known probably through the guidelines which instrumentation should be used because there is a lot of that that we do specify or that we do look at.

I would have to go back and look to see in specific cases or steps whether or not it's identified but generally speaking there is a priority in many of the steps in the guidelines and I would expect to find the guidelines wold say he would use this or this and go right down the list and it's usually not an either/or, it's usually all of them to account for contingencies if things are not available. Specific, I'm not sure I would expect it to be there.

MR. JENSEN: Is there any inference in certain EOP steps as to requiring safety grade or class 1-E instrumentation be utilized?

MR. JONES: Not that I'm aware of. Not that we would only require use of class one, no.

MR. JENSEN: Well, is there any inference that class 1-E instrumentation be used for any steps in the EOPs?

MR. JONES: I would say no. Generally the EOPs or EPGs are much broader. It uses all available instrumentation. It uses all available systems to respond so I would not expect it to necessarily make the distinction.

What I would expect to find, and part of the reason I say this is because we're involved in a similar issue on another plant, is the consideration of instrumentation accuracies in various environments, for

example, when you implement the procedures.

So I would expect that there would be some distinction in the development of that kind of information as to what is qualified, what isn't, what you may have to be careful with using in certain environmental conditions that that would be covered in training.

There is also usually a general -- you have to crosscheck instrumentation and never rely on one single piece of instrumentation to make a decision.

MR. JENSEN: Are there decisions so important that the operator should make in the EOPs that it would require instrumentation providing class 1-E power?

MR. JONES: Not that I can say right off the bat yes or no. I would rather take the following premise.

The operator should have enough instrumentation to follow the course of an accident based on 1-E power consistent with the Reg Guide 1.97 approach, that he has enough instrumentation, safety grade type instrumentation, available to monitor the course of an accident.

If he is ever to that situation, I expect it would not be ideal, anyway, if he's just down to the safety grade instrumentation and displays.

Clearly one of the reasons for development of Reg Guide 1.97 was to develop safety functions and assure that there would be safety grade available instrumentation for

the operator for monitoring the course of an accident. That is how you get your highest level of instrumentation and that is why I understand it's also referred to in the equipment qualification rule, 50.49, as being required to be qualified.

MR. JENSEN: How significant is the safety parameter display system, the SPDS, in the EOPs?

MR. JONES: Let me back up and make sure when I answer these questions on EOPs I want it clear that I can't answer from a Nine Mile 2 EOP.

MR. JENSEN: Sure.

MR. JONES: In fact, not even anybody's EOP. I would rather answer from an EPG perspective.

MR. JENSEN: Okay.

MR. JONES: So that's clear. The safety parameter display system is an operator aid. It is not safety grade and its reliability targets, as I understand it, clearly we place importance on the SPDS as an agency, I would say, given how the thing is put together, but I'm not sure from an EOP perspective that the SPDS is specifically called out in a way that makes it particularly important because there are various levels or differences in SPDS designs across the industry so it would be difficult in a generic guideline to call that out other than to talk about the functions and general instrumentation.

MR. KAUFFMAN: You call SPDS an operator aid. If SPDS is lost, how big of an impact do you think it would have, say, in an emergency with technical support centers EOPs and their ability to gather information?

MR. JONES: I don't know. That's beyond my scope. To the extent that it's tied to an SPDS, obviously significantly.

To the operator running the plant, assuming he hasn't lost all his control board instrumentation, which is my understanding of Nine Mile, under that circumstance arguably he should have enough information otherwise.

I mean there are ties with the SPDS which clearly you could say that has a bearing on the ability of other functions to perform if it's tied to it and it's lost.

MR. KAUFFMAN: Do you know how it was decided that SPDS wouldn't be safety grade, wouldn't be 1-E powered?

MR. JONES: No, beyond my -- That was before my time at the agency.

MR. KAUFFMAN: Do you know who was involved in that decision?

MR. JONES: No.

MR. JENSEN: It seems like the operators and the BWRs are very hesitant to inject boric acid into the SLCS system in the core.

Do you know of any safety problems or operational

problems that suggest boric acid played out in the core that might occur from boric acid injection subsequent boiling?

MR. JONES: No, I'm not aware of any particular reasons why you should not be able to inject SLCS. In fact, as I remember discussions we've had with the BWR owners group concerning ATWS mitigation recently.

One of the options that we were looking at related to the so-called stability issue, is earlier injection of SLCS for such transients -- that was transients with oscillations.

One of our questions very early on over the last two years of involvement on this was why can't you inject it earlier and we have never been given a good reason that sticks in my mind that says it's a bad thing to do.

Obviously it has cleanup implications and that's the only thing I have ever heard.

I'm sure there are some chemical issues that would need to be addressed from a material standpoint but at this point nobody has given me any good reason not to.

MR. JENSEN: To what extent is the RSB branch reviewing emergency procedures at this time or emergency guidelines?

MR. JONES: With respect to the boilers, we are effectively done for Rev.4 of the guidelines, and in fact we have taken the position that we are absolutely finished with

the boiler guidelines with respect to normal transient and accident mitigation and we are letting the industry carry forth from there.

With respect to accident management or extension into the severe accident area, we have kept our foot in the door and we have said when those happen we want to review it again.

However, we do get involved, as I've noted earlier, with plant-specific exceptions to the guidelines. We're involved in issues at WNP-2 right now. We've done some EOP issues at one of the Millstone units in the recent past.

We also have had ongoing discussions over the last two years with respect to some deviations, particularly ATWS deviation, taken by Susquehanna relative to the owners group, primarily related to whether or not you need to lower water level during an ATWS event.

We are also involved with ongoing discussions with the owners group related to implementation of the EPGs vis-a-vis the design basis of the plant because the EOPs and EPGs as written in such a broad-brush treatment of accident strategy for the entire fleet of BWRs makes it difficult to say whether following these steps assure you meet your design basis and we've asked them to review that as part of the implementation.

This has formed up with a few problems that we're still discussing and we don't have a resolution path yet on some of those.

Last has been the issue of ATWS instability which I mentioned earlier and the fix that is likely to come out of that issue will be a procedurally PG modification. That is not a resolved issue but we have had discussions as to the types of changes that may be made.

Although we said we're close, we still have a lot of work that we do in the area.

MR. KAUFFMAN: Are you expending any efforts toward the advance of BWR and looking at EPGs for those or is that just too far away?

MR. JONES: I'm trying -- I don't remember right now whether we have them or we've asked the question on them. We are going to do it so it's just a matter of I'm not sure where it is in the process, but clearly one of the steps is we are going to look at the EPGs for the ABWR as part of the licensing effort. I'm just not sure where it is right now.

MR. JENSEN: I believe you mentioned the issue of ATWS stability. I'm not sure I understand what that is.

MR. JONES: I was hoping you wouldn't ask that.

If you are aware of the LaSalle event of '87, '88, somewhere in there.

MR. KAUFFMAN: March 1988.

MR. JONES: That's where you get neutron flux instabilities, where you have large power oscillations due to void collapse and development. It's a thermal hydraulic instability.

Basically cold water comes in, gives you a reactivity surge, then you create a void which shuts it down, the cold water comes back in. It's a thermal hydraulic instability which feeds back to the nuclear calculations.

Similar things can happen in ATWS and the issue is what -- it appears to be mostly dominated by system effects.

The other is primarily dominated by core design, that is, pressure drops across the core, two-phase pressure drops, single-phase pressure drops in that relationship.

In ATWS what seems to really give you a large power oscillation is cold water insertion, so if you isolate it and have cold feedwater coming in because you've isolated the steam, extraction steam, and you're trying to maintain level in the vessel and now you get very cold water in you get power spikes. We have seen numbers as high as 3500 percent.

MR. KAUFFMAN: Walt, there's a large industry effort in the owners group in Brookhaven looking into this.

MR. JENSEN: What would the operator's response

be? Would it be to inject boric acid with the SLCS system?

MR. JONES: What we're looking at right now is -- As I mentioned earlier, there are basically two --

When you talk ATWS procedures and SLCS injection, you really start looking at two classes of ATWS. You look at the class of ATWS where you isolate the vessel which leads to a heatup of the suppression pool which leads you into SLCS actuation and leads you into lowering vessel water level.

There's the other class of ATWS and there is also the preferred ATWS mitigation scheme which is to simply dump steam to the condenser, an unisolated ATWS, and that's the one that can come back and feed back through the system with cold feedwater.

What we're talking about is -- I don't want to call it a simplification of the procedures but in my mind it is in the sense that what we do is you have an ATWS, isolated or unisolated, you would basically hit the SLCS system, the boron injection, early and then you would deal with the issue of do you still lower power level or not is still one of the fuzzy areas.

We will probably in coupling it with the oscillation issue would be you get indications that your oscillator is not shutting down you might start lowering the water level early.

MR. JENSEN: What will you do -- suppose you were an operator at Nine Mile 2 and the reactor had tripped and the neutron instrumentation indicated that the reactor was so critical and had no rod position indication, how long would you set at hot standby before you cooled down?

Would you inject boric acid before you cooled down? What would you do?

MR. KAUFFMAN: We are talking strategies here, obviously, not plant-specific.

MR. JONES: I understand that.

That was really in a sense part of what the position was in this owners group neutron flux monitoring thing. They would basically say you don't need to bother. You don't need to inject SLCS. You can shut down. You've got adequate rods in and if you shut down and try to come down the appropriate decay --

You seemed to imply in your question that you had neutron flux monitoring. If you have ---

MR. KAUFFMAN: The APRMs, LPRMs, were depressurizing.

MR. JONES: But I don't know how far and whether you continue and follow the decay -- Your LPRMs are going to drop off scale fairly fast and the transients, you don't know where they are, arguably.

Gut reaction is I would inject SLCS. That's my

reaction to it.

MR. JENSEN: One concern if you cool down and maybe you were subcritical but if you cool down then you might go critical because in the cooldown perhaps all of the rods weren't inserted or only partially inserted.

MR. JONES: If you have feedwater and you have level control and all that happened was you just came back up on power with your turbine available to dump steam in your condenser, you just sit there and no big deal.

It's a very difficult call to make because if you look at it from certain eyes you could say the plant just sits there and you sit at power level and then you ask yourself what do I do from here and if you really want to get down at that point, you know you're not fully shut down, your rods are not fully in because that should not be happening to you and that could be a good enough indication to go back and inject SLCS at that point.

MR. JENSEN: But if you did go critical, it wouldn't be a major safety problem?

MR. JONES: I don't believe it would be a major safety problem. The boiler is inherently -- from that sense, they appear to be inherently safe.

As I said, my reaction is I would prefer to inject SLCS but that's a very personal reaction.

MR. KAUFFMAN: Walt is assuming that when you

depressurized you had control of your condensate booster system, for example.

MR. JONES: So you should just stabilize out. From a pure safety standpoint it's not clear that anything is actually necessary.

MR. JENSEN: So an operator just might choose to cool down and if it did go critical he might wait and inject the boric acid then.

MR. JONES: That's correct, and that would clearly be, I think, through the procedures what he would then be directed to do because he is obviously not shut down.

MR. JENSEN: In your recent review of the GE EOPs, what other branches did RSB work with and interface with?

MR. JONES: Clearly plant systems. I am sure we worked somewhat with the human factors people but only -- not to a very large extent I'm sure because a lot of human factors issues have already been addressed in the earlier reviews. We may have touched base with instrumentation and control.

Again, you drew a rev of the report which was a fairly -- Well, it's a fairly major modification and a few of the strategies but it was mostly dealing with very specific items so the nature of the review is different that if you were starting from scratch.

We were looking primarily at things like

containment flooding as opposed to core spray as a final accident mitigation step, level control and venting the containment and a lot of that stuff was a lot of the emphasis in Rev 4.

MR. JENSEN: What kind of things did instrumentation and control branch look at?

MR. JONES: I don't remember. I'm not sure we interfaced very extensively with them except we probably if anything just touched on it.

MR. KAUFFMAN: I'm going to try this question. It might be too hard to answer but I'm going to try it.

Could you run me through the differences between the BWR EPG Revs 0 through 4 of the evolution and why those changes were made? If that's too hard --

MR. JONES: I can absolutely not do that because I am not that familiar with the early revisions at all. That was before my time.

MR. KAUFFMAN: It's a nagging question I have, are these just small refinements or are they major improvements as they have gone along.

MR. JONES: I can't speak for earlier. I can speak Rev 3 and Rev 4 and my expectations are Rev 0 and Rev 1 a lot of that is likely to be upgrade in response to staff questions, comments or open items, which was common for many of the emergency procedure guidelines we looked at in that

stage of their life.

Between Rev 3 and Rev 4 there were some very significant things that were changed. Containment venting is one of them. It's a much more detailed treatment of containment venting in the why and the when and how you calculate the various limits that you need to impose, et cetera.

Another big deviation step was there was a reliance in the old EPG on core spray. If you uncovered the core but you could maintain the core level at about two-thirds core height you would continue -- if you had spray available to you, you would just sit in that mode and cool in that fashion.

Rev 4, if you're in that mode and you're down to one pump, from a reliability standpoint if you're really down to one pump you are probably in pretty fairly strange territory and I'm not sure you know the reliability of your system as a whole any more so at that point you take so steps to start flooding containment so the ultimate path then, instead of cooling mode, would be in containment -- be in core spray or spray cooling as a whole different strategy of flooding and flooding has other implications associated with it. You have to vent the flood but it is much more stable and assured.

That's a fairly major change. There are some

minor rearrangements of a few cautions or elimination of a few cautions which were not considered significant. Those are probably the major changes.

MR. JENSEN: As far as your branch looks at PWR EOPs, as well as BWR EOPs, I wonder if you know of any significant difference in philosophy that operators could use in entering the ATWS procedures as far as indication that an ATWS had occurred between the EOPs for PWRs and BWRs.

MR. JONES: Actually I would say there are a couple of differences. Number one, there is obviously no distinction between a nonisolated and isolated ATWS in a PWR. An ATWS is an ATWS is an ATWS. There is no deviation associated with the actions due to other system conditions.

Generally speaking, the PWR, if you have indications that you're not shut down, you start injecting your boron systems. Well, your drive rods first and inject boron and that type of stuff, but it's pretty much a fairly immediate step to confirm the shutdown reactor and take those actions.

From an indication standpoint, other than the type of instrumentation that you may be using, it's very similar, position indicators or rod bottom lights, same thing, you're talking neutron flux monitoring instrumentation, etc cetera.

To the best of my knowledge, all of the Ps have

qualified neutron flux monitoring systems down to the ten to the minus six type range so from that standpoint they should be in better shape as a whole from the monitoring standpoint.

I think there is a very clear recognition that in a boiler you're talking a machine that doesn't really have tremendous reactivity type problems inherently because of the way feedback, et cetera, the rods go in and you actually go subcritical on rods in a boiler.

That's not true in a PWR, period. A PWR is not inherently shut down just because the rods are in so you have to inject boron, for example, before you depressurize so I think there's more sensitivity to that issue from that standpoint.

I think there are -- From a pure indication standpoint the distinctions are small. I think there is a level of sensitivity that's much higher and the quality of the instrumentation is different and certainly the actions are arguably simplified because you don't have the same system feedback to deal with.

MR. JENSEN: Okay, good.

MR. KAUFFMAN: That's it. We're off the record.

(Whereupon the matter concluded at 2:56 p.m.)

## 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: IIT Interview of Bob Jones

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.

Marilynn Estep

Official Reporter
Ann Riley & Associates, Ltd.

07-454B-91

# OFFICIAL TRANSCRIPT OF PROCEEDINGS

**Agency:** Nuclear Regulatory Commission
Incident Investigation Team

**Title:** Interview of Bob Jones

**Docket No.**

**LOCATION:** Bethesda, Maryland

**DATE:** Friday, August 30, 1991 **PAGES:** 1 - 29


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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

INCIDENT INVESTIGATION TEAM

INTERVIEW OF )
)
BOB JONES )
)

Nuclear Regulatory Commission
The Woodmont Building
8120 Woodmont Avenue
Bethesda, Maryland

Friday, August 30, 1991

The above-entitled interview convened, pursuant to notice, in closed session at 2:05 p.m.

PARTICIPANTS:

JOHN KAUFFMAN, NRC/IIT Team
WALTER JENSEN, NRC/IIT Team

P R O C E E D I N G S

MR. KAUFFMAN: It is August 30th, 1991, at approximately 2:05 in the afternoon. We're in the Woodmont Building, Bethesda, Maryland, conducting an interview of Bob Jones as part of our incident investigation of a Nine Mile Point Unit 2 event of August 13th, 1991.

I'm John Kauffman out of NRC Headquarters, AEOD.

MR. JENSEN: I'm Walt Jensen out of NRC Headquarters, plant assessment branch.

MR. JONES: I am Bob Jones, chief of the reactor systems branch.

MR. KAUFFMAN: Bob, at this time will you tell us a little bit about your previous background and work experience and education?

MR. JONES: I graduated from the Pennsylvania State University with a bachelors of science in nuclear engineering in 1971. From there I went on to the Babcock and Wilcox Company in Lynchburg, Virginia, where I worked until October of 1983, culminating my career there as the unit manager of the transient and accident analysis section.

I came to NRC in October of '83 in the reactor systems branch as an engineer, have progressed through three organizations or reorganizations to become now the chief of the reactor systems branch in the division of systems technology and I've been in that position for approximately

two years.

MR. JENSEN: Okay, Bob. Can you tell us about any involvement you've had in the review of the Nine Mile 2 event of August 13th?

MR. JONES: I have had no involvement in the Nine Mile 2 event of August 13th other than seeing the morning reports that come out and those types of general items.

MR. JENSEN: Okay, and you've have had no involvement in the original licensing of Nine Mile 2?

MR. JONES: That's correct.

MR. JENSEN: What about the review of the instrumentation that's included on Reg Guide 1.97, the instrumentation that's important to diagnosing severe accidents?

MR. JONES: I don't remember anything specifically for Nine Mile 2 in the last few years. About the only item that's come that would be arguably applicable to Nine Mile 2 would be neutron flux monitoring instrumentation which the BWR owners group appealed within the last -- I'm not sure exactly when this came in but we went through an appeal process on that, both my branch and the instrumentation and control system branch reviewed and prepared material for the appeal process.

MR. KAUFFMAN: And what was that issue?

MR. JONES: The basic issue was, as I try to

paraphrase it, when Reg Guide 1.97 was issued one of the instrumentation items that was listed to be safety grade class one or category one instrumentation for Reg Guide 1.97 -- I'm not that familiar with the categorizations but the highest level of instrumentation. That's an instrumentation issue.

That instrumentation, one of them was the neutron flux monitoring instrumentation and part of that included capability to detect neutron flux down to one times ten to the minus six count, one times ten to the minus six power range, need to be environmentally qualified and such items as that.

As just generically as instrumentation came through on the Reg Guide 1.97 for the boilers, it was recognized that there was no qualified neutron flux monitoring instrument generically available.

As a result, essentially all of the SERs that were issued blessed the adequacy of the existing instrumentation that was in the plants with a statement that should such instrumentation become available or they were to continue to pursue the development of such instrumentation capability and then would subsequently place that in their plants.

The owners group appeal basically came about because such instrumentation has become available in recent years by two companies and we were starting to impose that

back on the industry, the GE industry, the boilers, to start pursuing that, putting in that instrumentation and they were arguing that the existing instrumentation was effective.

We put together arguments for our management on it. It was a very tough issue to resolve because you do have flux monitoring instrumentation. The biggest issue was what do you qualify it to.

We went through the appeal process and the director issued a decision which was that they did not need to upgrade such instrumentation, that the instrumentation in place was adequate, that the current source ranges were at normal power.

MR. KAUFFMAN: Were adequate or could be backfit justified or --

MR. JONES: That it was adequate for Reg Guide 1.97 purposes and we were given directions for future plants to have them use such instrumentation.

We are still working through the mechanics of how to implement the director's decision because there is some guidance that we have to put together about severe accident mitigation and following severe accidents, core melt type events or accident management issues.

MR. JENSEN: Was the issue more as to whether the environmental qualification of the instrument or as to the quality of the power supply?

MR. JONES: It was a combination, I believe. There were arguments made about the environmental qualifications of the instrument, but one of the issues was the power supply because you have to drive in, at least generically in most boilers, the SRMs into the core using your -- because they were retractable so you would have to drive them in so therefore you had an electrical power supply issue as one of the issues.

MR. JENSEN: Do you know which nuclear instrumentation is supplied with vital power as opposed to that which is supplied with control grade power?

MR. JONES: I believe it's the APRMs, which is some combination of the LPRMs, so those must also have some -- I'm not sure about the classification of those but the APRMs must be because they provide trip signals for the reactor. I'm not that well versed in the power supply issues.

MR. JENSEN: What about the rod position indication? Was there any discussion over whether or not the rod position indication should be supplied with vital power?

MR. JONES: That was one of the arguments as I remember it in the owners group appeal, that you had that available to you generally speaking to monitor whether or not the rods were -- one of the issues was to use the reed

switches for the rod position indicators.

Again, when we put together our arguments, we recognized that it was a qualified safety grade type instrumentation, a recognized position but, as I said, we lost our appeal.

We argued to upgrade and when we went through the appeal process and we revisited the issue, we continued to push to upgrade the instrumentation.

MR. JENSEN: Did that include the rod position instrumentation for vital power as well as --

MR. JONES: No, we did not. We were looking at it primarily from the standpoint of just putting in the available instruments which were on the street, which were the Gammametrics in-core system and somebody had an ex-core system. We were not looking at specifically upgrading the position indication system.

MR. JENSEN: In the EOPs, one of the vital safety functions is to have the reactor shut down.

Do you remember which -- what kinds of instrumentation are required to assure reactor safe shutdown, the neutrons being absorbed?

MR. JONES: Well, you would have the APRMs, LPRMs go off scale, down scale. You would then drive in your SRMs. You would monitor through that whether or not you were at decay. You would also have your reed switches for your

rods, whether they were in or not. You would look at those indications. If they were bottomed out you would push them in, so to speak.

MR. KAUFFMAN: May I interrupt?

MR. JENSEN: Sure.

MR. KAUFFMAN: How would you feel if I said I had an event where I lost my reed switches, I lost my rod minimizer, I lost my rod sequence control system indications on rods and I couldn't tell the position of control rods although I did have APRM flux indication.

Would you think that's a significant event or would you say that's something that's covered by our guide -- our guidance recognized that that might happen and that's okay, or would you say that's reason to go back and reconsider our decision on upgrading our detectors and maybe making safety grade some of these power supplies?

MR. JONES: My reaction is one of I would feel uncomfortable in such a situation. I clearly would like to know that the reactor is fully shut down and be able to monitor it.

There are varied ways you could operate so I'm not sure whether I would say you would necessarily have to go back and look at it from the Reg Guide 1.97 point of view we were using when we looked at the appeal because we were looking for full-range environmental qualified for LOCA and

non LOCA transients, et cetera, going to a fairly extensive upgrade of the monitoring capability.

Arguably, you could upgrade power supplies, for example,, through reed switches would be one way of taking care of that.

MR. KAUFFMAN: Do you think that would be a hard fix, an expensive fix, or is that something that you think would be easy to do? I don't know, that's why --

MR. JONES: I don't know, either, and I would suggest you ask an instrumentation type on that.

Again, I think there are various options available to you. There are fixed core neutron systems, for example, that you could put in as one possibility, fixed core source range system which is similar to what we are looking at as one of the systems for the upgrade of the flux monitoring system. Limited capability there could be of use. What its relative cost is, I don't know.

MR. KAUFFMAN: I'm not familiar with what fixed core means.

MR. JONES: Unlike the APRMs which are in-core and stay in-core at all kinds, unlike the SRMs which are inserted and withdrawn. One of the neutron flux systems which we're looking at was a fixed in-core system. There are probably various ways of getting such information.

MR. JENSEN: So under the condition that the APRMs

and the LPRMs were both indicating that reactor power had been shut down but control rod indication was not available or indicated that some or all of the rods may be still out of the core, should an operator go to his ATWS EOPs or should he believe his nuclear instrumentation and believe the reactor is shut down, being that the nuclear information may be safety grade and the rod position --

MR. KAUFFMAN: Also considering you may be shut down now but if you cool down on Xenon fills in and burns out you may get positive reactivity.

MR. JONES: I'm not sure what you get necessarily by going to the ATWS procedures. One of the problems you end up with in the ATWS procedures which basically I think asks do you inject SLCS -- standby liquid control system -- which is really what you're looking for when you go to the ATWS procedure and initiate a short shutdown.

The ATWS procedures do not necessarily require you to initiate SLCS, depending on whether you are isolated or not isolated event. If you haven't isolated during this IVs, for example, then you would not be injecting SLCS and I'm not sure what the circumstances were at Nine Mile.

So if you went to the ATWS procedures, depending on the circumstances of the event, you may or may not -- it may or may not have helped you. You're not coming up tomorrow so cleanup is not a problem.

MR. KAUFFMAN: We may revisit that but at Nine Mile they did not get to their SLCS injection criteria which comes up suppression full temperature. They got hung up in the loop on procedure telling them to stay where they are, not depressurize and in the meantime they have to maintain level, they're running RCIC so they are depressurizing.

They basically got into one step said don't depressurize, the other one said if you can stay shut down while you're depressurizing then you can depressurize and there were some contradictions and some confusions in the EOPs so we're going to want to talk about EOPs.

We can start that now just generally on what your branch, what your involvement is in EOPs.

MR. JONES: Generally in the EOPs, and I'll go back a step.

We start at the EPGs or the emergency procedure guideline stage, which is the generic stage, the vendor generic guidelines, and we would review technically those procedures, the analyses that form the basis for those procedures and in conjunction with other branches would look at the overall accident mitigation strategies and approach steps, appropriateness of the steps to assure that it could deal with wide contingencies, wide range of events that we could postulate, and that means not just the standard design basis but also beyond design basis multiple failure events.

Typically, the branch we interface with especially on the boilers would be the plant systems branch which is the containment functions so we're very heavily intertwined with them.

We have overall control of that review. That is, we have the lead role.

Now from there, in the implementation and the EOPs, our role diminishes. The process to turn them into EOPs is each utility has their own plant specific technical guidelines and other processes, writers guides, et cetera, that they go through to develop their own EOPs, which accounts for the plant-unique conditions and such.

We get involved at times in deviations taken from the generic guidelines to come up with the plant-specific procedures. That would come about when we would have either an EOP inspection, which we may or may not be involved in that inspection program. We've done so with the boilers, I don't remember which ones anymore. We went through a few of them. We did not go on all of them but we have been involved in EOP deviations which have popped out of several of those reviews.

MR. JENSEN: Would the generic EOPs that you reviewed be specific enough to tell the operator as to whether he's allowed to cool the plant down without rod position indication, or require him to inject boron before

he cooled down? Would they give general guidance?

MR. JONES: It's difficult for me to answer that on the specifics on the rod position indication. I would say that generally though I know there are lots of steps within the guidelines and I don't know the ins and outs and all the details of the boiler guidelines but I know there are several areas in the boiler guidelines where you look at things like is the reactor shut down, do you believe you will maintain it shut down as you go through with depressurization, those kinds of steps are in the guidelines and have been discussed in our SERs.

Whether it specifically says by rod position indicators, I'm not sure it gets necessarily that specific, but it will probably lay out a series of options available to you, by rod positions or by flux or by this or by that so they will lay out several options and each utility can use a combination thereof.

MR. JENSEN: So it would be up to the utility to decide which instrumentation he would use to determine whether he would shut down the nuclear reaction or not and cold cool safely down to cold shutdown?

MR. JONES: I would say generally he would already have known probably through the guidelines which instrumentation should be used because there is a lot of that that we do specify or that we do look at.

I would have to go back and look to see in specific cases or steps whether or not it's identified but generally speaking there is a priority in many of the steps in the guidelines and I would expect to find the guidelines wold say he would use this or this and go right down the list and it's usually not an either/or, it's usually all of them to account for contingencies if things are not available. Specific, I'm not sure I would expect it to be there.

MR. JENSEN: Is there any inference in certain EOP steps as to requiring safety grade or class 1-E instrumentation be utilized?

MR. JONES: Not that I'm aware of. Not that we would only require use of class one, no.

MR. JENSEN: Well, is there any inference that class 1-E instrumentation be used for any steps in the EOPs?

MR. JONES: I would say no. Generally the EOPs or EPGs are much broader. It uses all available instrumentation. It uses all available systems to respond so I would not expect it to necessarily make the distinction.

What I would expect to find, and part of the reason I say this is because we're involved in a similar issue on another plant, is the consideration of instrumentation accuracies in various environments, for

example, when you implement the procedures.

So I would expect that there would be some distinction in the development of that kind of information as to what is qualified, what isn't, what you may have to be careful with using in certain environmental conditions that that would be covered in training.

There is also usually a general -- you have to crosscheck instrumentation and never rely on one single piece of instrumentation to make a decision.

MR. JENSEN: Are there decisions so important that the operator should make in the EOPs that it would require instrumentation providing class 1-E power?

MR. JONES: Not that I can say right off the bat yes or no. I would rather take the following premise.

The operator should have enough instrumentation to follow the course of an accident based on 1-E power consistent with the Reg Guide 1.97 approach, that he has enough instrumentation, safety grade type instrumentation, available to monitor the course of an accident.

If he is ever to that situation, I expect it would not be ideal, anyway, if he's just down to the safety grade instrumentation and displays.

Clearly one of the reasons for development of Reg Guide 1.97 was to develop safety functions and assure that there would be safety grade available instrumentation for

the operator for monitoring the course of an accident. That is how you get your highest level of instrumentation and that is why I understand it's also referred to in the equipment qualification rule, 50.49, as being required to be qualified.

MR. JENSEN: How significant is the safety parameter display system, the SPDS, in the EOPs?

MR. JONES: Let me back up and make sure when I answer these questions on EOPs I want it clear that I can't answer from a Nine Mile 2 EOP.

MR. JENSEN: Sure.

MR. JONES: In fact, not even anybody's EOP. I would rather answer from an EPG perspective.

MR. JENSEN: Okay.

MR. JONES: So that's clear. The safety parameter display system is an operator aid. It is not safety grade and its reliability targets, as I understand it, clearly we place importance on the SPDS as an agency, I would say, given how the thing is put together, but I'm not sure from an EOP perspective that the SPDS is specifically called out in a way that makes it particularly important because there are various levels or differences in SPDS designs across the industry so it would be difficult in a generic guideline to call that out other than to talk about the functions and general instrumentation.

MR. KAUFFMAN: You call SPDS an operator aid. If SPDS is lost, how big of an impact do you think it would have, say, in an emergency with technical support centers EOPs and their ability to gather information?

MR. JONES: I don't know. That's beyond my scope. To the extent that it's tied to an SPDS, obviously significantly.

To the operator running the plant, assuming he hasn't lost all his control board instrumentation, which is my understanding of Nine Mile, under that circumstance arguably he should have enough information otherwise.

I mean there are ties with the SPDS which clearly you could say that has a bearing on the ability of other functions to perform if it's tied to it and it's lost.

MR. KAUFFMAN: Do you know how it was decided that SPDS wouldn't be safety grade, wouldn't be 1-E powered?

MR. JONES: No, beyond my -- That was before my time at the agency.

MR. KAUFFMAN: Do you know who was involved in that decision?

MR. JONES: No.

MR. JENSEN: It seems like the operators and the BWRs are very hesitant to inject boric acid into the SLCS system in the core.

Do you know of any safety problems or operational

problems that suggest boric acid played out in the core that might occur from boric acid injection subsequent boiling?

MR. JONES: No, I'm not aware of any particular reasons why you should not be able to inject SLCS. In fact, as I remember discussions we've had with the BWR owners group concerning ATWS mitigation recently.

One of the options that we were looking at related to the so-called stability issue, is earlier injection of SLCS for such transients -- that was transients with oscillations.

One of our questions very early on over the last two years of involvement on this was why can't you inject it earlier and we have never been given a good reason that sticks in my mind that says it's a bad thing to do.

Obviously it has cleanup implications and that's the only thing I have ever heard.

I'm sure there are some chemical issues that would need to be addressed from a material standpoint but at this point nobody has given me any good reason not to.

MR. JENSEN: To what extent is the RSB branch reviewing emergency procedures at this time or emergency guidelines?

MR. JONES: With respect to the boilers, we are effectively done for Rev.4 of the guidelines, and in fact we have taken the position that we are absolutely finished with

the boiler guidelines with respect to normal transient and accident mitigation and we are letting the industry carry forth from there.

With respect to accident management or extension into the severe accident area, we have kept our foot in the door and we have said when those happen we want to review it again.

However, we do get involved, as I've noted earlier, with plant-specific exceptions to the guidelines. We're involved in issues at WNP-2 right now. We've done some EOP issues at one of the Millstone units in the recent past.

We also have had ongoing discussions over the last two years with respect to some deviations, particularly ATWS deviation, taken by Susquehanna relative to the owners group, primarily related to whether or not you need to lower water level during an ATWS event.

We are also involved with ongoing discussions with the owners group related to implementation of the EPGs vis-a-vis the design basis of the plant because the EOPs and EPGs as written in such a broad-brush treatment of accident strategy for the entire fleet of BWRs makes it difficult to say whether following these steps assure you meet your design basis and we've asked them to review that as part of the implementation.

This has formed up with a few problems that we're still discussing and we don't have a resolution path yet on some of those.

Last has been the issue of ATWS instability which I mentioned earlier and the fix that is likely to come out of that issue will be a procedurally PG modification. That is not a resolved issue but we have had discussions as to the types of changes that may be made.

Although we said we're close, we still have a lot of work that we do in the area.

MR. KAUFFMAN: Are you expending any efforts toward the advance of BWR and looking at EPGs for those or is that just too far away?

MR. JONES: I'm trying -- I don't remember right now whether we have them or we've asked the question on them. We are going to do it so it's just a matter of I'm not sure where it is in the process, but clearly one of the steps is we are going to look at the EPGs for the ABWR as part of the licensing effort. I'm just not sure where it is right now.

MR. JENSEN: I believe you mentioned the issue of ATWS stability. I'm not sure I understand what that is.

MR. JONES: I was hoping you wouldn't ask that.

If you are aware of the LaSalle event of '87, '88, somewhere in there.

MR. KAUFFMAN: March 1988.

MR. JONES: That's where you get neutron flux instabilities, where you have large power oscillations due to void collapse and development. It's a thermal hydraulic instability.

Basically cold water comes in, gives you a reactivity surge, then you create a void which shuts it down, the cold water comes back in. It's a thermal hydraulic instability which feeds back to the nuclear calculations.

Similar things can happen in ATWS and the issue is what -- it appears to be mostly dominated by system effects.

The other is primarily dominated by core design, that is, pressure drops across the core, two-phase pressure drops, single-phase pressure drops in that relationship.

In ATWS what seems to really give you a large power oscillation is cold water insertion, so if you isolate it and have cold feedwater coming in because you've isolated the steam, extraction steam, and you're trying to maintain level in the vessel and now you get very cold water in you get power spikes. We have seen numbers as high as 3500 percent.

MR. KAUFFMAN: Walt, there's a large industry effort in the owners group in Brookhaven looking into this.

MR. JENSEN: What would the operator's response

be? Would it be to inject boric acid with the SLCS system?

MR. JONES: What we're looking at right now is -- As I mentioned earlier, there are basically two --

When you talk ATWS procedures and SLCS injection, you really start looking at two classes of ATWS. You look at the class of ATWS where you isolate the vessel which leads to a heatup of the suppression pool which leads you into SLCS actuation and leads you into lowering vessel water level.

There's the other class of ATWS and there is also the preferred ATWS mitigation scheme which is to simply dump steam to the condenser, an unisolated ATWS, and that's the one that can come back and feed back through the system with cold feedwater.

What we're talking about is -- I don't want to call it a simplification of the procedures but in my mind it is in the sense that what we do is you have an ATWS, isolated or unisolated, you would basically hit the SLCS system, the boron injection, early and then you would deal with the issue of do you still lower power level or not is still one of the fuzzy areas.

We will probably in coupling it with the oscillation issue would be you get indications that your oscillator is not shutting down you might start lowering the water level early.

MR. JENSEN: What will you do -- suppose you were an operator at Nine Mile 2 and the reactor had tripped and the neutron instrumentation indicated that the reactor was so critical and had no rod position indication, how long would you set at hot standby before you cooled down?

Would you inject boric acid before you cooled down? What would you do?

MR. KAUFFMAN: We are talking strategies here, obviously, not plant-specific.

MR. JONES: I understand that.

That was really in a sense part of what the position was in this owners group neutron flux monitoring thing. They would basically say you don't need to bother. You don't need to inject SLCS. You can shut down. You've got adequate rods in and if you shut down and try to come down the appropriate decay --

You seemed to imply in your question that you had neutron flux monitoring. If you have ---

MR. KAUFFMAN: The APRMs, LPRMs, were depressurizing.

MR. JONES: But I don't know how far and whether you continue and follow the decay -- Your LPRMs are going to drop off scale fairly fast and the transients, you don't know where they are, arguably.

Gut reaction is I would inject SLCS. That's my

reaction to it.

MR. JENSEN: One concern if you cool down and maybe you were subcritical but if you cool down then you might go critical because in the cooldown perhaps all of the rods weren't inserted or only partially inserted.

MR. JONES: If you have feedwater and you have level control and all that happened was you just came back up on power with your turbine available to dump steam in your condenser, you just sit there and no big deal.

It's a very difficult call to make because if you look at it from certain eyes you could say the plant just sits there and you sit at power level and then you ask yourself what do I do from here and if you really want to get down at that point, you know you're not fully shut down, your rods are not fully in because that should not be happening to you and that could be a good enough indication to go back and inject SLCS at that point.

MR. JENSEN: But if you did go critical, it wouldn't be a major safety problem?

MR. JONES: I don't believe it would be a major safety problem. The boiler is inherently -- from that sense, they appear to be inherently safe.

As I said, my reaction is I would prefer to inject SLCS but that's a very personal reaction.

MR. KAUFFMAN: Walt is assuming that when you

depressurized you had control of your condensate booster system, for example.

MR. JONES: So you should just stabilize out. From a pure safety standpoint it's not clear that anything is actually necessary.

MR. JENSEN: So an operator just might choose to cool down and if it did go critical he might wait and inject the boric acid then.

MR. JONES: That's correct, and that would clearly be, I think, through the procedures what he would then be directed to do because he is obviously not shut down.

MR. JENSEN: In your recent review of the GE EOPs, what other branches did RSB work with and interface with?

MR. JONES: Clearly plant systems. I am sure we worked somewhat with the human factors people but only -- not to a very large extent I'm sure because a lot of human factors issues have already been addressed in the earlier reviews. We may have touched base with instrumentation and control.

Again, you drew a rev of the report which was a fairly -- Well, it's a fairly major modification and a few of the strategies but it was mostly dealing with very specific items so the nature of the review is different that if you were starting from scratch.

We were looking primarily at things like

containment flooding as opposed to core spray as a final accident mitigation step, level control and venting the containment and a lot of that stuff was a lot of the emphasis in Rev 4.

MR. JENSEN: What kind of things did instrumentation and control branch look at?

MR. JONES: I don't remember. I'm not sure we interfaced very extensively with them except we probably if anything just touched on it.

MR. KAUFFMAN: I'm going to try this question. It might be too hard to answer but I'm going to try it.

Could you run me through the differences between the BWR EPG Revs 0 through 4 of the evolution and why those changes were made? If that's too hard --

MR. JONES: I can absolutely not do that because I am not that familiar with the early revisions at all. That was before my time.

MR. KAUFFMAN: It's a nagging question I have, are these just small refinements or are they major improvements as they have gone along.

MR. JONES: I can't speak for earlier. I can speak Rev 3 and Rev 4 and my expectations are Rev 0 and Rev 1 a lot of that is likely to be upgrade in response to staff questions, comments or open items, which was common for many of the emergency procedure guidelines we looked at in that

stage of their life.

Between Rev 3 and Rev 4 there were some very significant things that were changed. Containment venting is one of them. It's a much more detailed treatment of containment venting in the why and the when and how you calculate the various limits that you need to impose, et cetera.

Another big deviation step was there was a reliance in the old EPG on core spray. If you uncovered the core but you could maintain the core level at about two-thirds core height you would continue -- if you had spray available to you, you would just sit in that mode and cool in that fashion.

Rev 4, if you're in that mode and you're down to one pump, from a reliability standpoint if you're really down to one pump you are probably in pretty fairly strange territory and I'm not sure you know the reliability of your system as a whole any more so at that point you take so steps to start flooding containment so the ultimate path then, instead of cooling mode, would be in containment -- be in core spray or spray cooling as a whole different strategy of flooding and flooding has other implications associated with it. You have to vent the flood but it is much more stable and assured.

That's a fairly major change. There are some

minor rearrangements of a few cautions or elimination of a few cautions which were not considered significant. Those are probably the major changes.

MR. JENSEN: As far as your branch looks at PWR EOPs, as well as BWR EOPs, I wonder if you know of any significant difference in philosophy that operators could use in entering the ATWS procedures as far as indication that an ATWS had occurred between the EOPs for PWRs and BWRs.

MR. JONES: Actually I would say there are a couple of differences. Number one, there is obviously no distinction between a nonisolated and isolated ATWS in a PWR. An ATWS is an ATWS is an ATWS. There is no deviation associated with the actions due to other system conditions.

Generally speaking, the PWR, if you have indications that you're not shut down, you start injecting your boron systems. Well, your drive rods first and inject boron and that type of stuff, but it's pretty much a fairly immediate step to confirm the shutdown reactor and take those actions.

From an indication standpoint, other than the type of instrumentation that you may be using, it's very similar, position indicators or rod bottom lights, same thing, you're talking neutron flux monitoring instrumentation, etc cetera.

To the best of my knowledge, all of the Ps have

qualified neutron flux monitoring systems down to the ten to the minus six type range so from that standpoint they should be in better shape as a whole from the monitoring standpoint.

I think there is a very clear recognition that in a boiler you're talking a machine that doesn't really have tremendous reactivity type problems inherently because of the way feedback, et cetera, the rods go in and you actually go subcritical on rods in a boiler.

That's not true in a PWR, period. A PWR is not inherently shut down just because the rods are in so you have to inject boron, for example, before you depressurize so I think there's more sensitivity to that issue from that standpoint.

I think there are -- From a pure indication standpoint the distinctions are small. I think there is a level of sensitivity that's much higher and the quality of the instrumentation is different and certainly the actions are arguably simplified because you don't have the same system feedback to deal with.

MR. JENSEN: Okay, good.

MR. KAUFFMAN: That's it. We're off the record.

(Whereupon the matter concluded at 2:56 p.m.)

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: IIT Interview of Bob Jones

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.

Marilynn Estep

Official Reporter
Ann Riley & Associates, Ltd.