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BRIEFING ON STATUS OF BWR WATER
LEVEL INDICATORS

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PUBLIC MEETING

Nuclear Regulatory Commission
One White Flint North
Rockville, Maryland

Tuesday, June 1, 1993

The Commission met in open session, pursuant to notice, at 2:00 p.m., Ivan Selin, Chairman, presiding.

COMMISSIONERS PRESENT:

IVAN SELIN, Chairman of the Commission
KENNETH C. ROGERS, Commissioner
JAMES R. CURTISS, Commissioner
FORREST J. REMICK, Commissioner
E. GAIL de PLANQUE, Commissioner

STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:

WILLIAM C. PARLER, General Counsel

JOHN HOYLE, Assistant Secretary

JAMES TAYLOR, Executive Director for Operations

WILLIAM RUSSELL, Associate Director for Inspection and Technical Assessment, NRR

ASHOK THADANI, Director, Division of Systems Technology, NRR

TIM COLLINS, NRR Staff

GEORGE BECK, Chairman BWROG Water Level Instrumentation Committee

CYNTHIA TULLY, BWROG Chairperson

J.T. BECKHAM, JR., Chairman, BWROG Executive Committee

JAMES BOOKER, Vice Chairman, BWROG Executive Committee

STANLEY McBRUNEY, BWROG Executive Committee

PAUL BLANCH

P-R-O-C-E-E-D-I-N-G-S

2:00 p.m.

CHAIRMAN SELIN: Good afternoon, ladies and gentlemen.

We have before us a very interesting meeting this afternoon. We are to be briefed in turn by the staff, by the Boiling Water Reactor Owner Group and by Mr. Paul Blanch on various aspects of the water level instrument inaccuracies.

In 1992, errors were observed in level instrumentation for boiling water reactor water level. The cause of this error was determined to be that under high pressure gases would dissolve in the leg that presented back pressure to a particularly interesting piece of instrumentation and then when pressure was released that certain gases rather than staying dissolved in the water would condense and they would throw off the measurement in this instrumentation displacing a volume of water from the so-called reference leg.

This issue is of major concern to the Commission. Compensatory measures have been established and have been discussed. Additional measures will be discussed this afternoon, however I'd like to emphasize a number of points.

The first is that anytime there's instrumentation, safety-related instrumentation that cannot be relied on, you have a weakening of discipline in the plants because the question is too easily asked by operators, "If I'm not to rely on this instrumentation, how do I know that I can rely on other instrumentation."

The second question has to do with the burden put on operators. It's tough enough to operate a power plant when everything is going the way it's designed. Additional burdens mean additional pressure on people when and if they have to react in a serious situation.

And the third is the degree of time that's appropriate to give to the operators, the licensees and the vendors to rectify an important situation.

These are all critical questions which will be discussed this afternoon. My own view, and I think the Commission shares it, is that it is important that this issue be resolved without further delay.

I understand that copies of all the viewgraphs and statements are available.

We'll start with the staff.

Mr. Taylor, you may proceed.

MR. TAYLOR: Good afternoon.

With me at the table are Bill Russell, Ashok Thadani and Tim Collins, all from the Office of Nuclear Reactor Regulation.

We are here to talk about this important issue of reactor vessel water level which affects some 36 BWRs throughout the country. We discussed the safety importance of this issue with you in a meeting last November and indicated our concerns that the operators must have highly reliable water level indication. Since that time, the staff has gathered additional information which tells us that remedial action should not be further postponed and in that regard we issued a bulletin, 93-03, last Friday, May 28th.

Mr. Russell will now continue with the formal presentation.

MR. RUSSELL: When we last briefed the Commission we focused principally on events that initiated from power with the primary system starting at normal temperature and pressure and we concluded at that time that the errors would be small until depressurization had occurred to less than about 450 pounds and that the automatic protection systems would in fact actuate to provide protection. We believe

that there were some issues associated with longer-term cooling and we requested that short-term actions be taken to address those issues.

But it's important to keep in mind the importance of the reactor vessel water level instrumentation itself in boiling water reactors. It is the staff's view that there is no instrumentation more important to safety in this type of reactor. The degassing of the reactor vessel water level instrument reference legs is a potential common mode failure of redundant level instruments.

Typically, older boiling water reactors have two reference legs while newer boiling water reactors have four reference legs. This is not a hypothetical concern. The basic phenomenon is understood. Non-condensable gases dissolved in the instrument reference legs will come out of solution during depressurization and can cause large non-conservative errors in indicated water level. This has been observed in operating boiling water reactors, although the magnitude and duration of the observed level error has been on the order of several inches with a maximum of 32 inches which was observed at WNP-2, and the duration was short and was characterized by spiking or notching with the exception again of WNP-2

which lasted approximately two hours.

The effect of depressurization on soluble non-condensable gases has been evaluated by testing by the BWR Owners Group. This testing confirms that large non-conservative errors can occur. In the staff's view, this testing confirms the need for hardware modifications to resolve the problem in the long-term. Hardware modifications to fix the problem do not, in the staff's opinion, require extensive additional testing and can be implemented in a reasonable period of time.

This problem was observed during a July 1992 shutdown of Millstone 1, reported to the NRC on July 15th 1992 and hardware modifications were implemented prior to the start-up on August 13th 1992. Resolution by Northeast Utilities required about one month from reporting of the problem to implementation of a hardware resolution.

Recent information from the BWR Owners Group highlights the importance of water level indication to shutdown modes of operations and the potential serious consequences of inaccurate water level instrumentation during loss of inventory events. These concerns resulted in the staff issuing a bulletin last Friday to alert operators to the

importance of water level implementation to shutdown risk. This bulletin requests short-term actions within 15 days, training of operators by July 30th, 1993, and implementation of hardware modifications at the next cold shutdown after July 30th 1993.

Mr. Thadani will now present the details and the bases for the staff findings and the actions we've taken.

CHAIRMAN SELIN: Before you go on, Mr. Russell, at some point I'd like you to explain whether there are in fact short-term actions available to be taken, that this isn't a "beware of falling rocks" sign, but it's --

MR. RUSSELL: Yes, sir, there are and we will discuss those when we get that point in the bulletin, but there are three specific short-term actions which can be taken. The first is clearly alerting the operators. The second is control of valves and maintenance activities.

When we evaluated short-term risk or shut-down risk in our NUREG reports, we found that the majority of events of interest to risk during shutdown for boiling water reactors were drain-down events and that they were principally caused by operator error or failing to control activities, so these are

preventable.

And we also believe that actions can be taken to provide closer monitoring of the water level instruments during this period of time of shutdown, but we will cover that in more detail with respect to the actions we've requested.

CHAIRMAN SELIN: Doctor Thadani?

DOCTOR THADANI: Okay. Thank you, Bill.

What I will do is to briefly go over some of the background fairly quickly, some of the background that we covered at the November 13th meeting, and then summarize things we have learned since then and in fact what led us to conclude that we needed to issue a bulletin on a fairly short time frame basis.

(Slide) If I could have viewgraph number 2, please, at the last briefing I described the basic design of the vessel level instruments and the importance of the vessel level instruments since a number of automatic actions and safety systems and the long-term operator actions rely on these level instruments.

We also discussed the most likely mechanisms for transport of non-condensables. At that time we talked about diffusion, thermal convection and

the leakage paths and so on. We discussed the most likely cause of transport of non-condensables was leakage through these reference legs.

If significant quantities of non-condensable gases are present in the reference legs, large significant errors could be indicated in terms of level response particularly if you have a depressurization event. At that time, we talked about rapid depressurization being caused by low probability events such as loss of coolant accidents.

This understanding led to the issuance of Generic Letter 92-04 which we discussed with the Commission at that time. In August of '92 we issued the Generic Letter and requested that the licensees take short-term compensatory actions. These were mostly procedural and analysis oriented actions. And the long-term corrective actions, this was the hardware modifications to fix the problem. The hardware modifications per the generic letter were to be implemented during the first refueling outage after November 1992.

We discussed with the Commission our rationale for not requiring immediate corrective action by way of hardware modification, and I want to repeat the reasons we had then because there's some

relevance to the discussion that will follow.

First, we said the probability of an accident causing rapid depressurization, since that was the focus, was low. I stated at the meeting it was probably on the order of 10^{-4} per reactor year. Large amounts of condensables must be present in all reference legs, but Bill noted the potential common cause considerations here.

A very important fact we presented to the Commission was that all automatic safety functions would be performed even in the presence of large amounts of non-condensables.

Further, for the long-term we believed that sufficient operator guidance was out there for them to make sure the core would be kept cool for the long-term.

These were the reasons why we thought it was not necessary to go forward and require immediate modifications.

CHAIRMAN SELIN: Doctor Thadani, at that point was it clear to you what modifications should be made if they had been made immediately?

DOCTOR THADANI: At the time we believed that at least one modification ought to fix the problem and that modification had been made at

Millstone Unit 1, so all the options in terms of what type of modifications one would consider I believe were known options. Some were probably better understood than others, but at least one we knew of that had -- the licensee had made the modification. We had reviewed it. We had sent an inspection team and concluded that that was in fact going to resolve this issue.

I remember very clearly even at that meeting six, seven months ago, the Commission and the staff were actually skeptical that the BWR Owners Group test program could show that the modifications were not needed. The staff agreed that the testing program would lead to a better understanding, particularly in assessing the effectiveness of various modifications which were under consideration at the time.

Considering the safety significance as I described -- the four factors, so to speak, and our sense that there was some value to the test program-- we agreed to what I think probably amounts to a several month delay in the implementation of the hardware modifications. And in December of '92 we informed the Boiling Water Reactor Owners Group of our agreement to extend the implementation schedule, but

made a very important point though. We noted the modifications would have to be made at the earliest opportunity and not the refueling outage after July '93. That was a distinction.

CHAIRMAN SELIN: Repeat this again, please.

DOCTOR THADANI: We informed the owners group that we agreed to a delay, however the modifications would have to be made after July '93 at the earliest opportunity instead of refueling outage. And earliest opportunity in our view was something like going to cold shutdown condition where you are going to be in that condition for several days. We felt that was a reasonable time period to make the modification and that was a distinction from what was stated in the generic letter when we agreed to extend the schedule.

CHAIRMAN SELIN: I'm missing something. I'm sorry. The delay said "at the earliest opportunity." In other words, the first time a licensee would go into cold shutdown after July 1993 the modification had to be made?

DOCTOR THADANI: Correct.

CHAIRMAN SELIN: What was the situation before that?

DOCTOR THADANI: Before that, the generic letter said "make this modification after November of '92 whenever the plant goes into refueling outage."

CHAIRMAN SELIN: So the difference would be the possibility of a cold shutdown for reasons other than a refueling outage?

DOCTOR THADANI: Exactly. Exactly.

CHAIRMAN SELIN: Which is relatively infrequent.

DOCTOR THADANI: It's infrequent. Some plants go into mid-cycle extended inspection activities and so on.

CHAIRMAN SELIN: But the practical effect was to move the date from the first refueling outage after November '92 to the first refueling outage, except for this odd case of mid-cycle shutdown, after July '93?

DOCTOR THADANI: That's right. Any time they had to go to cold shutdown for whatever reason, whether it was mid-cycle or if they had to do some other maintenance work because there was a problem and the maintenance could best be accomplished during cold shutdown, that's what would lead licensees to go to that condition.

CHAIRMAN SELIN: At the time that the

staff permitted this delay to go through, were you under the impression that there would be an energetic effort to evaluate the different permanent fixes and that today we would know a lot more than we knew, say, six months ago about permanent fixes?

DOCTOR THADANI: There's absolutely no doubt about that. In fact, in October before the Commission meeting we discussed the issue of potential modifications with the owners, and I believe it was in October, but we got a fairly good understanding of what alternatives they were considering. We could see clearly that in some cases one would have to do more assessment, better assessment to make sure up-side and the down-side was clearly and carefully evaluated.

We had subsequent meetings and I believe it was in March of this year, it was my understanding and they could correct me, that they indicated to us that they had done -- they did not think any additional testing would be necessary to assess any of these modifications under consideration.

It's also my view that enough months have gone by for us to have completed all the necessary assessments.

CHAIRMAN SELIN: "Us" being the Boiling Water Reactors Owner Group or the NRC staff?

DOCTOR THADANI: I'm talking about the owners group in this case. They should have completed all the assessments.

CHAIRMAN SELIN: Well, let me just ask you a simple question. Do you today know significantly more about either the designs or the value of the designs for the permanent fixes than you knew in November 1992?

DOCTOR THADANI: We don't know much more.

(Slide) Could I go to viewgraph number 3, please?

Okay. Now let me quickly go through things we have learned since that time, the last briefing.

The Boiling Water Reactor Owners Group has completed test program to better understand the impact of different aspects. They have done tests to look at variations in concentrations of non-condensables in the reference legs. They have looked at various depressurization rates. They have looked at various configurations, because, if you recall, at the last briefing I talked about the number of geometries out there and geometry is an important factor in this, and they have done a number of tests to get a better understanding of what might happen.

While the owners group is, I'm sure, going to go through a description of their program, we took a preliminary look at raw data that we collected when the tests were completed. We drew a basic conclusion from what we have seen by way of the raw data, that errors ranging from many inches to many feet occurred during these tests. Our conclusion is fairly straightforward, I think, that the tests confirm that large errors can occur.

However, when we look through the raw data we could see some things we couldn't really explain, but, as we think the magnitude of errors is not so easy to predict, it's probably due to fairly complex bubble dynamics, we think. There are various geometries. Nucleation sites and bubble growth may be difficult to predict.

But what we did find was, while we can't tell the exact magnitude of the error, you can tell the errors are significant, many inches to many feet.

CHAIRMAN SELIN: I assume that the fixes would be to avoid the errors, not to learn how to live with them.

DOCTOR THADANI: The fixes we think would be to prevent the situation from developing -- that is, prevent the gases from getting down into reference

legs.

CHAIRMAN SELIN: And your interim steps were to recognize that errors were occurring and to ignore the -- not to make a correction, but to ignore the offensive instrumentation?

DOCTOR THADANI: No. You still need the instruments in the interim. If such errors were to occur, we have identified mechanisms that we described before as to how the operators could keep the core cooled in the long-term.

CHAIRMAN SELIN: Right. But you weren't trying to figure out whether it was five foot in error or six foot in error.

DOCTOR THADANI: No, sir.

CHAIRMAN SELIN: Once there was an error you said, "I can't trust that instrument and here's my back-up --

DOCTOR THADANI: That's correct. That is correct.

COMMISSIONER de PLANQUE: Excuse me.

CHAIRMAN SELIN: Please go on, Commissioner de Planque.

COMMISSIONER de PLANQUE: The data you're talking about is the data that came from the test program, not retrospective plant data?

DOCTOR THADANI: No, this is all test data I'm talking about.

COMMISSIONER de PLANQUE: All test data.

DOCTOR THADANI: Yes, which really confirms that if you have an accident and rapid depressurization and you have significant amounts of gases in the reference legs, the tests confirm that you can get very significant errors in the level indication.

CHAIRMAN SELIN: The point I'm trying to make is that where we stand today -- I'm sorry, the question I'm trying to address is where we stand today. We know a lot more about the situation, but nevertheless the key point is that we know it's a situation to be avoided, not one to --

DOCTOR THADANI: Absolutely. That's correct. Yes.

CHAIRMAN SELIN: And we don't know that much more than we did six months ago about the best way to avoid the situation.

DOCTOR THADANI: We certainly don't know any more.

CHAIRMAN SELIN: Mr. Russell?

MR. RUSSELL: The one point I would make is that the results from the WNP-2 low pressure

situation when they went on to RHR with the 32 inch level there that Ashok will discuss about --

DOCTOR THADANI: That's the next point.

MR. RUSSELL: -- that is beyond the scope of what was looked at for the test program, which was essentially the rapid depressurization, depressurization rates.

CHAIRMAN SELIN: So, far from showing that--

DOCTOR THADANI: Bill, if I may --

CHAIRMAN SELIN: Go ahead.

DOCTOR THADANI: The owners did do some tests to simulate what happened at WNP-2 and I will briefly go over that.

CHAIRMAN SELIN: Okay. Why don't you continue?

DOCTOR THADANI: In fact, that was the next point. The new information we have is the owners group test program results and what I'd call a very significant event that happened at WNP-2. This event occurred earlier this year and would show that significant errors can occur even during normal shutdown. Recall everything I've been saying is rapid depressurization events, low probability events like loss of coolant accidents.

CHAIRMAN SELIN: After the emergency cooling systems had been initiated?

DOCTOR THADANI: In this case, yes. But in this case the situation is you're cooling down normally, and I will show you a schematic in a couple of minutes as to how they were cooling down. They were at 20 pounds pressure, very low pressure. They actuated their shutdown cooling system that led to a small reduction in pressure of about ten pounds.

What they found was that they lost significant amount of water from the reference legs so that it was no longer a transient, short transient event, what we call notching, bubbles move up, out, and the level comes back down to accurate point. But here they actually had sustained conditions where they lost approximately 40 percent of the water in the reference leg and it took two hours for condensation process to refill and they had sustained errors of about 32 inches lasting for almost, I believe, about half an hour or so.

To us, this was something we didn't appreciate before, that such conditions like normal shutdown, small differences in pressure, particularly when you're at very low pressures where you can get non-condensables out, that they can give you such high

errors in the indicated level.

CHAIRMAN SELIN: Was this gas that had been dissolved at high pressure or just --

DOCTOR THADANI: Yes. During normal operation you have gases in the condensate pot and, if you have any kind of leakage, which we suspect they did-- by the way, I believe there are four reference legs at WNP-2 and this phenomenon occurred in one reference leg and that they probably had leakage and that over the time period that they have been operating gases have been dissolved and moved on into the reference leg.

They saw, actually, before they got to this point, they did see some notching, I believe, so that they knew that some gases were present. That's an important aspect. That is, when you're shutting down, if you see notching, that tells you that you have gases present. And when they got low enough in pressure and they depressurized by ten pounds, whole bunch of gases came out, caused them to lose a fair amount of inventory from the reference leg.

So, this raised basically a new concern that during shutdown conditions you can have inaccurate indication of level. What happens if during shutdown conditions you get into potential loss

of inventory events? What would happen was the question and the issue.

Let me go on. Other than to say that owners group testing, WNP-2 event did nothing more than to really heighten our sensitivity that this issue is real. It's important. It's more important than we thought and it needs attention.

(Slide) In the next viewgraph, which is viewgraph number 4 -- before I get into that cool-down scenario, may I go to viewgraph number 5, please? I think that might help if I do this first.

(Slide) Okay. This shows a simplified boiling water reactor residual heat removal system during shutdown cooling mode of operation. We simplified this, although I'm sure you recognize that there are many, many more connections, pipes, valves, pumps, but we thought it was best to simplify to illustrate the type of problem one can get into.

This is but one pathway. There can be several pathways and, in fact, the owners have looked at, I believe, six or seven different pathways of what could happen during this condition.

First, normally when you go into mode 3, that is you're going from hot shutdown, you start the cool-down process, you're in mode 3, and when the

pressure gets down below -- it's different for different plants, but roughly on the order of about 130 pounds or so, what you do is you open these valves in this schematic number F009 and F008 and you start what's termed here the RHR or the residual heat removal pumps. So, the pathway is taking this coolant from the vessel by the RHR pumps through the heat exchangers back into this recirculation line, so you're cooling the primary coolant and this is the pathway you're using for that cool-down process.

Now you notice this valve F004 which is closed during this cool-down process. If the operator makes an error and opens this valve during this process, this is about typically 20 inch piping, diameter piping, there is sufficient driving head, if you look at the elevations and so on, sufficient driving head that you will get many thousands of gallon per minute flow going toward the pool instead of back into the reactor.

So, if such an error is made, you have what we call a "drain-down event" that Bill touched on earlier. This drain-down event happens to be one of the very most serious ones because you can get many, many thousands of gallons. There are two or three such pathways where you can get thousands of gallons

per minute flow and then there are others where you get lower loss of inventory, that is you have more time to correct the situation.

(Slide) Now if I can go back to viewgraph number 4 to describe the scenario concerned, plant is under normal cool-down process. If a drain-down event like the one I just described, which requires misalignment of certain valves, occurs, and if significant gases are present that lead to an error of about 24 inches or two feet roughly, we think that could lead to serious conditions because the automatic isolation of those valves F008 and F009 occurs at set points which are less than two feet above the variable tap. And if you have two feet or more air, you will not get that signal to isolate those valves.

COMMISSIONER de PLANQUE: You're talking about the multiple reference legs. Does that have to occur in four of four, if you have four?

DOCTOR THADANI: No. In fact, it's just basically two reference legs is the key. It depends on which two.

COMMISSIONER de PLANQUE: What about a plant with two?

DOCTOR THADANI: At a plant with two, it's still two. It would have to occur in both reference

legs.

COMMISSIONER de PLANQUE: So it has to occur in two if there are two and two if there are four.

DOCTOR THADANI: I believe it's two if there are four also. There are plants with three reference legs also, and there also I believe it's two.

MR. COLLINS: In plants that have four reference legs, it has to be the right two, the right combination of two. There's a couple of combinations of those four, two at a time, that can cause the problem.

COMMISSIONER de PLANQUE: Okay.

MR. COLLINS: But it always has to be at least two.

COMMISSIONER de PLANQUE: And two specific ones.

MR. COLLINS: Yes.

DOCTOR THADANI: For that one where there are four, two specific ones, yes, so the isolation signal wouldn't be available. And further, level one signal in BWR actuates low pressure emergency core cooling systems. This is the high-flow low-pressure injection system. Even that wouldn't be available

because of this potential safe-point being much less than two feet error.

So if that situation were to exist, that is you have a large drain-down path, an error something on the order of 24 inches, one would have about 15 to 20 minutes available for operators to recognize what is happening and to take corrective action. Corrective action, clearly, would be to isolate and inject ECCS. Otherwise, core damage can occur.

We asked the owners to analyze these situations. The case that they analyzed basically took about two minutes to get down to the suction path, this piping, and so you're steaming afterwards and it will take probably another 15 or so minutes and the cladding temperatures would be on the order of 2,000 degrees or so.

So, that's the key. Big drain event. Available time is 15 to 20 minutes. The owners group sent us a report last week, as a matter of fact, and in that report they felt that the time available -- that the probability of this event is low and the time available is sufficient, 15 to 20 minutes.

COMMISSIONER de PLANQUE: What about the probability of getting that error to occur in the two

legs simultaneously?

DOCTOR THADANI: It's very difficult to say what the probability would be, but, if I can -- WNP-2, let's use that as an example. One reference leg had error greater than 24 inches. I believe two of the other three reference legs -- Tim, correct me if I'm wrong -- I think experienced some amount of notching. They saw gases in there.

What is the probability that you will get leaks in at least two reference legs that lead to high concentration of gases is tough to estimate, but the probability I think is fairly high that you'll have gases. How much is not so easy to estimate. I couldn't tell you what that might be.

MR. RUSSELL: There's another side of this, though, that is easier to understand. And that is there have been a number of events. I mean, these drain-down events have happened and the drain-downs are fairly significant. I believe the low-pressure suction valve, the equivalent of F004, was mispositioned I believe four times. That was identified in an AEOD study. There are other paths that can also drain-down, so --

CHAIRMAN SELIN: And the drain-down doesn't have to be in two legs. It's just one drain-

down event plus enough mistakes to hide the need for emergency core cooling is the sequence that leads --

DOCTOR THADANI: That's the key. That's the sequence.

MR. RUSSELL: That's correct. And the valve could be mispositioned before you initiated RHR cooling and that could also exacerbate it from the standpoint it would further depressurize. Clearly, if you're at pressure with that valve open, you will have an even higher flow rate.

DOCTOR THADANI: I guess I do want to say something to be sure we're not misinforming you. That is, I believe most plants have interlocks which would prevent opening valves F008 and F009 if valve F004 is open, but the reverse isn't true. That is, if you're into this mode of operation, then you can open F004. Mission time is small, so the probability will go down some, however that's just one pathway. There are other pathways and Bill is exactly right.

Drain-down events have happened generally during cold shutdown, but I know of at least one, and our database is not up to date, but I know of at least one that happened during mode 3 operation. And so, I mean, one can say there's some frequency of those events and that's real based on at least some data.

MR. RUSSELL: It's not a 10^{-4} large LOCA which we haven't had which we worried about with the at-power scenario. There have been a number of drain-down events. We've got a fixed number of reactor years of operating experience with BWRs, and so we're probably in a 10^{-2}, 10^{-3} kind of event initiator for a drain-down event.

DOCTOR THADANI: So where are we now, then? A few months ago we were here at this table saying that rapid depressurization at power was the issue. That issue hasn't gone away. We had some operational interim actions that we proposed be taken.

We have now concerns during cool-down mode of operation and it's clear to us that some early actions are necessary and I will go over some of these actions.

(Slide) May I have the next viewgraph, please?

Our position, before I describe what we have asked the industry to do via this bulletin, I thought it would be worthwhile to again give you a sense of what is the basis for our position today. We have changed a little bit. I personally have changed a little bit in my perception. I thought that I was more optimistic about what type of testing would be

done and how much more we would know about the effectiveness of modifications in a few months than we do know now.

We believe -- our view is based on simple fact, that the level instrumentation, reliable level instrumentation in BWRs is a must, absolutely essential. Enough work has been conducted to confirm that non-condensables can migrate into the reference legs. We've seen enough events to believe that. We've also seen, through the tests as well as the WNP-2 event, that the errors in the indicated level can be significant. We think the modifications can be made in the short-term to correct this deficiency. We keep coming back to at least one licensee, most on Unit 1 wherein they added this continuous backfill system. I have, as part of the viewgraph -- viewgraph number 8 is a schematic of what Millstone Unit 1 did. It's an interesting aspect. I'm not saying this is more than what it is. During recent shutdown at Millstone Unit 1, I believe they did not observe any presence of gases. That's not proof positive, but it's a good indication, I think.

We don't think one should add any further delays in implementing modifications to correct this problem, and that consistent with our December letter

to the Owners Group we believe that the modification should be completed at the first opportunity after July 30th, and we have defined that first opportunity as cold shutdown condition.

Further, in view of the WNP-2 event and our better understanding of what could happen during cool down period, we have requested the industry to take additional actions and I will describe those with the next viewgraph.

(Slide) As Jim mentioned, we issued this Bulletin 93-03 on May 28. Requested certain interim compensatory actions be in place in 15 days.

CHAIRMAN SELIN: Can we get the next --

DOCTOR THADANI: It's beyond the staff position. It's viewgraph number 7.

Okay. We have requested that certain interim actions be taken when the plant is in mode 3. Mode 3, as I indicated earlier, basically is going from hot shutdown condition to cold shutdown condition. It starts at pressure and temperature and cooldown and as I indicated that pressure is in the range of 100 to 135 or 140 pounds. You cut in RHR and then proceed with cooldown. So, it's during that mode 3 we've asked that the industry have enhanced monitoring of level instrumentation. There should be

focused attention on the level. They should watch for any anomalies that may indicate presence of gas.

WNP-2, after what they saw, decided to have dedicated operators wherein they would be looking -- it's enhanced monitoring, looking to see if there's signs of gases being present and if they see signs, then they would take certain actions. It's in one reference leg or more reference legs. They would, if necessary, backflush or stop operation of RHR, put that level instrument in trip mode. That is, it's not operable at that point.

In any case, the key point here is to focus attention to see signs of gas being present to take appropriate actions.

Further, during this mode, we want to make sure there are sufficient cautions and controls in place to minimize the potential for any drain-down events. That is, drain-down events would happen if there's actions to change valve positions. We're saying restrict certain valve movements for those valves that could lead to drain-down. Even in spite of that, you need to make sure there are some verification techniques used to verify the valves are in appropriate position before you go into this mode of operation.

During maintenance, it is very important also to keep track of these issues and to try and limit, if possible, maintenance on these portions of the system during mode 3 operation. Further, it is very important to make sure to again, once more, alert the operators that they can get confusing information from these level instruments. That needs to be done essentially immediately, 15 days. By July 30th, we're asking for two pieces basically. The first piece, we said we want a report. We want also classroom and/or simulator training for people to make sure there is good understanding of drain-down events, good understanding of the implications of these events and that they have actually been cycled through, all shifts of operators have been cycled through this training.

Finally, that these modifications -- what we're doing in the interim is trying to live with what's out there basically. We're saying, "Take interim actions to minimize multiple things going wrong." But the goal is to get away from that, get away from continually increasing burden on operators and so on. The goal is to have reliable instruments which I think the operators deserve. That needs to be done quickly. We don't believe that the schedule

we've been on should be further delayed and that's a recommendation that the Owners Group has made. We disagree with that.

That ends my briefing.

CHAIRMAN SELIN: Doctor Thadani, I find one of the most attractive things working with you personally and with the staff in general is a true openness about looking back and drawing lessons even when the mistakes or the judgments that don't work our perfectly are ours instead of other people. In that sense, I think your openness and your approach to your presentation, answering questions, are commendable.

But I have the feeling that we've wasted six months and that it's perhaps not entirely at random, that in addition to the events that you went through, the ACRS, which in fact is the perfect avenue to bring competing technical opinions together, was talked into holding a couple of these key sessions on a closed basis because of proprietary information where this conflict might have been brought out earlier, that if anything what we know about the systems now is more discouraging, not less discouraging than six months ago, and that a fix was available awhile ago.

Now, I'm not questioning that these short-

term steps sound effective, but I really am concerned that we've been, if anything, just too open to suggestion on what to do as of November or December before, that there were a couple of times when this conflict could have been drawn much more sharply and it would have been clear that either -- I'm just concerned that fixes weren't made or at least carried out in great detail at the same time the analysis was done and then in effect on purpose and not that we were put off rather than just being one of those experiments that sometimes doesn't produce proper --

DOCTOR THADANI: Mr. Chairman, I happen to agree with everything you say. I think that's very accurate. If I'd known six, seven months ago what I know today, I would not have agreed to that delay. I honestly thought that by now the owners would have thoroughly evaluated the modifications, the effectiveness of modifications, pros and cons, and come to a decision. But unfortunately even today, as recently as I think it was last Friday, we received a letter from the owners saying they think there are lots of down sides to some of these modifications. I have yet to see a thorough study evaluation and if that's the case it should have been done a long time ago. We shouldn't have had to wait until now. I

can't say anything but I agree with what you said, and I think I have contributed to that.

MR. RUSSELL: There's one other issue that I think is fairly significant and that is we continue even with what we know about shutdown risk and having put out a NUREG and evaluated it rather extensively, our focus last summer was on operation from power, and yet we did not take it the next step and say, "To what extent do we rely on level indication?" because it provides, in fact, the only automatic protection for drain-down events initiated from shutdown conditions. So, here's a situation we did have some information. We were working on it as a generic activity. It was not embodied fully into our practices yet, but we were not pulling all of those pieces of information today and asking the questions last summer, "What about shutdown risk and what about the inoperability of this instrument for normal shutdown conditions?"

CHAIRMAN SELIN: Mr. Russell, is there anybody else who is now or will be in cold shutdown between now and July 30th who will slip by the net because of the further two months delay?

MR. RUSSELL: There are some facilities that are in shutdown now in the bulletin. We did indicate that if they're in shutdown on July 30th that

they should correct it prior to start-up. There's one facility, I believe it's Pilgrim, that is in shutdown now and that has scheduled a start-up before the 30th of July. I don't know if there are others. They're back up now.

CHAIRMAN SELIN: Commissioner Rogers?

COMMISSIONER ROGERS: I've got a couple of questions and a couple of comments.

Did you ask AEOD to go and look to see whether there had been any LERs on any events similar to the WNP-2 event at an earlier time? It's really puzzling to me why it's taken so long for something like this to show up in normal shutdown.

DOCTOR THADANI: I think Tim can expand on this, but I believe unless you've got the right resolution on your instrumentation, if you get fairly -- you might have notching in reality, but you may not see it because of the instrumentation capability. As a result --

COMMISSIONER ROGERS: It's just integrated out or something?

DOCTOR THADANI: Yes, exactly.

MR. RUSSELL: It's also likely that even if you did see it, if you were to do a calibration afterwards the problem would not reveal itself. It's

a transient type of problem due to a loss of a level in the reference leg. So, you'd have to be looking carefully at the strip charts. There's a lot of noise on strip charts themselves and that's why we say it would take enhanced monitoring to detect this.

The issue did come up, in fact at the CRGR meeting, and Ed Jordan indicated that he intended to look into the reporting requirements associated with this to see what type of reporting would be required for this type of event.

COMMISSIONER ROGERS: Well, I think it should be pursued just to try to get a better understanding of how broad this is.

The other point is at the other end of the scale. How sure are we that there isn't any concern about 450 pounds pressure? This is where we've said, "Well, there's no concern above 450 pounds psi gauge pressure," and I'm not at all comfortable with that assurance in light of the other things that have happened when we never expected this to show up in a normal shutdown. So, it seems to me that looking at the 450 pound up situation, I don't think the Owners Group -- did the Owners Group do a study above 450 pounds?

MR. COLLINS: Yes. The testing that was

done at the EPRI facility was full-scale testing from 1,000 pounds is when the blowdowns occurred. Errors didn't show up until they were down to the range about 200 or 300 pounds and they were very small at that point. It wasn't until you got down pretty much below 100 pounds that you saw significant errors. The EPRI testing pretty much confirmed the hypothesis that there's not a problem above 450.

COMMISSIONER ROGERS: Well, if you feel comfortable on that. I'm uncomfortable about the situation for a totally different reason and that is I don't understand how this method of measuring water levels really satisfies our defense in depth philosophy with respect to diversity. Redundancy, yes, but diversity, not at all. You've got what looks like a very simple, conceptually simple way of measuring water levels, a little manometer system, and yet in the environment in which it's being used there are all kinds of possible complications.

I don't understand, frankly, why at a much earlier date we didn't insist that there be a totally different way of measuring water level in addition to this method. I don't buy the arguments that the report of the Owners Group made, and I'd like to hear what they have to say, that they have a diverse

system, because it's all based on the same physical principle. It's a very simple manometer idea and it clearly has the potential for serious errors due to out-gassing.

What we're doing here is beating away on this thing to try to make this simple system perfect, but I haven't heard anything about an alternative way of measuring water levels in these systems. I know this is what's built in and this is what everybody is using and we have to do what we're doing, but I personally would not like us to stop with that and be entirely satisfied that that's the only way you can measure water levels in a BWR. There's lots and lots of other physical phenomena and they should be employed here for instrumentation or could, in principle, be employed for instrumentation to measure water levels.

I know it's not easy in a BWR. It's not a trivial matter and that's why this one undoubtedly was selected in the first place and why everybody is behind it. But it clearly has the potential for our errors to creep in for a variety of reasons and I'm not very happy to say that this is the only system in a BWR that's being employed to measure water levels. They measure them at different places and so on and so

forth, but it's the same physical principle that's being employed here, simple manometer to measure water levels. To me, that's not very satisfying.

MR. TAYLOR: Commissioner, maybe the Owners Group could address that with GE. I understand the point. Your point is an entirely different methodology --

COMMISSIONER ROGERS: Yes.

MR. TAYLOR: -- which is potentially a longer range look at this subject.

MR. RUSSELL: We agreed on Thursday that this issue needed to be looked into. In fact, in a similar situation with the core make-up tanks on the passive designs, we're looking at strings of heated thermocouples along with manometers because of the importance of level to the blow-down sequence from the passive plants. So, this issue is not finished at this point in time. We agree.

COMMISSIONER ROGERS: Okay.

CHAIRMAN SELIN: Commissioner Curtiss?

DOCTOR THADANI: If I may also comment on that. Commissioner Rogers, you're quite right. I recall, and Tim might know more facts than I do, but after Three Mile Island accident there are a whole bunch of issues that were raised. One issue that was

raised was the desire to have reactor vessel level indication system, what was called RVLIS. Boiling Water Reactor Owners looked at a number of different ways that one could either measure or infer level. Certainly thermocouples, heated junction thermocouples was a way depending on how many strengths you have. The conclusion at that time was it's a backfit that was difficult to justify in view of the expense involved.

But your fundamental point, I think, is exactly right. At the outset, it would have been nice if one had considered other ways, particularly because level is so important in boiling water reactors, other ways of knowing what the level is.

COMMISSIONER ROGERS: I mean even if it didn't have the precision that this method has when it works, but is not subject to the possibility of enormous errors that this method has when it doesn't work would be a very important alternative, it seems to me.

DOCTOR THADANI: Yes. Yes, it would be. I agree.

CHAIRMAN SELIN: Commissioner, are you finished?

COMMISSIONER ROGERS: Yes.

CHAIRMAN SELIN: Commissioner Curtiss?

COMMISSIONER CURTISS: I just have a couple of specific questions.

In the advance paper that came up to the Commission on Friday, in the cover paper itself on page 2, roughly two-thirds of the way down the page, speaking here of the backfit question, the paper says that, "This bulletin requests the addressees to take action to achieve compliance with the existing regulations. Therefore, no new rulemaking is necessary."

In the bulletin itself on page 5, again about two-thirds of the way down the page, the following statement is contained therein. "The hardware modifications discussed here are the same as the modifications requested in GL-92-04 and therefore the modifications are not considered to be additional backfits beyond those required in that generic letter. The short-term compensatory actions requested by this bulletin are considered necessary to ensure that the addressees are in compliance with existing NRC rules and regulations."

Do I read this bulletin to draw a distinction between the short-term compensatory actions which you view to be compliance backfits and

the hardware modifications which you have characterized here as backfits, the analysis for which is in the earlier generic letter?

MR. RUSSELL: The issue is really one of mechanics. When we went to the CRGR we focused on what was being done in addition that CRGR had not reviewed previously, that was not already discussed and an action taken on. So, we were trying to carefully distinguish because the hardware modifications were already justified as a compliance backfit earlier. They both are indeed compliance backfits.

COMMISSIONER CURTISS: Okay.

MR. RUSSELL: What we focused on were the additional short-term actions which we were requesting be done in 15 days and the training to be done by July 30th.

COMMISSIONER CURTISS: Okay. It wasn't clear to me in that paragraph whether you viewed all these as compliance backfits.

MR. RUSSELL: If you combine this one with the earlier generic letter, they are all in fact compliance backfits.

COMMISSIONER CURTISS: Okay.

DOCTOR THADANI: Yes. That's the best --

COMMISSIONER CURTISS: Okay. You've spoken on a couple of occasions about the Millstone 1 fix. In fact, I had an opportunity a week ago this past Friday to visit Millstone and see that fix and discuss it in some detail with the licensee. Is it your view that the fix that has been adopted there and that you've described accurately I think in terms of the time that it took to institute the fix is in fact an approach that is generically applicable with some perhaps minor adjustment to all the BWRs?

DOCTOR THADANI: We see no reason why that couldn't be applied generically. There may be some things very unique we're not aware of. But we don't see why such an approach couldn't be utilized.

MR. TAYLOR: That's why we have that one paragraph that says, "If you don't take this action, you have to come in and explain," because there could be some plant-specific issues that we are not completely cognizant of.

Isn't that true?

DOCTOR THADANI: Yes.

MR. RUSSELL: I would point out that reference leg fill for these things has been around for a long time, particularly for hot reference legs where you were worried about flashing due to

depressurization. There it usually is filled from the top and allowing it to overflow. But it's been used for some time in different applications. In this case, flushing it from the bottom provides a longer flow path, slower flow rates. So, we believe that the Millstone type of solution, there may be some aspects that need to be looked at, the larger diameter lines, if you have one inch lines instead of the three-eights inch lines to reference legs. There may be some issues that need to be looked at, but in principle a flush from the bottom of the reference leg would eliminate the concern with respect to build-up of non-condensable gases.

COMMISSIONER CURTISS: Okay. That's all I have.

CHAIRMAN SELIN: Commissioner Remick?

COMMISSIONER REMICK: Ashok, why is it that there's -- you indicate that a small leak aggravates the amount of gas that occurs in the reference leg. Why is it that leaks occur, and since this is a part of the primary system?

DOCTOR THADANI: These are leaks that we're talking about are so small. We're talking about just drops an hour or something so small that even if you have leaks -- these are sometimes swage lock

fittings and so on. If you have such a tiny leak that -- even if you have a leak and you go back and look for it, it would have evaporated and you may not even see it. So, we're talking about these -- seepage is the term that we should use, not leaks.

COMMISSIONER REMICK: Yes. I didn't realize it took that small a leak to make --

DOCTOR THADANI: Yes.

MR. RUSSELL: In fact, if you think about these, all the DP cells basically have isolation valves, drain valves and an equalizing valve, typically a five valve arrangement. If the equalizing valve leaks past its seep, you'll have a small amount of flow. If the drain valves leak to atmosphere, you can have a small amount of flow to atmosphere or you could have packing gland leaks on them even though they're relatively tight. So, it does not take much leakage to get a period of time where you would have mass transport.

COMMISSIONER REMICK: Another question. The condensing pots appear to take an unusually long time to refill. Why is that? The size?

MR. RUSSELL: Basically sizing of the pots.

DOCTOR THADANI: Size.

COMMISSIONER REMICK: Size of the pots?

DOCTOR THADANI: Yes.

COMMISSIONER REMICK: Are they insulated or not?

MR. RUSSELL: No, they're uninsulated. Basically six inch in diameter pipe or so, maybe a foot to 18 inches long, exposed for condensation to occur to give you a refill and it would take on the order of an hour to two hours to refill.

COMMISSIONER REMICK: Another question. On your short-term actions of training operators by July 30th, you did mention that it could be classroom or simulator. In either case, with six shifts and presumably that they have to get it a little bit of thought even as classroom training, let alone coming up with simulator programs. Especially, I assume, that the simulators -- the level indicators are not modeled for this. Have you given thought about maybe they can't get all the crews through by July 30th? So, I assume that's before they go back on shift, training before they go on shift even if it's on July 30th?

MR. RUSSELL: We discussed that. Essentially what can be done by way of alerting or notifying is one thing and you could put that in

required reading or you could discuss some activities on a shift basis, put it in the night orders. But the thought is that there ought to be some time devoted in this upcoming training cycle to discussing it in more detail and getting feedback from operators. It's not clear that that cannot be accomplished. We expect them to feed back operating experience back into the training programs. Most are on a six week cycle if they're in six shifts or less and there is essentially a two month period of time where the operators could be trained. If they have not completed it by July 30th but they've completed it by that time for the shifts that are standing watch, that would be a reasonable alternative.

COMMISSIONER REMICK: That's what I was assuming, that before they actually stood shift.

DOCTOR THADANI: Right.

COMMISSIONER REMICK: Shift work, because that -- although it's eight weeks, with six week training cycle, it can be short, unless you're just talking, as you mentioned, about making them aware of it. But if you're talking about simulator exercises, it could be difficult perhaps.

DOCTOR THADANI: Yes, we realize the simulator might be tough.

COMMISSIONER REMICK: Yes.

CHAIRMAN SELIN: Commissioner?

COMMISSIONER de PLANQUE: Back to the modification that Millstone installed, has this been tested elsewhere? Are there any plans to test it elsewhere? Is there any possibility that there's a down side to this fix that we don't know about?

DOCTOR THADANI: By way of testing, Millstone -- actually you're required to do a certain amount of testing after modification is made. Millstone did go through that testing. We sent a team of people with all kinds of difficult questions to look at systems interactions, look to see what could happen if the system doesn't do what it's supposed to do, challenge it to see what problems there might be. We were satisfied.

I don't know of any plans that -- I haven't seen any plans on the part of the industry that says, "Here is where we're going to test the system." I don't know of any such.

Tim, do you?

COMMISSIONER de PLANQUE: But you would consider the testing done at Millstone sufficient to say there aren't any clear downsides to this?

DOCTOR THADANI: Yes, that's our view,

because, A, it seems to make sense that it would work. B, we challenged it in terms of our evaluation. C, Millstone -- Northeast came to that conclusion and they did go through a shutdown and they didn't see anything. I think it gives us reasonable confidence that it's a pretty good way to go.

COMMISSIONER de PLANQUE: I only ask this in the context of knowing how many operator years have gone into discovering the problem that we're trying to fix.

MR. RUSSELL: Let me point out that reference leg fill for level detection has been around for a long time with hot reference legs to take care of flashing. Sometimes it's on continuously, other times it's on demand. I don't think that's the issue so much. There are some potential downsides. For example, if you do it with a valve and the valve could fail open and you've got more flow than you anticipated, that could raise a question regarding potentially colder water being in the reference leg, changing your calibration. That would potentially cause you to have a conservative indication level that is higher than indicated rather than the other way around.

There are also some questions with nozzle,

of the penetrations themselves and cold water going through the penetrations. I think there are also some questions with the proposed venting design. If you vented to a steam line and it acts like a ventury with flow going past it, what is actually going on? Do you know enough about that design to be able to say that that's going to work? What about gases flowing up? That's what you want, to vent the gases off. If the line is going to condense and you have water flowing down, you could get a manometer or a blockage in that line and the vent wouldn't work and you still have the problem.

So, there are some issues with some of the other proposed solutions as well. We think that the reference leg fill approach or flushing will work and it needs to be implemented carefully. But we don't see any downsides to it at this point.

DOCTOR THADANI: I think that's the key point, that we did look and asked ourselves a number of such questions, what if and so on, and convince ourselves that it was an appropriate way to go. I have not seen -- I would have thought I would have seen a very thorough study. I have not seen a thorough study by the owners which would really evaluate each modification and come to grips with why

one is preferred over another. Our judgment was we have looked at one approach, asked a lot of questions, what if type questions, and convince ourselves that that would work, that approach would work. I understand some of our approaches used in perhaps Navy reactors and so on, but I don't know any details.

COMMISSIONER de PLANQUE: And if a plant wanted to try another fix, what would you require?

DOCTOR THADANI: We would again go through the same approach of making sure that they have looked at potential downsides and that they are not significant.

MR. RUSSELL: We have not specified the Millstone fix as the fix to be implemented. We believe whether they take a venting approach or something like the Millstone approach, that that can be done pursuant to 50.59. We have asked for a description of the fix they propose to implement such that if they propose something that looks to us to be not fully thought out, we can't follow-up with that through our inspection activities and intercede if necessary. But we have not specified a particular fix.

COMMISSIONER de PLANQUE: Okay. Thank you.

CHAIRMAN SELIN: I don't see myself any reason to wait until July 30th. It seems to me that listening to your arguments that the most -- the least conservative approach that could be justified is anybody who is in cold shutdown from today on should be required to make the fix. That's my personal view listening to your discussion. There are always reasons for not acting, but if we're fooled twice, there's nobody else to blame. That's the way I feel about that.

There was a quote in the paper from the Pilgrim Boston Edison public affairs person saying, "If the NRC orders us to fix it, of course we'll fix it, but otherwise we'll just keep studying the topic."

DOCTOR THADANI: I saw that too.

CHAIRMAN SELIN: Commissioners, do you have any other questions?

Thank you very much.

Mr. Beck or whoever is the leader of the next group? You look a little like a congressional committee. You must have enough subcommittees so everybody is the chairman of something.

We're very interested in your views on what's to be gained by not going ahead and ordering these fixes to be made in addition to any of the other

points that are raised that you may wish to respond to or to counter. We'll try to keep it to 30 minutes plus the Commission's questions, but this is clearly a very important topic and we need to take the time that it takes to get at these issues.

So, Mr. Beckham, the floor is yours.

MR. BECKHAM: Thank you, Chairman.

I'll be very brief on my introductions. Let me just introduce the people I have with me just quickly. I have Jim Booker, Vice Chairman, EOC, Stanley McBruney, a member of the EOC, Cynthia Tully, the Chairperson of the BWR Owners Group, and George Beck.

CHAIRMAN SELIN: Would you also identify your other affiliations as appropriate, please?

MR. BECKHAM: All right. I'm with Georgia Power Company.

MR. BECK: Philadelphia Electric Company.

MS. TULLY: Southern Nuclear.

MR. BOOKER: Gulf States Utilities.

MR. McBRUNEY: Public Service Electric and Gas Company.

CHAIRMAN SELIN: Thank you.

MR. BECKHAM: Today we want to tell you what we see is the concern for water level and the

inaccuracies and I think tremendously we agree pretty much with what we've heard. What we've seen is the importance of the issue and our assessment of it. What we've done and why we think we've had somewhat of an aggressive program, although there may be some disagreement in this area, but what we've done. We also want to tell you what we found out and what we've recommended and what we think about the implementation plan.

Of course, the bulletin just came out. We've looked it over and I think the bottom line is we don't see much problem except on the implementation and that's been a big discussion of what we've just heard. So, we would just like to tell you where we are and what we've tried to do and hopefully go away so that we end up with the right fix, properly done at the right time so that we get the problem behind us and fixed correctly. That's what I want done.

With that, I'm going to turn it over to George Beck and let him go into the details.

CHAIRMAN SELIN: Thank you.

MR. BECK: (Slide) Okay. Can we have slide 4, please?

As a quick review, we sketched out the reference legs and the concern of non-condensables

finding their way down the reference leg. I think that's pretty straightforward.

(Slide) A quick review of the background on slide 5. In the 1980s, in response to Generic Letter 84-23, a number of plants installed cold legs in various configurations and combinations, in some cases with the old Yarway hot reference legs. In essence there's an array of configurations out there in the industry. Some of the discussion earlier indicated as far as two and four and so forth. There's also a combination of cold legs in combination with Yarway reference legs.

Mid-1992 the concern about rapid depressurization was raised and we have been addressing that.

In '93, the non-condensable gas released during slow depressurization became evident and we have been addressing that. In both cases we have reviewed the safety significance of the concern and provided reports on what we believe is the safety significance. We've also conducted a conservative full-scale testing program on de-gassing and that test program is designed primarily to provide validation for a mathematical model. Not just test results per se, but input to a mathematical model to allow better

understanding and prediction.

We do recognize from the results we have, although they're not fully digested and not into the final form, that most plants will have to provide some kind of modifications, that the error levels are significant enough that we need to address them. We do believe that the modifications do need to be significantly engineered and we're about to do that.

(Slide) As far as the safety significance assessment, slide 6, as I mentioned in rapid depressurization issue came to light in mid-'92 with the activation of the regulatory response group at the request of the Commission staff. The de-gassing impact above 450, I think you heard the very correct answer there as far as the test results do validate that above 450 we do not see any significant results from de-gassing. So, the test results do very much confirm that initial 450 pound assessment. In fact, that is a relatively conservative -- it is a very conservative number.

COMMISSIONER ROGERS: How many times were those runs made? How many times were they depressurized from a high level and see nothing?

MR. BECK: Probably on the order of 60. At different configurations and different

depressurization rates, we used a LOCA depressurization rate and a more normal depressurization rate. So, we have a significant number of runs and did sufficient testing initially to determine that it could be repeated, that the test results were very repeatable. With a given concentration and a given blow-down rate, we saw the same results repeatedly. So, we have high confidence in the results we have.

As mentioned previously, the rapid depressurization event is a low probability event. There are diverse systems for indication of a rapid depressurization, high drywell pressure.

Moving to slow depressurization, which came to light --

CHAIRMAN SELIN: But your statement -- Commissioner Remick?

COMMISSIONER REMICK: The last bullet under rapid depressurization, could you elaborate on that, not all plants rely on this type of instrument?

MR. BECK: I'll get into that in a few slides.

COMMISSIONER REMICK: Okay. Fine.

MR. BECK: I have another slide that addresses that straight on.

CHAIRMAN SELIN: But you said something different from what your document says. I mean this suggests that in most plants there is reliance on this type of instrumentation. Your verbal statement more suggested that this is only one of several avenues to determining pressure level.

MR. BECK: High drywell pressure is also another initiating for high pressure injection systems.

CHAIRMAN SELIN: Oh, initiation, but not --

MR. BECK: Yes, initiation signal --

CHAIRMAN SELIN: -- after loss of pressure. Okay.

MR. BECK: At the rapid depressurization --

COMMISSIONER ROGERS: But not water level.

MR. BECK: Not water level per se, no. I'm sorry. For the high pressure concern, we do have the diversity, if you will, in the high drywell pressure. In the slow depressurization issue that came to light from the WNP-2 observations, we provided a safety-significant assessment of that and we believe that adequate time and water level indications exist.

(Slide) Basically there have been -- and

it shows up more clearly on the next slide -- no observed problems during mode 3 operation. But we do believe that the operator guidance that we've issued, and we've issued several times, heightens the awareness of the operators to the concern.

(Slide) The next slide, which may not be in your packet of information, we did bring the slow depressurization -- used very conservative assumptions in assessing that situation.

CHAIRMAN SELIN: You're throwing us off. You have a chart that's got the same title as our charts, but doesn't seem to have the same --

MR. BECK: It should be 32 up there.

MS. TULLY: We have not -- unfortunately we couldn't make copies of the backup slides.

MR. BECK: I'm using a couple of additional slides.

CHAIRMAN SELIN: Okay.

MS. TULLY: This is a backup slide.

MR. BECK: Yes, we will provide that to you. I'm sorry.

We did use conservative assumptions in that analysis, identical errors in multiple redundant channels, that many variables must be identical. We've also, as I mentioned in the previous, have seen

during mode 3 operation, which is a several hour window from reactor pressure 150 down to about zero, we have not seen any drain-down events. During the 6500 or 6400 shutdowns, that's not been observed. We have, however, seen some number of events during cold shutdown modes 4 and 5. By that point you're out of the concern because you're not maneuvering pressure any further.

Some additional pieces that were not included, it was mentioned some plants have interlocks. Those are supplemented in many other plants with lifted leads on valves to prevent inadvertent operation during that mode.

Also the operator guidance, we've sent two formal communications to sensitive the operators as well as discussions with the various emergency procedure committee members to heighten awareness. The operator will see notches before he swaps over. It won't be a sudden surprise of one large error. There is sufficient information to suggest that he will see some perturbations before he sees a large error.

CHAIRMAN SELIN: Mr. Russell's comments sort of suggested that there might be notches there, but given all the noise, et cetera, you shouldn't be

as confident as you suggest, that the operator will see the notches. Do you disagree with that or did I misunderstand him?

MR. BECK: I think it's probably a matter of when you begin to notice them. If they are significant, more than six inches, eight inches, some small numbers like that, the operators would be able to see them. I think that's borne out by the WNP-2 operators' reaction to what they saw in January. They did switch channels to check on what was going on. So, I don't want to get into a semantics debate, but I think it is observable. Now, there is some amount of noise. It does require you to be sensitive to what you're looking at. So, it's not immediately obvious. It does require somebody to be knowledgeable and be concentrating on what he's doing.

Also, the existing emergency procedures provide the proper guidance. The operator does have time react. We believe that on balance that the safety significance is low for that postulated concern.

(Slide) As far as the Owners Group -- slide 7. As far as the Owners Group program itself is concerned, we provided safety assessment back early on when the concern was focused on high pressure, rapid

depressurization, and we've provided essentially the same review when the low pressure issues came to light. We've investigated the phenomenon with what we've referred to as benchtop testing, basically simply conceptual testing to verify what was going on so that our large scale testing could be further developed and more accurate, and we've done conservative full-scale reference leg depressurization testing. The results of that should be completed in the final report form sometime mid-June.

As I said, the intent of that testing is to provide the information to -- input into the mathematical model. It is not -- in most cases the reference leg geometry that was modeled or that was replicated in EPRI's facility in Charlotte was a simplified geometry, so that we could learn from that and we modified the geometries to have different combinations of vertical and horizontal legs and different combinations of slope.

COMMISSIONER ROGERS: I wonder if you could describe just very roughly what the features of this mathematical model are that you're talking about?

MR. BECK: I'll attempt, but I'm not a mathematical modeler.

COMMISSIONER ROGERS: Physics will do

fine.

MR. BECK: Even that. It recognizes the difference in geometries. It looks at bubble velocity and depressurization rate, bubble size, growth, nucleation sites, all that factored in, and with it the data observed during the testing, that is in essence what factors into the mathematical model. That's not a very in-depth discussion.

COMMISSIONER ROGERS: It doesn't give much of a nice warm feeling to understand what the basic approach is in setting that model up. Where did it come from?

MR. BECK: It's basic fundamental physics from --

COMMISSIONER ROGERS: Well, I know everything is basic fundamental physics. Somebody has to put it together to make a model. A model isn't physics. A model uses physics. Now, what does the model contain? That's what I'm asking. Where did it come from?

MR. BECK: It was developed for this effort --

COMMISSIONER ROGERS: By?

MR. BECK: By Continuum Dynamics, Incorporated, a subcontractor, looking at bubble rise

velocity, diameter of pipes. We found that to be a significant input. So, that's a piece of one of the inputs. Bubble size, depressurization rate. We found a time dependency in depressurization rate affects the bubble out gassing timing -- I'm sorry. The depressurization rate and the initial pressure have an effect on how fast the gasses come out of solution.

MS. TULLY: And it should also be emphasized that when we put this model together we put it together with the intent of validating that via the test program. Of the 13 configurations that we ran in the test program, 12 of them were specifically constructed to validate the model. That is the reason that we used a number of very conservative arrangements, purely in order to validate the model. It should be noted upon review of the test results, that it's very possible that due to a number of conservatisms in the test results, as well as conservatisms in the model, we don't know yet, we haven't finished this validation process, but it may end up that this model is very, very conservative and therefore doesn't end up being perhaps as useful an engineering tool as we would like to have. But I have to emphasize that we haven't completed that yet, so we really don't know how we're going to be able to use

this model. But it's a combination of first principles as well as the data from the test program itself.

COMMISSIONER ROGERS: Well, what would you expect to use the model for? What's the purpose of the model?

MS. TULLY: Our initial intent was the hope that, as George noted, each plant would be able to input its own plant-specific geometry once the model had been validated and be able to draw some conclusions then about the plants, about possible effects of non-condensables at that plant and that would assist in the plant's decision as to whether to mod or how to mod.

Right now, we don't know how useful that model will be because of how conservative, and I believe George could probably note there are a number of conservatisms in the test data. So, I don't know how useful it will be and honestly I don't know how they'll be able to use it right now, and I can't answer for individual utilities how they may want to use it.

MR. BECK: But the basic intent was to develop a predictive model that you could put in plant-specific geometry. One of the reviews that was

made as input to this, to the model and to the work that was done at Charlotte, was a review of all the plant-specific geometry from all the various plants, so that we enveloped those plants.

COMMISSIONER ROGERS: Okay.

MR. BECK: (Slide) Slide number 8.

Although the results and the analysis is not finalized, we have recognized that the significant expectation that errors above the half -- six inch screening criteria that we used, that we will see errors above that. We gained technical understanding of the phenomena, including some significant counterintuitive insights and I'll go into some of them in a moment. We also recognized that there is a gas concentration of about 250 parts per million by volume. There's a threshold there below which you just do not see any effect of non-condensable gases. Also, we believe that some plant-unique configurations may result in acceptably small errors. So, our bottom line conclusion at this point is that modifications are indicated for most plants.

CHAIRMAN SELIN: Before you go on, I don't propose to speak for Commissioner Rogers, but based on his question and my question and your conclusion, I hope there's no misunderstanding about this, that the

burden of proof is on the individual utility to show that they don't have the problem. It is enough evidence of this situation that if they're going to try to use the model, let's say in our situation, it can't arise. The model is going to have to be well understood, well proved and well demonstrated in the particular configuration. I assume that the last line on your slide indicates you agree with this statement.

MR. BECK: We recognize that and the approach to the modeling was conservative.

CHAIRMAN SELIN: But the going in hypothesis is there's got to be a fix unless somebody makes a pretty good case that the problem --

MR. BECK: Understand.

CHAIRMAN SELIN: -- can't or won't arise in that specific facility.

MR. BECK: We understand that.

Some of what we learned from the testing is that the gas evolution process is not as simple as we first thought last year, that the simplistic bounding analysis, while it was accurate for determining the 450 pound number, still turned out to be more complicated than initially thought. Most of the degas test results do show errors much smaller than the 37 foot error that was postulated last July.

So, although we recognize modifications are required, there are some encouraging aspects of the test results as far as the relatively small magnitude of the errors.

As I mentioned, we recognize the threshold below which no errors are seen. There is a time dependency of gas evolution depending on the gas concentration, which is something that we had not recognized initially. And some plant-unique features may result in small errors. So, that's to the point of the geometry possibly being satisfactory.

As I mentioned before, plants do have different combinations of both Yarways and cold legs. So, there's a vast array of combinations and permutations out there. While we show typical in sketches and so forth, each plant is relatively unique in its configuration of geometry and valving and so forth.

We do believe that all condensing chambers and reference legs have some amount of gas, but that we have not quantified that concentration. We simply do not have that information at this point.

Non-condensable gas effects were not specifically addressed in the original design. The previous condensing chamber test that we had proposed

initially and did not implement yet would not have supported the program. We did recognize out of the test work that we did do the test, the condensing chamber test effort that we almost embarked on would not have produced any significant useful results to us. We've also recognized that the absence of visible leakage does not equal a tight system to the point of how much leakage or seepage --

CHAIRMAN SELIN: Can I go back to one of your points about the non-condensable gases not having been properly taken account of -- sorry about that -- in the original design? Is GE an active part of this test program? Do they have test information, design information that's helpful to you in trying to decide what the situation is and where to go?

MR. BECK: GE is actively supporting the Owners Group program. So, it's a team effort.

CHAIRMAN SELIN: Do they have models or experimental information from their own design efforts or their own experiences --

MR. BECK: No. No. The gas concentration --

CHAIRMAN SELIN: Even at this point, 20 years after the first reactor?

MR. BECK: That's correct. That's

correct. We've been unable to identify any valid information. We have pursued that. We've found some data from some Swedish experimentation done or Swedish sampling done about ten years or so ago and that is not really useful to us. So, it's a combination of testing and calculations.

CHAIRMAN SELIN: The Swedish work was done on A-Betong -- on their own reactors?

MR. BECK: It was done on one of the plants. I forget where.

CHAIRMAN SELIN: Yes.

MR. BECK: But we have had access to that information sufficient to determine that it wasn't useful to us.

MS. TULLY: I should be noted that we did a rather wide search before we embarked on this test program to gain any knowledge and we really feel that the data that we produced may be somewhat first of a kind in this area.

MR. BECK: One of the -- several of the counterintuitive observations are that half inch tubing or smaller will trap the gas bubble in the vertical section, causing the indicated error to be significantly greater than that predicted from the mass loss. So, that was something that we observed

that we did not expect to observe. Also, smaller diameter vertical piping yields greater transient errors, which is something we did not expect.

As far as modification concepts are concerned, we're looking at essentially three modifications. The reference leg backfill, which was discussed, condensing chamber vent, vent that to the main steam line or to the variable leg of a Yarway or possibly a negative slope so that the condensing chamber in essence is right at the vessel wall, and the core range monitor which basically would substitute the reference leg of the lower fuel zone connected to the variable leg so that when the water level drops you now have uncovered a new reference leg.

We believe that the modifications must be well conceived and sufficiently engineered and to the point that two previously considered viable modifications are recognized as not viable at this point, those are the post-accident backfill and larger condensing chambers. We recognize now that while we once thought we could do them and resolve the problem, that that would not be of use to us now.

(Slide) Some of the concerns on slide 10 associated with the reference leg backfill

modifications, the evaluation for use on safety-related trip systems, we're very concerned with challenges to the plant and economic risk of shutdown if we do trip off the plant, as well as the safety challenges to the plant, possible injections or initiations of unwanted systems or unneeded systems at that point, verification of flow rate, that it's adequate to prevent convective mixing, the interface between safety and non-safety systems, the introduction of thermal stress to the nozzle and the effect that the instrument would have on operational requirements, tech specs and so forth.

(Slide) The next slide --

COMMISSIONER CURTISS: Could I ask you, are these all questions that came up in the context of the Millstone fix and that were evaluated at that point?

MR. BECK: I'm sorry, I didn't hear the question.

COMMISSIONER CURTISS: Were these all issues that came up and were evaluated in the context of the Millstone fix?

MR. BECK: These are -- let me go to the next slide and I think that will serve to answer several of the questions.

A tabulation of the comparison of what we're calling cold leg plants and hot leg plants. As I mentioned, some plants maintained their Yarways for safety functions and that's what we're referring to here as a hot leg plant, those plants that maintained the Yarways for safety functions and used the cold reference leg instrumentation for post-accident only.

The applicable concerns, if you will, associated with the hot leg plants are greatly reduced. The only thing you're concerned about for the hot leg plant is the fuel zone range instrumentation. The narrow range, wide range instruments come off of the cold leg, so injection into the bottom of the hot leg plants doesn't matter. They're using the Yarway for that service. ECCS and RPS initiation come off of the hot leg, so that you don't perturbate it with injection into the cold leg.

CHAIRMAN SELIN: Mr. Beck, what are we supposed to conclude from this chart? I'm sorry. The argument has gotten a little bit too arcane, too complicated.

MR. BECK: That there are significant differences in injecting into plants that have the Yarway column and take their safety functions off of the Yarway column.

CHAIRMAN SELIN: They have both the Yarway and the cold --

MR. BECK: They have the Yarway and the cold leg, but they use the Yarway for their safety initiation systems. So that the concerns that they have, if they perturbate that instrument because of injection, is non-consequential because their safety initiations come off a different instrument.

CHAIRMAN SELIN: So, if they have the Yarway instrumentation, what are you saying, there isn't a problem or there's a different fix or --

MR. BECK: The Yarway instrumentation is what they use for their high pressure and their normal operation. So, by introducing concerns in the cold leg that they don't use for ECCS actuations, they aren't taking that risk of perturbating instrumentation. Whereas plants with cold leg only would be --

CHAIRMAN SELIN: Are you arguing that plants that have a Yarway instrumentation scheme do not need a fix?

MR. BECK: No, that the fix on their cold legs is much easier for them to evaluate because they're not -- they don't have the concerns that the rest of us are exposed to, that those with cold legs

only are exposed to.

CHAIRMAN SELIN: And what's the -- I'm really trying to understand the point you're making rather than just saying, "Isn't that nice," and go ahead. So, please figure me for going into this. But what should I conclude, that it's easier to fix the plants --

MR. BECK: It is easier to inject and backfill into plants with Yarway instrumentation, that take their safety systems off of the Yarway instrumentation because you're dealing with a different set of instruments.

CHAIRMAN SELIN: Are you therefore --

MR. BECK: So you aren't upsetting the ones of concern.

CHAIRMAN SELIN: Okay. Are you concluding that therefore for plants that include the Yarway as well as the cold reference leg once you go ahead with the mods immediately and not be troubled by these other concerns?

MR. BECK: We're concluding that those plants that have their ACCS initiation off of the cold legs have significantly more concerns than those plants that have Yarways.

CHAIRMAN SELIN: Okay. Let me put it

bluntly. So what? Do you have a different course of action for the two kinds of plants?

MR. BECK: I think the "so what" is that they're at much greater risk and need to evaluate perturbations of the instrumentation.

CHAIRMAN SELIN: In the plants that don't have the Yarway?

MR. BECK: In the plants that do not have the Yarways.

CHAIRMAN SELIN: And what would you do about the plants that do have the Yarway? What does the Owners Group recommend as the proper course of action?

MR. BECK: In those cases the backfill modification would be much easier to review and much easier to implement.

CHAIRMAN SELIN: And therefore it should go ahead quickly --

MR. BECK: Much less in the way of concerns.

CHAIRMAN SELIN: How many plants are we talking about?

MR. BECK: A handful.

CHAIRMAN SELIN: Most rely completely on the cold leg?

MR. BECK: Most of them -- and they all have different combinations. Some that maintained their Yarways also then moved their ECCS instrumentation to the cold legs. So, it's a vast array of combinations.

MS. TULLY: The bottom line message upon our close look at it is due to the number of different types of instrumentation that's out there, the varieties between whether you have your ECCS off of Yarways or off of cold legs, and the potential downsides, potential, of the Millstone-type mod if you're taking ECCS initiation off of a cold leg leads us to conclude that while the Millstone mod may be right for a fair number of plants, it may not be the optimum fix for other plants.

CHAIRMAN SELIN: The staff didn't conclude that. They said they have an existence theory. There's at least one known mod. There apparently are others. In effect they're saying the situation is complicated but rather than just throw up their hands and say it's complicated, they're saying, "Let's go to the owners and say, 'You have by such and such a date to fix this,'" and it's up to you to, A, fix it, and B, convince us that you're fixing it correctly.

MS. TULLY: We understand that.

CHAIRMAN SELIN: Now, what's your reaction to that? I really am trying to understand whether you're saying, "We appreciate the flexibility," or you're saying, "It's too confusing, we can't do anything for awhile," or someplace between the two.

MS. TULLY: We are not saying it's too confusing. What we are saying is there may be a couple of other mods which -- like the vent mod, that may be a better fix for some plants. The time that we are asking for is merely the amount of time to assure that either the backfill mod or the vent mod is appropriately designed such that we fix this program once and for all.

CHAIRMAN SELIN: It's a plant by plant conclusion or do you believe there's a dominant solution?

MS. TULLY: Do I believe -- I'm sorry, I didn't understand the question.

CHAIRMAN SELIN: The best mod, is that different for different plants or do you believe that a little more research --

MS. TULLY: I believe that's different for different plants.

CHAIRMAN SELIN: So, we have 30 some plants out there. How long would it take if each of

the plants went ahead and said, "What's the best solution to my problem?" How long would it take them to figure that out? I'm trying to understand the point you're making. If you'd like to me to sort of hold off on the questions and go through the presentation, I'll be glad to.

MR. BECK: No. I was essentially complete on the presentation and obviously I didn't --

CHAIRMAN SELIN: I don't understand the conclusion you draw --

MR. BECK: -- make the point I was trying to make.

CHAIRMAN SELIN: -- other than that you'd like some more time and that's what I'm trying to get at.

MR. BECK: The basic conclusion that we have drawn is that for a family of plants that have cold legs only there is a significant number of issues and concerns that need to be more thoroughly addressed than were addressed previously.

COMMISSIONER de PLANQUE: How would you plan to address those?

MR. BECK: We have currently under consideration some additional test work using the full-scale mock-up to actually determine backflow rate

and some of that sort of thing and determine what perturbations we could introduce to the instrumentation.

CHAIRMAN SELIN: I think it's only fair to you to tell you at least my own state of mind and see if you can address it directly. You've made a pretty convincing argument that that course of action isn't going to get you from here to there because there are so many differences from plant to plant and that these differences have to be taken into account. Maybe I misunderstood your argument, but at least in my mind you have to convince me that a generic course of action when there are so many differences from plant to plant is, in fact, a fruitful way to figure out what's the right set of mods as opposed to taking each plant and just figuring it out on a plant-specific basis. So, that's the thought at this point that I have in my mind and perhaps you want to address that or not.

MR. BECK: We believe that some additional work regarding backflow, for example, we could determine appropriate backflow rates and determine what, if any, convective influences we need to offset. It would be done in a bounding approach.

MR. BECKHAM: Mr. Chairman, if I might

comment, I think we've got you kind of going around here. I think the point was that there are different plants out there that proper engineering ought to be done and I don't think that anybody's really arguing about that and it ought to be done in an expeditious manner and get it done.

I think probably the best way is to let Mr. McBruney kind of pull this together because I think what he says -- we're just going around in circles there and maybe we can give you a better feeling of what the Owners Group is saying.

CHAIRMAN SELIN: Proposing to do?

MR. BECKHAM: Yes, sir.

MR. McBRUNEY: George, if I could just maybe summarize in conclusion as to where we've been in this presentation. First and foremost, our approach has been one that has focused on plant safety. As Mr. Russell brought up this morning, it becomes difficult when you have a questioning of instrumentation on the part of our operators with sincere concerns on the part of operators. We share that and want to keep them well informed, as we have through the recommendations of the Owners Group in a timely manner. I've done some work in simulations and provided them with a full awareness in the midst of

transient what types of things to look for to validate whether this is an issue or not.

Importantly, we have, in our reviews, taken a look at the general design criteria. We feel that even under these concerns those design criteria have been met. We talked about the redundancy that's available in the design.

Commissioner Rogers, with all due respect, the diversity piece there was not uniquely through a different methodology to measure a water level, but as George brought up, that the diversity and actuation of ECCS equipment through initiation via containment pressure was the key point for the diversity there.

Then the piece on operator action that together in our communications with the NRC staff we have moved forward to assure that every licensed operator has clear understanding of the issues at hand here.

There's been a lot of discussion about the Owners Groups' program itself, has it been responsive to the needs. I as a member of the Executive Oversight Committee for the Owners Group know that with due diligence that the group of people working on this activity, as well as the executives of all the utilities, have with much ernest been very, very

interested in moving this forward to conclusion. I'll admit that we took a very grand approach to best understand the methodologies that bring us to this concern in the first place, to really understand it so that we would do the right thing. Clearly, we have a real level of confidence that we share with the staff relative to the immediacy or the urgency of the safety implications. There's a high level of confidence where we stand today. But all in all when I look over the agenda of activities that have transpired over the last ten months, there's been a lot of dedicated effort on the NRC's part and by the utilities, particularly the Owners Group.

As a matter of fact, George, I don't know if we made copies to provide the Commissioners with, I guess the litany of the meetings that we've had month after month within ourselves, at the executive level, at the working level, with our contractors, with General Electric and with the NRC staff, all in the sincerity of keeping one another informed as to exactly where we stand. So, we're moving down the solution path together. There's no form of trickery here or trying to deceive anybody, but with much ernest to bring this to closure and to be very open in our communications about that.

We do recognize that this is a real problem. It must be resolved. You've heard from your staff and you're hearing from the Owners Group in the industry that we, with much ernest, want to bring this to closure and recognize and clearly out of the Owners Group recommend that hardware fixes are in order, and we concur on that.

The piece that George was trying to convey is that in our work we've gotten it down to about a couple of alternatives. One is a Millstone type fix and it was our plans and as a matter of fact we have a funding request out right now to investigate each of those alternatives, talk about flow rates, so we can intelligently measure the impact on nozzles on the vessel and putting cooler water in through the taps. And certainly we want to develop a sensitivity for that instrumentation so that we're not having false starts of ECCS equipments and challenging the plant and the operators particularly in cases where we don't have Yarway type systems and the backfilled systems are the systems not only for indication but for actuation of safeguards equipment. That's why we feel with due diligence this needs to be continued with, to assure we fully understand what the balanced pros and cons are and moving forward with a well-engineered fix

in a timely fashion.

So, the way we see it from the industry standpoint, it's clear we must move forward and take corrective actions. It's a matter of how much engineering time is enough to assure ourselves that we've measured all the downside risks and the upside potentials that we have, that we're going to be spending money and taking the time. The hardship here, when you look at the emergency bulletin that's been released, is that here after ten months or almost a year now that without having us taking the time to do a full evaluation over the next few months of the options that we see are reasonable for the utilities to take, that we're going to be forced into making some arbitrary decisions and not doing it with sufficient defense in depth to understand the results of what backflow would be or what venting to the main steam line could be. But we'd be making it with a level of intelligence that would satisfy operator as well as regulator needs. I think that's what's most important to us.

With that, we feel that from the precedents that we have seen and what it takes to do a well-engineered job based on all the facts that are required and the testing would help us with those

facts, that we'd be in a position to ask the NRC to perhaps reconsider that emergency bulletin and not in a punitive way challenge plants that are going to go to cold shutdown here post-July 30th, most of which have no design in hand. Certainly conceptually there's been things talked about, but not engineered. There are concerns with the availability of valves or ability to -- you know, the valves to adjust the flows for a backfill mod. There's concern about fittings and piping and so on to do the job right and to make sure it's well engineered.

So, that's where we are as an industry and would really like to see some -- at this point, now that the emergency bulletin is out, some reconsideration after we've gone down this path over the last almost 12 months to say that we need time to do a solid engineering job, to complete the tests for the specific types of modifications that are in order, and implement during certainly a refueling outage, ideally a refueling outage after the design is well engineered and going into this, we felt that would be post-June of 1994. I realize that's a long time from now, but in the balance of things we feel that to engineer properly and get the material delivered so that we can install these modifications, that that is

not unreasonable.

CHAIRMAN SELIN: Mr. Beckham, shall we go on with the questions at this point?

MR. BECKHAM: Yes, sir.

CHAIRMAN SELIN: Commissioner Rogers?

COMMISSIONER ROGERS: Well, I assume that what you're talking about is just the engineering aspects and implementation, not the reactor operator training and --

MR. McBRUNEY: Oh, no. That is correct, sir.

COMMISSIONER ROGERS: That has to proceed as rapidly as possible.

MR. McBRUNEY: By all means.

COMMISSIONER ROGERS: Well, what you're saying sounds very reasonable, but I'll tell you I'm not so comfortable about the fundamental understanding of the whole phenomena here that has to be dealt with. I have an uncomfortable feeling that this model that we've heard about -- I don't understand the model. I haven't seen it. I don't know to what extent it's been argued about within the scientific community, but I know that out-gassing and bubble formation and things of this sort can be very complicated phenomena and you're talking about not only the basic phenomena

itself but the geometry, the geometrical effects which are always difficult to take into account in a theoretical calculation, bounded problems, bounded geometry.

I'm not surprised by the things that surprised you, by the way. When I saw your slides there about the bubble attachment to the wall for small pipes and so on and so forth, that didn't surprise me at all frankly. But I think these things are very complicated to understand from a purely scientific point of view. Now, there isn't going to be time to do fundamental research that hasn't been done over the years in this kind of thing. So, some very reasonable approach has to be taken here and I don't know how much time is reasonable to give the community, but I'd certainly like to see that the fix which you finally come up with has really been subjected to some pretty strong outside criticism by experts in phenomena that we're talking about here. I don't know that that's been done. Maybe it has. I'd appreciate hearing exactly what the peer review process has been for the process that you have employed to generate the model and use the model in making a decision here. I think that's very important.

So, I'm not too comfortable with either rushing ahead or delaying forever because there isn't an adequate scientific basis. It's going to be difficult to deal with this in a reasonable time frame, but I think we have the feeling there is a degree of urgency here. I'm most concerned that some of these things are showing up that must have been around for a long time. You're the owners. You have the responsibility as far as the relationship to NRC is concerned, but you didn't design those plants. You didn't design that instrumentation. Somebody else did and I think they have to stand up for it as well. You're trying to find a reasonable solution.

All I'm saying is that I'm somewhat skeptical from a scientific basis about how deep your knowledge can be of these fundamental phenomena, but that doesn't mean that you can't find a workable solution on pragmatic grounds. That's why I'm a little concerned about this so-called model and what it includes and what you want to use it for because I think that might be somewhat questionable. I don't know.

But I'm convinced that you must proceed immediately with your training of reactor operators to deal with these possible situations. I'm

uncomfortable with the kind of diversity of plants and situations that you've sketched out here and how much time is reasonable to give anybody to deal with those. Maybe some of them can proceed ahead much more rapidly. I'm a little uncomfortable here with a totally generic approach here when you're making the argument that there are a number of diverse designs and situations that have to be dealt with. Maybe we should not try to do this as an across-the-board generic approach. Maybe we have to look to each of you individually to come forward on a reasonable time scale and make a case for that. I don't know. I'm willing to think about that.

CHAIRMAN SELIN: Commissioner Curtiss? Oh, I'm sorry. Excuse me.

MR. McBRUNEY: Just in a brief response, and help me, George. The large scale testing that we've done was really -- went a long way to validate what we have seen taking place and I think we're better for it and we have a firmer understanding of what's taken place. Certainly the sensitivities that George has reviewed are clear at this point.

The testing that we were planning to move forward on was to better understand the uniqueness of a couple of options that we see and the Millstone

option is one of them, but better to understand how much -- like George pointed out, how much flow, what the impact is on nozzle degradation, if any, or what the sensitivities may be relative to false starts or some of the ECCS equipment because of the configurations that we are currently designed to.

From that standpoint, that's about as generic as those test results would permit us to go, but at least those utilities moving forward with a design of that nature in backfill would be doing it with his eyes a lot wider open than they are today. That's really the only point.

I think in the Millstone case, I think they're using what, .4, .5 gpm? On the backfill.

MR. BECK: Yes.

MR. McBRUNEY: Right? And sitting here, I couldn't tell you what the adverse impacts of that are to nozzles on the vessel. I don't know. Neither does anyone else today and I don't think that's -- that doesn't give me necessarily a warm feeling.

MR. BECK: I guess, if I could, to address your concern or question about the peer review, we did employ a peer review throughout this process. So, maybe my description was less than adequate and I apologize for that. But we did employ a peer review

by Sol Levi to review all of the aspects of the test program before we implemented it. So, we had that sort of outside criticism and critique. We also used the services of a professor from University of Utah to also kind of challenge some of our assumptions going into it. So, I believe we properly managed that portion of it to get the most out of the test program that we could.

We weren't also, as a point of interest, able -- in the mock-up work we did, we weren't able to replicate the signature, if you will, of the WNP-2 January event. So, that gave us some confidence that our replication was appropriate. So, I think there's more there than I was able to convey and I apologize for that.

COMMISSIONER ROGERS: Thank you.

MR. BECK: One of the other things that we believe we -- or maybe the words I should have used was didn't was a failure modes and affects analysis is one way we're looking at what we should be doing for the modifications, to be sure that we've looked at all the possible ways we could. You know, high-flow failure of the flow controller to its max, that sort of thing.

CHAIRMAN SELIN: Commissioner Curtiss?

Commissioner Remick?

COMMISSIONER REMICK: As I understand the additional testing that you've talked about, all of it or at least most of it, as I understood it, related to the backfill option and I can certainly understand that temperature of the water, the effect on nozzles, the rate of flow on diffusion and convection and things like that are extremely important. But suppose if somebody chose the option, and I don't by any means know if it's a good option, of venting the condensing chambers, that's one of your options, are there questions of that type that need testing?

MR. BECK: Yes, and the program that we have proposed to the group does employ testing of condensing chambers to address those very concerns, as well as gather data around temperature monitoring of the condensing chamber so we got a good correlation of condensing chamber performance and temperature data.

COMMISSIONER REMICK: But what are some of the questions associated with venting that you would undertake tests for to clarify?

MR. BECK: To assure that we have the adequate sweeping flow to convey off non-condensables and that we aren't, in fact, drawing any down the reference leg.

COMMISSIONER REMICK: I see.

MR. BECK: Once again, it's simplistic.

MS. TULLY: It might be appropriate if they could put up backup slide 12.

COMMISSIONER REMICK: All right.

MS. TULLY: This identifies some of the concerns that have been identified by our design team in looking at the vent mod that we are trying to design the new test program to address. I might note that this new test program will cover both the backfill mod and try to answer these concerns. It is a very aggressive schedule again and it is currently under review by the executives on whether or not we will support it, the funding for it. But if it is approved, we have proposed approximately a three to four month schedule for this work to be completed. Our goal is to get enough initial work done to support utilities providing the information that they need to provide to you folks by the end of July, and then have good design basis information to proceed toward modifications sometime in the September time frame, and then the generic work would be done.

COMMISSIONER REMICK: Well, that slide adds to the sensitivity you've already raised in to me about us forging ahead too rapidly. There have been

too many times after TMI when we forced backfits on a schedule that the Commission had to back down on because they were unrealistic. I do have concerns that we're talking about tapping into the primary system and we're connecting to instruments of major safety importance. So, I think it's extremely important that we do understand what we're doing before we do it.

At the same time, I agree with some of the views that have been expressed and I think you agree that it's important that we move ahead with all reasonable speed. But I certainly agree that we must do it from a deliberate engineering standpoint when we talk about the actual backfits and I agree with Commissioner Rogers and I think you agree that the short-term things, the training, the awareness, those type of things, there's no reason to delay on that. But I must admit you've raised my sensitivity about the time tables that are in the bulletin.

CHAIRMAN SELIN: Commissioner de Planque?

COMMISSIONER de PLANQUE: The points have all been covered.

CHAIRMAN SELIN: Okay. Thank you very much.

MS. TULLY: Thank you.

MR. BECKHAM: Thank you for the opportunity, sir.

CHAIRMAN SELIN: Mr. Blanch? We welcome you to your first -- at least to my knowledge your first appearance before the Commission, Mr. Blanch. You're scheduled for ten minutes, more or less, of presentation, plus whatever time the questions of the Commission will go on.

We've had a chance to look at your statement and that will be in our record and distributed. But I might say the most useful thing you could do in your presentation is to concentrate on the safety considerations and the type of questions that have come up. Of course, we're not going to stop you from saying anything you'd care to say, but your personal history is much better known to the Commission than the safety and engineering questions that face us at this point. So, if I might just request that you concentrate on that, I think that would be most useful to us, if you would be so kind. The floor is yours.

MR. BLANCH: Thank you, Mr. Chairman. Again, you've just informed me that I have ten minutes to essentially present my position and I believe that if I did present my statement, that would take

approximately 15 minutes.

I'd like to just remind the Commission that if it were not for me, none of us would be here today. I was the one to identify, analyze and eventually fix this very severe problem. I've given up my career as a result of this problem and drove over 800 miles on my own time yesterday and tomorrow and at my own expense for ten minutes.

My only advocate, Robert Pollard for Union of Concerned Scientists, was unable to attend this meeting and told me I could use his allotted time. I therefore respectfully request adequate time to read my prepared statement, giving what I've gone through to bring this issue to the forefront and I would also like some time to respond to some questions.

I would like to provide some clarification to Commissioner Rogers that the flow rate at Millstone 1 was not 4/10ths of a gallon per minute, it was 1/100th of a gallon per minute. I'd also like to state that all of the considerations that are being studied forever by the BWR Owners Group and by General Electric have been addressed by Millstone and it took us about two to three weeks to do the engineering. That engineering has already been done and it is very applicable to various other plants. Again, we can get

into that a little bit later, but I would like the opportunity to present my statement as I've drafted it. It may go over ten minutes.

My presentation reflects my personal opinions and those of We the People. We the People was the organization first identifying this issue, yet they have been excluded from presenting their position this afternoon.

I am somewhat encouraged that the NRC staff issued a bulletin on May 28th. However, this bulletin clearly acknowledges the inoperability of safety systems and the fact that this significant defect clearly violates many NRC regulations.

Today I will be presenting the history of the problem surrounding the BWR reactor vessel water level measurements and the appearance of a cozy relationship between the NRC Commission, the NRC staff and the industry.

For some personal background, I recently resigned from Northeast Utilities where I was Supervisor of Instrumentation and Controls Engineering at the home office in Berlin, Connecticut. My resignation was the result of a mutually acceptable agreement between Northeast Utilities and myself due to conflicts reflected to Whistleblower harassment,

discrimination and intimidation as a direct result of the Rosemount transmitter issues and the recent level problems I identified both on pressurized water reactors and boiling water reactors.

On May 4th of this year, the NRC issued a severity level II violation to Northeast Utilities for top management involvement in the harassment of me. The notice of violation also concluded that Rosemount, Incorporated influenced Northeast Utilities in their discrimination which I believe was due to the fact that Rosemount had been aware of the problem for many years and had failed to inform either the NRC or the utilities of this significant defect.

After serving my country for seven years in the Nuclear Navy, I joined Northeast Utilities in 1972, after receiving a B.S. degree in Electric Engineering. Since 1980 I was Supervisor of Instrumentation and Control Engineering and involved in many of the post-TMI backfits, including post-accident monitoring and I was actually chairman of an INPO group on many of the backfits.

To respond to your question, Commissioner Roberts, about the --

COMMISSIONER ROGERS: Rogers.

MR. BLANCH: I apologize. Commissioner

Rogers. Yes, after Three Mile Island we rushed into many things. Many things were very, very ambitious. Safety parameter display system was one of them, one of the things that we did not do a good job in engineering. We still haven't done a good job. There are other things that we haven't done a good job. However, this modification is relatively straightforward.

During 1988 I discovered the undetectable failure mechanism of Rosemount transmitters which eventually resulted in my present position of unemployment. This was the first example I observed of the NRC's refusal to enforce existing regulations. I discovered in 1987 that condensate pots on many steam generators and pressurizers were not capable of performing their function due to the presence of non-condensable gases.

With my extensive experience in this area, I was requested by the NRC in May of '92 to look into the unexplained level problems at the Pilgrim plant in Plymouth, Mass. Within two days of this NRC request, I reported back to Pilgrim and the NRC that the condensate pots were not functioning and in the event of an accident significant non-conservative common mode errors would occur that may inhibit some safety

systems and affect other devices required by the plant technical specifications. This problem had been studied by Pilgrim engineers for years and millions of dollars expended on repairs that had no positive impact on the operation of the system.

As a result of the Pilgrim data, I immediately reviewed some historic data from Millstone Unit 1. This data indicated that the problem had also existed at Millstone 1 for over 20 years. From experience on PWRs, Northeast Utilities immediately recognized the potential for significant errors and in accordance with the requirements of the technical specifications, initiated an operability determination as required by NRC Generic Letter 91-18. This operability determination concluded these level devices were not operable and that the potential errors were in the range of 20 to 40 feet, and I believe that the proprietary data confirms that the actual testing errors are in that same range.

As a result of this error, some safety systems, interlocks, and post-accident monitoring systems required by the Millstone license were not operable.

I had many conversations with NRC personnel including two with Mr. William Russell in

June of 1992, requesting the NRC inform other utilities of these significant errors. I informed him that other utilities must also perform an operability determination as required by each individual license.

My pleas were ignored until Mr. Ernest Hadley, attorney for We the People, wrote to the Chairman of the Commission on July 21, 1992. As a direct result of this letter, the NRC conducted a public meeting on July 29, 1992. At this meeting, only the NRC Staff, General Electric, and the BWR Owners Group were allowed to speak. After all decisions were made by Mr. Russell, only then was I allowed to make comments. Many of the comments I made after the meeting continue to be intentionally ignored by the NRC and the industry.

In August '92, because NRC determined the instruments were inoperable, I was responsible for the development of a permanent fix for this problem. During the engineering stages of the project, at the request of my manager, I authorized our consultant, Sol Levi, Incorporated, to commence preliminary engineering due to the project being on critical path. While 36 other BWRs continue to operate outside their license requirement, Northeast Utilities receives a severity level four violation with a statement to the

press that "Blanch violated Commission rules."

As a direct result of this violation and the accompanying statement, my annual performance evaluation at Northeast Utilities was downgraded. This is another factor which lead to my early resignation from Northeast Utilities.

CHAIRMAN SELIN: Mr. Blanch, you've been here ten minutes. You're a page-and-a-half into a six page statement. A few extra minutes certainly wouldn't affect us, but we really need to understand your views on the safety. Your credentials are impeccable. That's why you're here in the first place, and as you said, that's why we're here in the first place.

We'll accept all of that, but please, could you give us whatever advice you can as you did in the first questions to Commissioner Rogers about what's involved, what the problems are. Your expertise is without question in this area.

MR. BLANCH: Again, I will let my statement go into the Commission record.

CHAIRMAN SELIN: Thank you very much, Mr. Blanch.

MR. BLANCH: My advice here, what I've been pleading for in writing, verbally, at meetings,

is that the NRC enforce the regulations. There is a clear requirement that every licensee has, if an operability of any safety related system is in question, they are required to perform an operability determination. The operability determination and how it's accomplished is clearly stated in Generic Letter 91-18. It is a requirement of the license and a requirement of the regulations. The Commission, the Staff, and the utilities absolutely refuse to perform an operability determination.

I'm asking for one thing this afternoon, and that's to have the Commission require the utilities to comply with the existing regulations and do a plant specific operability determination based on the latest results of the testing program or the analysis, whichever is better, and to perform that operability determination immediately.

Thank you.

CHAIRMAN SELIN: I have quite a large number of other questions, but in the instance of clarity, would you give an example of what this operability determination would require? One of the plants that you know will?

MR. BLANCH: Operability is defined as the capability of a device to perform its designated

function. An operability determination, as we did, as I did at Northeast Utilities, took a look at the failure mechanism, first of all, of the condensate pot, and then we looked at the various functions of that particular device, the level instruments. It trips the reactor. It provides indication to the operators to assess the severity of an accident. It provides interlocks.

Now, we're also learning from Washington Nuclear, WNP-2, that it actually caused certain valves, isolation valves, that could cause a direct release outside the containment to be inoperable. The operability determination takes a look at all the functions and determines whether the system in question is capable of performing its function. It's a very simple concept.

CHAIRMAN SELIN: I assume -- if I'm wrong, please correct me -- that after taking a look at this, if the plant were not by your definition operable, you would see them closed until they had fixed the situation? Because in your own statement, you made two very interesting comments. One to the effect that, you know, we have rules. We have to follow them because otherwise, discipline doesn't hold. But you also recognized this as not being the most important

safety consideration even before the Commission.

So, could you explain to us how you would weigh the safety versus other considerations, having done this operability test?

MR. BLANCH: Well, again, when I was at Northeast Utilities, we always complied with regulations. If we determine that a device is inoperable, we then go to the technical specifications. Some technical specifications, for instance, a radiation monitor, may allow you to operate for 30 days. Other devices, a diesel generator, seven days. I know that the technical specifications for this particular device state that if level measurement is inoperable, it has to be fixed before you -- or you have to come to cold shutdown, I believe. I'm only familiar with the most on one.

As far as my overall assessment of the safety of this particular problem, it's a very significant safety issue. Again, the Rosemount issue was a significant safety issue, but these are not the most safety significant issues out there. We all know that. Yes, this one is probably up around an eight on a scale of one to ten. There are other issues. I think station blackout is a very significant issue. I think the motor operated valves are a very

significant issue that are way higher in safety significance than this particular problem.

What bothers me is that we have a lot of problems out there that aren't being addressed properly, or in a timely fashion. The sum of all these problems, I think, could eventually result in an accident that we weren't expecting.

CHAIRMAN SELIN: Could you give us your opinion on some of the remarks you heard today about the necessity for doing more research, more modeling, et cetera, before settling one or a number of fixes?

MR. BLANCH: I think, in my personal opinion, it's more delaying tactics. We had all the information to do a phenomenal engineering job on the repair of Millstone I. That has recently been demonstrated by the shutdown. We have analyzed the thermal stresses in accordance with the ASMI III codes for the nozzles. We went through an extensive evaluation of that, and we had a lot of very good consultants from universities, from MIT, University of Connecticut. We had General Electric. We had the Owners Group involved. We had the world's experts. All those questions have been answered. There are no questions that we are aware of, otherwise Millstone unit I would not have started up. All those questions

we have been aware of.

The other two solutions, we looked at them and saw potential problems with those other proposed solutions that we didn't have the answers for. And at Millstone, we obviously elected the backfill, which appears to work just fine.

CHAIRMAN SELIN: Could you discuss what, from your opinion and background, is generalizable from the Millstone experience as opposed to what might be specific to Millstone? In other words, why wouldn't the Millstone solution be a pretty good solution for most other plants?

MR. BLANCH: I'm not that familiar with other boiling water reactors. My background is primarily pressurized water reactors. However, based on my knowledge, I don't see any drawbacks of the Millstone solution.

In fact, I talked to Doctor Thadani last week and I think it was even our assessment that some plants such as Millstone could actually implement this fix with proper engineering while the plant's on line.

CHAIRMAN SELIN: Is that right? That's interesting.

Commissioner Rogers?

COMMISSIONER ROGERS: Well, I guess it's

really a concern about the questions that were raised here about the different designs, the different types of designs in some of the BWRs, and whether the Millstone fix is appropriate for each one of those or not. Whether there are some serious questions as to whether that's the best way to go for every particular reactor or not. To me, that is a question that I think has to be answered.

I would take it that you would feel that you're not in a position to answer that question exactly, because you're familiar with the Millstone situation and design, but not all the other ones. And so, I just still have the feeling that perhaps, despite what you've said, that the Millstone solution works very well for Millstone and Millstone-type reactors. But maybe there is still a question whether that's the best way to go for every BWR.

That isn't to say that we're going to take your observation and run with it, but would you feel still that the Millstone solution would be a good one for everybody, despite what you heard from the Owners Group?

MR. BLANCH: I've talked to a lot of people within the industry. I am not aware of any plant where the Millstone solution would not be

appropriate. I know it's appropriate for plants such as Fitzpatrick, Vermont Yankee, and especially the Pilgrim which has almost an identical system. Unless there is something very uniquely different with a plant, the Millstone solution, I believe, would work. That's based on a lot of conversations I've had with many people in the industry.

COMMISSIONER ROGERS: That's all I need.

CHAIRMAN SELIN: Commissioner Curtiss?

Commissioner Remick?

COMMISSIONER REMICK: Just one question. I was curious about your emphasis on the Commission requiring all, as I understood it, BWR licensees to conduct an operability determination. But in effect, on a generic basis, haven't the Owners Group done that, and hasn't the Staff done that, and have not declared the instruments to be inoperable?

MR. BLANCH: Commissioner Remick, if they have, then the entire regulations have been changed. Operability determination, again, it is the licensee's responsibility for his own safety. It can not be done by General Electric. It can not be done by the NRC Staff, and it can not be done by the BWR Owners Group. Plus, it has to be done on a plant-specific basis.

It's clearly in the requirements or the

guidance of Generic Letter 91-18, that each one has to do it. It's not done by the NRC Staff, and it can't be done based on "well, if my reactor trip system, if the breakers won't operate, well, I'll just go have a guy with an ax cut the wires to the control rods," or something like that.

Either it's operable or it's not operable. In this case, and even the NRC Staff in their bulletin has acknowledged, and Washington Public Power has acknowledged, that these devices are inoperable. All I'm asking is that the Commission direct the Staff to enforce the regulations and go into the tech specs, the action statements of the technical specifications. No generic operability determination, in my understanding of the regulations, is not allowed.

COMMISSIONER REMICK: No, I don't disagree with that, but the point I was trying to make, is there any reason why individual licensees would come to a different conclusion than the other groups?

MR. BLANCH: Most definitely. I think that if WNP-2 did an operability determination, they would identified the fact that that particular valve was inoperable, and that plant should not have been restarted from January 21st. Yes, every plant --

COMMISSIONER REMICK: No, I'm not talking

about the valve. I'm talking about the level instrumentation.

MR. BLANCH: Well, the level instrumentation, actually, it's the valve.

COMMISSIONER REMICK: Yes.

MR. BLANCH: So, that would have made the valve inoperable because the instrument's inoperable. That's a function of the instrument to isolate that.

COMMISSIONER REMICK: So, you feel if every licensee pursued an operability determination, that they would conclude that all the level instrumentation are inoperable at this time?

MR. BLANCH: That would be my assessment of what their conclusion. And again, after the testing has been completed that now indicates my understanding level error of 27 feet, Pilgrim's analysis only analyzed either 14 inches or 29 inches. Now that's it's 324 inches, Pilgrim is outside of their analysis, but the NRC hasn't ordered them to do anything. They said, "okay, go ahead and start up."

COMMISSIONER REMICK: That was another question. In your testimony, where did the 27 feet come from? I'm not familiar with that.

MR. BLANCH: Again, if you've read my statement, you are aware that the NRC Staff forgot to

tell me about the ACRS meeting. My understanding, talking to some ACRS members, when the data was presented in closed session as proprietary, after the closed session, one of the ACRS members mentioned 27 feet. Then Mr. Collins from the Staff confirmed yes, it was 27 feet.

And again, I'm not even sure that that information has gotten to the utilities. As far as I'm concerned, the free flow of information is being restricted from the utilities, to do a plant-specific operability determination.

COMMISSIONER REMICK: So, that's the source of the 27 feet, from the ACRS meeting, a comment from an ACRS member?

MR. BLANCH: And confirmed by Mr. Collins of the NRC Staff.

COMMISSIONER REMICK: Who?

MR. BLANCH: Mr. Collins of the --

COMMISSIONER REMICK: Oh, him, Collins.

MR. COLLINS: Me. Remember me?

CHAIRMAN SELIN: I knew he was a very ambitious fellow.

Okay, thank you very much.

MR. BLANCH: Thank you.

CHAIRMAN SELIN: Commissioner de Planque?

COMMISSIONER de PLANQUE: If you had to set the criteria for determining what would make the water level indicators inoperable, what would that criteria be?

MR. BLANCH: Again, you'd have to go into the accident analysis. And again, there are so many different functions provided by reactor vessel water level, you'd have to --

COMMISSIONER de PLANQUE: But what error in the indication?

MR. BLANCH: Whether it be 24 inches or 27 feet?

COMMISSIONER de PLANQUE: Yes.

MR. BLANCH: I don't know. I haven't seen and I'm not allowed to see the test results from the BWR Owners Group. I don't know how the tests were conducted. All I saw was one number that said 27 feet. I don't know what number I would have to use. I know our Millstone number was in the range 20 to 40 feet, depending on who looked at it.

COMMISSIONER de PLANQUE: And you found that out looking at historical data?

MR. BLANCH: The way I found out, after I identified the program problem, I looked at historic records and I saw symptoms, and only symptoms, of non-

condensable gasses coming out of solution. The symptoms were only in the range of one to two inches. Again, the symptom was only an indicator of a very severe disease, in this case, and with our analysis, the symptom was two inches. On Pilgrim, the symptom happens to be 20-some inches.

Again, it doesn't matter the magnitude. If the symptom is there, the problem is there. The problem was very severe at Northeast Utilities Millstone Unit I.

COMMISSIONER de PLANQUE: But are you suggesting, are there historical data available at every plant that could be looked at to see the magnitude of potential --

MR. BLANCH: No. There is no way that any plant could quantify the maximum error. It would have to be under a conservative assumption that they make. What they haven't done, they've never determined whether their condensate pots are working or not. That's a relatively straightforward test that can be conducted. Again, the Staff has refused to require anyone to look at the temperature of the condensate pots.

COMMISSIONER de PLANQUE: Okay.

CHAIRMAN SELIN: How do you tell if the

condensate pot is working or not?

MR. BLANCH: A condensate pot is designed to be at saturation temperature for the particular pressure. On a BWR, I think that the temperature of the condensate pot should be close to 550 degrees minus, maybe, 20, 30 degrees for differential temperature across the metal, straightforward.

CHAIRMAN SELIN: Just a temperature measurement?

MR. BLANCH: It's a temperature measurement.

CHAIRMAN SELIN: Mr. Blanch, one thing that I personally would find helpful if you could discuss just a little bit more what aspects of the Millstone solution seem to be generic to you? You've been properly qualified, both your credentials and your knowledge of the other plants, but that seems still to me, to be a huge gap among the various people that appeared before us today, about how generic the solution is likely to be.

MR. BLANCH: Well again, my lack of understanding of BWRs. We happen to have a very convenient high pressure source of water, control rod drive mechanism pump, which was located not too far -- within 200 to 300 feet. It made it quite easy for us

to implement that fix.

Now, again, not being familiar with other reactors, they might have to go through penetrations. If they have to go through penetrations to get to that source of water, yes, that's a monumental problem. Line size is probably not too much of a problem. That would effect the amount, the required amount of flow rate. It's basically a 3/8th inch stainless steel tube that's required and that can accommodate the flow required for any particular reference line.

There may be other unique problems associated with the location of the reference leg or the source of water. I'm just not familiar with --

CHAIRMAN SELIN: But you're talking about basically, practical implementation problems as opposed to an analysis of the impact on the nozzles or---

MR. BLANCH: I don't think there are --

CHAIRMAN SELIN: -- if you can get the water to the cold leg, do you see anything that's special about Millstone?

MR. BLANCH: I don't think there's anything special. And I think there's a little bit of misunderstanding in my mind about some of the data that was presented here that related leakage to non-

condensable gas concentration.

At Millstone I, we had been shut down for over 30 days and we never lost one inch of water. We had no leakage at Millstone Unit I. Yet, we had very severe concentrations of non-condensable gasses. We don't understand entirely what is going on inside that reference leg. That I will admit to. Now, we could study it for the next ten years and possibly not understand what's going on.

We do understand how to fix it though. There are three different mechanisms that can drive the non-condensable gasses into solution, and we're not 100 percent sure how they're getting there. We know they're there. We know how to get them out. We fixed it. And I really applaud Northeast Utilities for taking that very aggressive action in that case.

CHAIRMAN SELIN: All right, thank you for coming down. It's true that you did call attention to this, just as you did to the Rosemount. That's been a very valuable service. Your statement will be, in fact, put into the record. So, even though you didn't get a chance to read the whole thing, it will be known to anybody who looks at our transcript.

Thank you very much.

MR. BLANCH: Thank you very much, Mr.

Chairman, Commissioners.

CHAIRMAN SELIN: Just in wrapping up, there clearly are a number of questions out on the table. They call for a rather rapid set of decisions, either confirming or modifying the document that the Staff has put out.

There are a couple of other questions that have been raised about the availability to the general public of information in which some of these decisions have been made. I would ask the Staff at least to take a look at that because, as we all know, we do have an obligation to make as much of this public as possible.

There have been many questions, differences among different people who have appeared before us today, but everybody seems to agree that this is an important issue which should be addressed as quickly as the facts, the science, and the engineering will permit. I'm quite sure it will get that level of attention.

The meeting is adjourned. Thank you.

(Whereupon, the meeting was adjourned at 4:38 p.m.)

CERTIFICATE OF TRANSCRIBER

This is to certify that the attached events of a meeting of the United States Nuclear Regulatory Commission entitled:

TITLE OF MEETING: BRIEFING ON STATUS OF BWR WATER LEVEL INDICATORS

PLACE OF MEETING: ROCKVILLE, MARYLAND

DATE OF MEETING: JUNE 1, 1993

were transcribed by me. I further certify that said transcription is accurate and complete, to the best of my ability, and that the transcript is a true and accurate record of the foregoing events.

Carol Lynch

Reporter's name: Peter Lynch

SCHEDULING NOTES

Title: Briefing on Status of BWR Water Level Indicators

Scheduled: 2:00 p.m., Tuesday, June 1, 1993 (PUBLIC)

Duration: Approx 1-1/2 hrs

Participants:

NRC

- J. Taylor
- T. Murley
- W. Russell
- A. Thadani

BWR Owners Group

- George Beck, Chairman BWROG
  Water Level Instrumentation Committee
- Cynthia Tully, BWROG Chairperson
- J.T. Beckham, Jr., Chairman
  BWROG Executive Committee
- James Booker, Vice Chairman
  BWROG Executive Committee

Others

- Paul Blanch

Documents:

- Staff viewgraphs issued 5/25
- BWROG viewgraphs issued 5/26
- Paul Blanch's statement issued 5/25

BWR REACTOR VESSEL WATER LEVEL INSTRUMENT INACCURACIES

PRESENTED BY

ASHOK THADANI, DIRECTOR
DIVISION OF SYSTEMS SAFETY AND ANALYSIS
NUCLEAR REACTOR REGULATION

JUNE 1, 1993

BACKGROUND

- HIGHLY IMPORTANT SAFETY INSTRUMENTATION
  - AUTOMATIC SAFETY SYSTEM ACTUATION
  - LONG TERM OPERATOR ACTIONS
- GENERIC LETTER 92-04 ISSUED AUGUST 19, 1992
  - MODIFICATIONS TO BE IMPLEMENTED NO LATER THE NEXT REFUELING OUTAGE AFTER NOVEMBER 1992
- DELAY IN IMPLEMENTATION
  - BWROG TEST PROGRAM
  - IMPLEMENTATION AT THE EARLIEST OPPORTUNITY FOLLOWING JULY 1993
- INTERIM OPERATION ACCEPTABLE

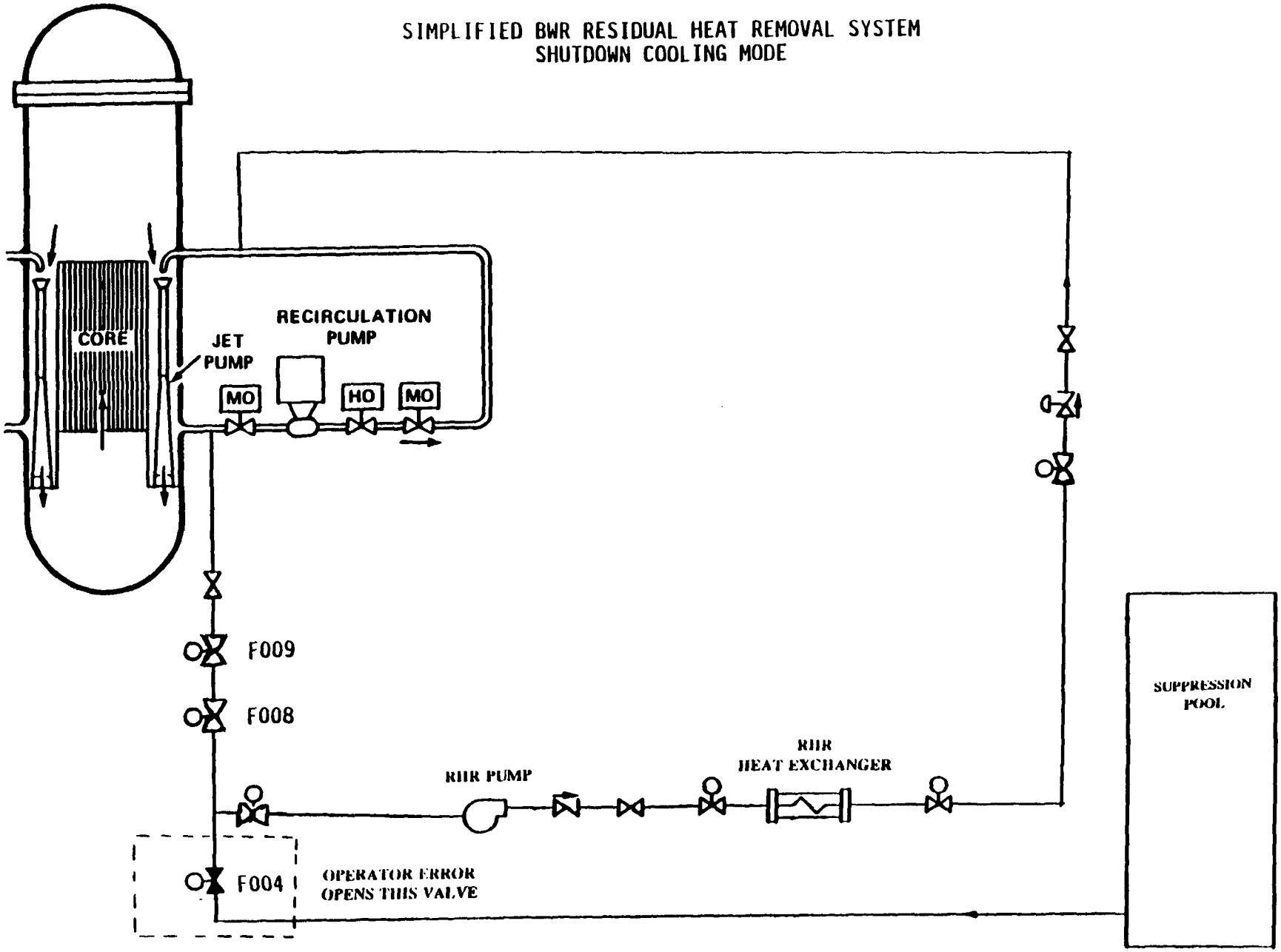
RECENT INFORMATION

- BWROG TEST RESULTS CONFIRM LARGE LEVEL ERRORS POSSIBLE DURING RAPID DEPRESSURIZATION
- PLANT DATA CONFIRMS GAS PRESENCE AND LARGE NON-CONSERVATIVE EFFECTS
- CONCERN HEIGHTENED DUE TO IDENTIFICATION OF COOLDOWN SCENARIOS

COOLDOWN SCENARIOS

- CORE DAMAGE CAN OCCUR IN 15 TO 20 MINUTES IF:
  - VESSEL DRAINS DUE TO SINGLE VALVE MISALIGNMENT BY OPERATOR
  - SIGNIFICANT GAS IS PRESENT IN MULTIPLE REFERENCE LEGS AND RESULTS IN FAILURE OF AUTOMATIC ISOLATION
  - OPERATOR FAILS TO RECOGNIZE EVENT - NO MANUAL ACTIONS
- BWROG REPORT DATED MAY 20, 1993
  - CONFIRMS SCENARIO
  - ASSERTS RELIANCE ON OPERATOR ADEQUATE FOR SAFETY
- STAFF POSITION: ADDITIONAL OPERATOR GUIDANCE REQUIRED FOR INTERIM OPERATION

SIMPLIFIED BWR RESIDUAL HEAT REMOVAL SYSTEM
SHUTDOWN COOLING MODE



STAFF POSITION

- RELIABLE WATER LEVEL INSTRUMENTATION IS ESSENTIAL FOR BWR SAFETY AND OPERATION

- HARDWARE MODIFICATIONS MUST BE IMPLEMENTED IN A TIMELY FASHION - NEXT REFUELING OUTAGE OR COLD SHUTDOWN AFTER 7/30/93

  - PROBLEM HAS BEEN KNOWN TO EXIST FOR 1 YEAR

  - MODIFICATION (E.G. BACKFLUSH) IS AVAILABLE AND READILY ACHIEVABLE

- ADDITIONAL COMPENSATORY MEASURES FOR NORMAL COOLDOWN WILL BE REQUIRED UNTIL HARDWARE MODIFICATIONS ARE IMPLEMENTED

REQUESTED ACTIONS

* WITHIN 15 DAYS IMPLEMENT INTERIM COMPENSATORY ACTIONS FOR MODE 3

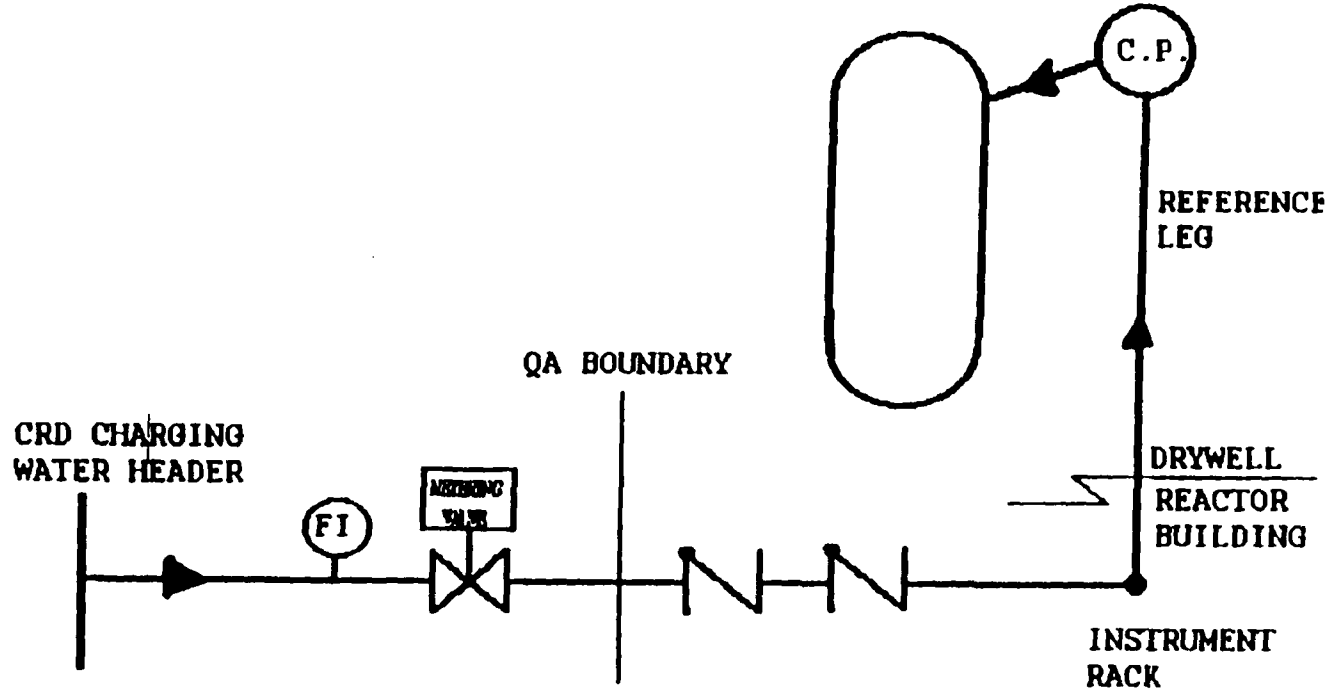
  - ENHANCED MONITORING OF LEVEL INDICATION

  - ADDITIONAL ADMINISTRATIVE CONTROLS
    - RESTRICT VALVE MOVEMENTS
    - VERIFY VALVE POSITION
    - LIMIT MAINTENANCE

  - ALERT OPERATORS TO POTENTIALLY CONFLICTING INDICATIONS DURING A MODE 3 TRANSIENT

* BY JULY 30, 1993 TRAIN OPERATORS ON DRAINDOWN EVENTS AND THE IMPLICATIONS OF WATER LEVEL ERRORS

* IMPLEMENT HARDWARE MODIFICATIONS AT 1ST COLD SHUTDOWN AFTER JULY 30, 1993



MILLSTONE UNIT 1 REFERENCE LEG FILL MODIFICATION

REACTOR WATER LEVEL INSTRUMENTATION

BWR Owners' Group
Briefing
NRC Commissioners

June 1, 1993
Rockville, Maryland

REACTOR WATER LEVEL INSTRUMENTATION

INTRODUCTION

- **Concern for water level measurement inaccuracies due to de-gassing**
  - Rapid depressurizations
  - Normal depressurizations
- **Importance of issue and safety assessment**
  - Water level measurement is vital
  - Conservative assessment: No substantial safety hazard
  - Clear need to address concern
- **Aggressive short-term progress**
  - Conservative full-scale tests
  - Operator guidance
  - Modification conceptual designs

REACTOR WATER LEVEL INSTRUMENTATION

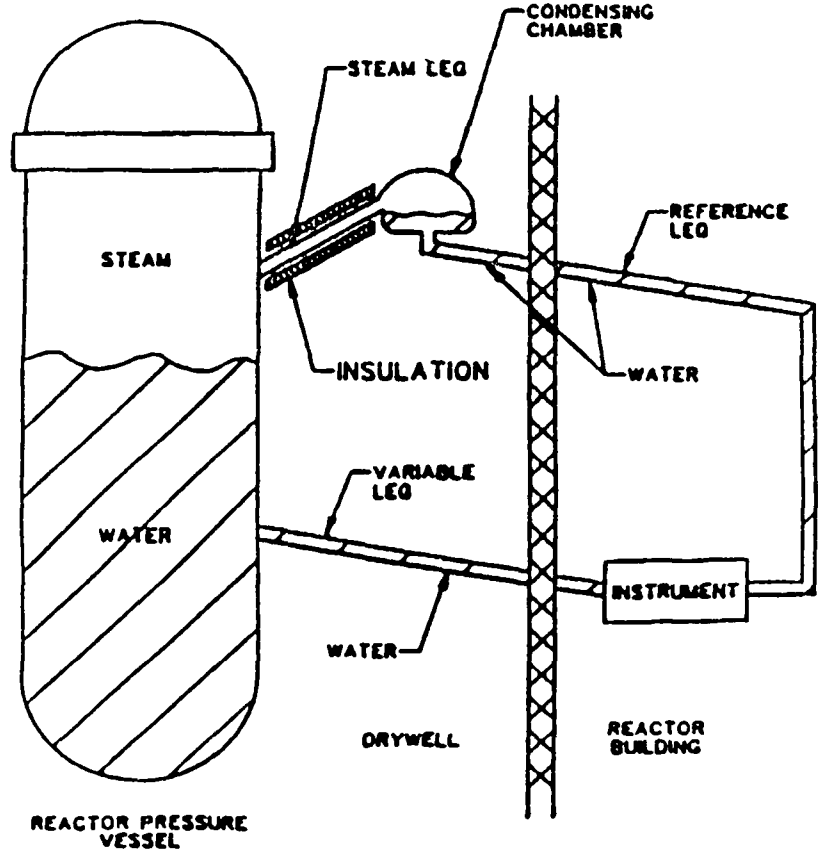
INTRODUCTION (continued)

- **Findings and recommendations**
  - Testing revealed significant insights (not intuitive)
  - Concern is real
  - Not nearly as severe as originally postulated (July 1992)
  - Modifications indicated for most plants
- **Aggressive, deliberate implementation plan**
  - Three promising concepts identified
  - Modifications must be well-conceived and sufficiently engineered
  - Previous lesson learned: <u>test before use</u>

REACTOR WATER LEVEL INSTRUMENTATION

CONCERNS

- Non-condensable gases accumulate in condensing chamber and dissolve in liquid
- Leak near instrument causes gas-laden liquid to be drawn into reference leg
- Depressurization (fast or slow) can cause gas bubbles in reference leg
- Gas bubbles lead to false high level indications



REACTOR WATER LEVEL INSTRUMENTATION

BACKGROUND

- 1980's
  - Generic Letter 84-23
  - Install cold leg configurations to replace original instruments in some applications
- 1992
  - Non-condensable gas release during rapid depressurization
  - Very conservative initial calculations show potential for large errors
  - Generic safety report - no substantial safety hazard
  - Full-scale test program planned and funded
- 1993
  - Non-condensable gas release during slow depressurization
  - Supplemental generic safety report - no substantial safety hazard
  - Conservative full-scale test program conducted
  - BWROG recommendation that most plants modify on reasonable schedule

Modifications are indicated for most BWRs

Modifications must be sufficiently engineered, tested and implications understood

REACTOR WATER LEVEL INSTRUMENTATION

SAFETY ASSESSMENT

- **Rapid Depressurization**
  - De-gassing impact not a concern above 450 psig
  - Water level safety system initiation functions occur above 450 psig
  - Diverse safety system initiation functions also available
  - Operator guidance provided (EPGs and EPC communications)
  - Not all plants rely on this type instrument for safety initiation
- **Slow Depressurization**
  - Low-pressure de-gassing can disable automatic low-level isolation during shutdown for some plants(assuming common mode failure)
  - Adequate time and water level indication exists to correct reactor vessel drain down to suppression pool (no observed problem during Mode 3 in ~6400 shutdowns - drain down only observed in Mode 4/5 [cold shut down/refuel])
  - Operator guidance adequate (EPGs and EPC communications)
  - Manual actions can be taken to assure accurate water level instrumentation during shut down.

Conservative Assessment - No substantial safety hazard
Clearly important to investigate and remedy
System continues to meet GDC-21 while modifications are engineered

REACTOR WATER LEVEL INSTRUMENTATION

BWROG PROGRAM

- Safety Assessment
- Phenomena investigation
  - Benchtop testing
  - Conservative full-scale reference leg depressurization testing
- Evaluation of potential modifications

Aggressive schedule
Very responsive to identified concerns

REACTOR WATER LEVEL INSTRUMENTATION

DEPRESSURIZATION TESTING RESULTS

- Identified errors >1/2 ft. screening criterion
- Gained technical understanding of phenomenon including significant counterintuitive insights
- Determined non-condensable gas concentration threshold for evaluating modification requirements
- Some plant-unique configurations may result in acceptably small errors

Modifications indicated for most plants

REACTOR WATER LEVEL INSTRUMENTATION

MODIFICATION CONCEPTS

- **Three promising concepts**
  - Reference Leg Backfill
  - Condensing Chamber Vent (3 configurations)
  - Core Range Monitor
- **Modifications must be well-conceived and sufficiently engineered**
- **Two previously considered modifications determined not viable**
  - Post Accident Backfill
  - Larger Chambers

REACTOR WATER LEVEL INSTRUMENTATION

- **EXAMPLE: Concerns to be addressed for Reference Leg Backfill modification**
  - Evaluation for use on safety related trip systems
  - Verification that flow rate is adequate to prevent significant convective mixing in reference leg
  - Interface between safety/non-safety systems
  - Introduction of thermal stresses on reactor nozzles and other components (e.g., with failed controller)
  - Effect on instrument operation requirements (i.e., Tech Spec impact)

Cost is not the issue --
Aggressive but deliberate engineering is

REACTOR WATER LEVEL INSTRUMENTATION

CONCLUSIONS

- Water level systems meet GDC-21 despite concern
  - Redundancy
  - Diversity
  - Operator action
- BWROG program was very responsive
  - Conservative full scale tests
  - Operator guidance
  - Modification conceptual design
- Concern is real and must be addressed with equal responsiveness
  - Modifications indicated for most plants
  - A few plants may individually demonstrate modifications are not required
- Implementation plan must be aggressive but deliberate
  - Modifications must be well conceived and sufficiently engineered
  - Avoid making the "cure" worse than the "disease"

Recommended implementation schedule:
Refueling outages starting after June 1994

REACTOR WATER LEVEL INSTRUMENTATION

CONCERNS

- CONDENSING CHAMBER VENTING
  - Sensitivity to off-normal plant operations
    - » Performance with reactor in hot standby due to higher gas concentrations in reactor
  - Water entrainment in vent
  - Effect on existing instrumentation
    - » Oscillations
    - » Setpoint bias

REACTOR WATER LEVEL INSTRUMENTATION

INSIGHTS

- Gas evolution not simple process as thought last year (July, 1992)
- Most De-Gas test data shows small errors not 37 ft. (last July)
- Determined non-condensable gas concentration threshold for evaluating modification requirements - threshold below which no errors are seen
- Time dependency of gas evolution depending on gas concentration
- Some plant-unique configurations may result in small errors

REACTOR WATER LEVEL INSTRUMENTATION

INSIGHTS (continued)

- Plants have different configurations - combination vs. all cold legs
- All condensate chamber and reference legs have gas - have not quantified the concentration
- Non-condensable gas effects not specifically addressed in original design
- Previous scope of condensation chamber inlet geometry test would not have supported the program
- Absence of visible leakage $\neq$ a tight piping system

REACTOR WATER LEVEL INSTRUMENTATION

NOT INTUITIVE

- $\leq$ 1/2" tubing will trap gas bubble in vertical section causing indicated error from stored gas > predicted (mass loss)
- Smaller diameter vertical piping > transient errors

REACTOR WATER LEVEL INSTRUMENTATION

POSTULATED NORMAL DEPRESSURIZATION EVENT

- **Very conservative assumptions (common mode failure)**
  - Identical errors on multiple redundant channels
  - Many variables must be identical
- **No draindown events during approximately 6400 shutdowns**
  - Small approximately 2 - 3 hours (Mode 3) window (reactor press. 150 - 0 psig)
  - Small number of draindown events during cold shutdown/refueling (Modes 4/5) which last 1 - 3 month window (long time)
- **Operator guidance**
  - EPC issued two communications to sensitize operators to phenomenon
  - Existing EOPs provide proper guidance
  - Multiple alarms and trip signals to alert operators
  - Design basis events allow credit for operator action after 10 minutes
  - This very conservative assessment has operator action within 17 minutes

REACTOR WATER LEVEL INSTRUMENTATION

MOD COMPARISON

Backfill Mod - Typical

	"cold leg" plants	"hot leg" plants[1]
Full Zone Range	yes	yes
Narrow Range	yes	no
Wide Range	yes	no
ECCS Initiation	yes	no
RPS Initiation	yes	no
Tech Space Impact	yes	no
Instrument Set Point Impact	yes	no
Post Accident Monitoring	yes	yes
Instrument Channels	4	2
Safety Grade Instruments	yes	no

1 -"hot leg" plants - maintained Yarway instruments for safety functions, "cold leg" is used for post accident

STATEMENT TO THE NRC COMMISSIONERS ON REACTOR LEVEL MEASUREMENTS

JUNE 1, 1993

BY

PAUL M. BLANCH

Good afternoon Mr. Chairman and Commissioners. I appreciate this opportunity to present my views related to the issue of level errors due to non-functioning condensate pots on boiling water reactors (BWR's).

My presentation reflects my personal opinions and those of We the People. We the People was the organization first identifying this issue, yet they have been excluded from presenting their position this afternoon.

I am somewhat encouraged that the NRC Staff issued a Bulletin on May 28, 1993, however this Bulletin clearly acknowledges the inoperability of safety systems and the fact that this significant defect violates many NRC Regulations.

Today I will be presenting the history of the problems surrounding the BWR reactor vessel water level measurements, and the appearance of a cozy relationship between the NRC Commission, NRC Staff, and the industry.

For some personal background information, I recently resigned from Northeast Utilities where I was Supervisor of Instrumentation and Controls Engineering at NU's home office in Berlin, Connecticut. My resignation was the result of a mutually acceptable agreement between NU and myself due to conflicts related to Whistleblower Harassment, Discrimination and Intimidation as a direct result of the Rosemount Transmitter issues and the recent level problems I identified both on PWR's and BWR's.

On May 4, 1993, the NRC issued a Notice of Violation, Severity Level II, to NU for top management involvement in Harassment, Discrimination and Intimidation. The Notice of Violation also concluded that Rosemount Inc., influenced NU in their discrimination which I believe was due to the fact that Rosemount had been aware of the problem for many years and had failed to inform either the NRC or the utilities of this significant defect.

After serving my country for seven years in the Nuclear Navy, I joined NU in 1972 after receiving a BS degree in Electrical Engineering. Since 1980, I had been Supervisor of Instrumentation and Control Engineering involved in numerous industry activities including many of the post TMI backfits, including the requirements for Post Accident Monitoring. I was Chairman of the INPO NUTAC addressing Emergency Response Facilities including the Safety Parameter Display System, and the old Nuclear Data Link now called ERDS.

During 1988, I discovered the undetectable failure mechanism of Rosemount transmitters that eventually resulted in my present position of unemployment. This was the first example I observed of the NRC's refusal to enforce existing Regulations. I discovered in 1987 that condensate pots on many steam generators and pressurizers were not capable of performing their function due to the presence of non-condensable gases.

With my extensive experience in this area, I was requested by the NRC, in May of 1992 to look into the unexplained level problems at the Pilgrim plant in Plymouth Mass. Within two days of this NRC request, I reported back to Pilgrim and the NRC that the condensate pots were not functioning and, in the event of an accident, significant, non-conservative, common mode errors would occur, that may inhibit some safety systems and effect other devices required by plant Technical Specifications. This problem had been studied by Pilgrim engineers for years and

millions of dollars expended on repairs that had no positive impact on the operation of the system.

As a result of the Pilgrim data, I immediately reviewed some historic data from Millstone Unit 1. This data indicated the same problem had also existed at Millstone Unit 1 for over twenty years. From experience on PWR's, NU immediately recognized the potential for significant errors and in accordance with the requirements of the Technical Specifications, initiated an Operability Determination as required by NRC Generic Letter 91-18. This Operability determination concluded these level devices were not operable and that the potential errors were in the range of 20 to 40 feet. As a result of this error, some safety systems, interlocks and post accident monitoring required by the Millstone license were not operable.

I had many conversations with NRC personnel, including two with Mr. William Russell in June of 1992, requesting the NRC inform the other utilities of these significant errors and informed him that other utilities must also perform an operability determination as required by each individual license. My pleas were ignored until Mr. Ernest Hadley, Attorney for We the People wrote to the Chairman of the Commission on July 21, 1992.

As a direct result of this letter, the NRC conducted a "public" meeting on July 29, 1992. At this meeting only the NRC staff, General Electric and the BWROG were allowed to speak. After all decisions were made by Mr. Russell, only then was I allowed to make comments. Many of the comments I made after the meeting continue to be intentionally ignored by the NRC and the industry.

During August 1992, because NU determined the instruments were inoperable, I was responsible for the development of a permanent fix for this problem. During the engineering stages of the project, at the request of my manager, I authorized our consultant, S. Levy Inc. commence preliminary engineering due to the project being on critical path. While 36 BWR's continued to operate outside of their license requirements, NU receives a Severity Level IV Violation with a statement to the press that "...Blanch violated Commission rules...". As a direct result of this violation and accompanying statement, my annual performance evaluation at Northeast Utilities was downgraded. This is another factor that led to my early resignation from NU.

The NRC took a hard-line position during this July meeting that every plant was to implement a fix within a reasonable period of time, however, our requests for an operability determination continued to be ignored. This meeting was conducted with a large amount of media attention and "fanfare". During November 1992, the NRC, General Electric and the BWROG decided that the problem must be studied for a few more months, thereby reversing their initial position requiring a timely resolution. This second meeting went unannounced except for the BWROG and General Electric. Again, the individuals responsible for the identification and the resolution, were not informed and thereby excluded Again the BWROG wants to "study " the issue for another year or more.

As usual, the NRC managed to exclude those individuals responsible for the identification of the problem from any decisions while continuing to rely solely on the organization responsible for the problem, for input. By classifying the test program and results as "propriety", the NRC and the BWROG have withheld information from my review so I am unable to verify the adequacy of the testing program.

When I learned the NRC had reversed their position based on discussions from which I was intentionally excluded, Mr. Hadley and I contacted the office of the Commission on December 18, 1992. During our conversation with Commission Staff, we were provide assurance that we would be notified of all future meetings related to the level issue. For the first four months of 1993, we faithfully receive notices of all meeting, most of which were held in North Carolina.

To me, these meetings were of little interest, especially considering the expense associated with travel.

The only meeting of interest was the ACRS meeting of May 12, 1993. I consider this Committee the only group independent of the industry and the only organization with the technical competence and authority to question the NRC Staff. On May 13, 1993, I was informed by the news media that the ACRS conducted a meeting on this topic. Needless to say, I was a little more than upset when I learned of this meeting and was apparently intentionally excluded even after written promises from the Commission Staff.

It is my understanding that the results of the testing program were presented at this ACRS meeting, however they were classified as "Proprietary" by General Electric and the BWROG. I find it appalling and very difficult to believe that information that effects the overall safety analysis of 36 nuclear plants can be withheld not only from those plants but also from the general public.

This information directly effects many BWR's. For example, Pilgrim has stated "The analysis concluded that a **29 inch** spike (error) of continuous duration...would be required to uncover the core."[1] The NRC staff and the BWROG have concluded that "..the residual error, (due to non-condensable gases is now) **27 feet**."[2]

The NRC's own evaluation of the Pilgrim errors states "...over 20 feet of reference leg volume...must be voided and not recovered to **cause a continuous 14 inch level error**...and an error of this amplitude is already considered in the interlock setpoint."[3] The ACRS and the NRC now agree that the error is 324 inches and will not recover. Is this NRC evaluation still valid considering the latest test results? With this magnitude of sustained error and the clear fact that this error would cause all level indicators to be inoperable, why is the NRC allowed Pilgrim to restart without fixing the problem?

Many other plants like Fitzpatrick, Peach Bottom 1&2, WNP-2, and LaSalle have also confirmed the existence of non-functioning condensate pots. As a matter of interest, I don't believe any plant has ever confirmed the existence of a functioning condensate pot, including Millstone Unit 1.

WNP-2 and the NRC concluded that certain isolation valves were inoperable as a result of the gas problem yet the NRC allows them to restart and operate in violation of their Technical Specifications.

It is my understanding Fitzpatrick has installed temperature monitors on the condensate pots to determine operability during plant startup. After significant expense, data was taken that indicated the condensate pots were not functioning. After the initial readings were obtained, the temperature monitoring system was disconnected and the temperatures were never published because operability could not be assured with the measured temperatures.

The fix of the level instruments involves simple thermodynamic principles and has been reviewed by most of the world experts including NU, S. Levy and General Electric. The NRC has also conducted a complete review of the design including an analysis of all possible system interactions. Testing of the system during start up verified the design functions. After more than

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[1]Letter from Mr. Charles Hehl, NRC Director of Reactor Projects to Mr. Roy Andersen, Senior Vice President, Boston Edison, dated April 8, 1992.

[2]Statement by Mr. Collins, USNRC. ACRS transcript May 12, 1993, Page 107

[3]NRC Pilgrim Inspection Report 92-28 dated January 28,1993: BECo analysis dated November 20, 1992

9 months of continuous operation at temperature and pressure, Millstone Unit 1 was shutdown and cooled down in April 1993. Precise data was taken of all level instruments and all symptoms of the presence of non-condensable gases had disappeared. The conclusion reached by NU and the NRC, is **this fix provides a simple and inexpensive long term solution to this significant problem.** All issues identified by The BWROG as reasons for further delayed implementation have been addressed by NU, the NRC, General Electric and S. Levy. All this information is available from NU. The NRC has even stated that the Millstone solution is "...cheap and it works." and "If any utilities choose to take that path, we have no problems."[4] If NU can engineer a solution in a matter of four weeks, why does it take the entire industry more than two years do understand and fix the problem? The two other concepts being considered by the BWROG were studied extensively by NU and discounted due to potential interaction problems with other safety systems and equipment.

After a review of the following facts, it is my opinion that a reasonable individual could conclude a less than open atmosphere exists between the public and the NRC, and that a very cozy relationship[5] still exists between the NRC and the nuclear industry. This cozy relationship is hindering the free flow of significant safety information between the NRC, interested public and possibly other licensees.

The Mr. William Russell of the NRC refused to let the individuals identifying the problem to participate in the July 29, 1992 meeting until all decisions were made.

At this same meeting, Mr. Russell denied the fact the he was aware of the magnitude of the problem in June 1992. This matter was investigated by the Inspector General's Office, and the allegation could not be substantiated. This means that either Mr. Russell or I am not telling the truth. I request individuals make their own determination based on our past records.

The NRC and/or the Commission continue to refuse to respond to our requests for plant specific operability determinations.

The NRC issued a violation to NU as a result of my work on Millstone 1 and then made a statement to the press that "Blanch violated Commission rules.."[6] resulting in a downgrade of my annual performance.

The NRC conducted a meeting with GE and the BWROG in November 1992, changing the schedule for implementing changes, without informing me or Atty. Hadley of this meeting.

Written[7] and verbal promises were received from the Commission Staff on December 18, 1992, that Mr. Hadley and I would be provided all information available to the Staff and that we would be informed and invited to all meetings on the level issue have not been kept.

The Staff and the BWROG became aware of the fact the test results indicated errors that were greater than expected. It is possible if the public knew the magnitude of these

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[4]Statement by Ashok Thadani to the Boston Globe, May 6, 1993

[5]"NRC Cozy Relationship with Industry": Investigative Report, House Subcommittee on General Oversight and Investigations: Representative Sam Gejdensen, Chairman: December 1987

[6]Cape Cod Times, November 6, 1992. Statement by Mr. William Ruland, NRC Region 1

[7]Letter from the Office of the Commissioner to Paul M. Blanch dated January 11,1993

errors, operation of many plants may not be justified. The BWROG decided to classify this information as "Proprietary" with the only apparent intent being to keep this information from the public.

The NRC stated during a public meeting in Plymouth Mass. on February 3, 1993 that Pilgrim had performed an operability determination as required by the Technical Specifications and Generic Letter 91-18. The NRC committed to make this document available for public review, however, even after a FOIA request, the NRC has refused to produce this operability determination.

The ACRS and the NRC Staff arranged a presentation for the ACRS on the level problems for May 12, 1993. The NRC Staff "forgot" to inform us of this most important meeting.

The Commission Staff's response was that it was the NRC Staff's responsibility to invite us.

The NRC Staff stated that this was an innocent oversight. Mr. Ashok Thadani stated that he was "out of the country" and his staff was responsible. His staff "forgot" to inform me of this meeting.

Reading the ACRS transcript of the meeting, General Electric and the BWROG stated that the results of the testing were "proprietary" and that the part of the meeting discussing the results would be closed to the public. Both before and after the closed session, the ACRS questioned what was proprietary about the information.

Only because an ACRS member mentioned after the closed session the error was 27 feet (324 inches), was I able to determine the significance of this potential level error.

I am not aware if the NRC staff has informed the utilities of results of the tests, or required any plant to consider these results in the safety analysis. This may be a violation of the "Proprietary" nature of this information.

Pilgrim's engineering analysis assumed a maximum error of 29 inches and stated core uncovery would not occur as long as the error is less than 29 inches. The error is known to be 324 inches which is greater than 29 inches. I ask you, how is the Pilgrim analysis still valid?

The NRC's own evaluation of the Pilgrim errors states "...over 20 feet of reference leg volume...must be voided and not recovered to cause a **continuous 14 inch level error**...and an error of this amplitude is already considered in the interlock setpoint."[8] The ACRS, General Electric, BWROG and the NRC all apparently agree that the **continuous error is 324 inches** and will not recover. Is this NRC evaluation still valid considering these latest test results?

Mr. Chairman, Commissioners, the industry and the NRC have intentionally been ignoring a major safety issue for almost one year. The NRC, the BWROG and the utilities continued to hide behind "testing" when analysis clearly shows the most vital instrument on a BWR cannot perform many of its designated functions.

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[8]NRC Pilgrim Inspection Report 92-28 dated January 28,1993.

The most recent analysis[9] conducted by General Electric clearly concludes the level instruments are not operable, that is, not capable of performing their designated functions The NRC's own regulations require each plant to comply with the action statements of the Technical Specifications when a device is not operable. Why does the NRC clearly fail to require these plants to comply with regulations? If plants are permitted to ignore these regulations, what other regulations are they allowed to ignore? If the reactor trip system is inoperable, will General Electric also state this is not a safety problem because the operators would recognize the need for a trip and manually trip the reactor?

I do not support the most recent proposed action by the NRC Staff requiring utilities implement a fix after July 30, 1993. Utilities will argue this is a "Backfit" and the Commission and the Staff will deliberate for months. **Instead, the Commission must direct the Staff today, to require all BWR's and PWR's perform plant specific operability determinations using the BWROG "proprietary data" on all level measuring devices using condensate pots, as required by each plant's license.**

These Operability determinations must consider the latest test results and analysis from "proprietary information" presently being withheld from most utilities and the general public. If a particular plant has data which indicates the condensate pots are at the required temperature, this alone may be sufficient to demonstrate operability.

The problems with Rosemount transmitters and condensate pots are not the most significant issues facing the industry, but provide prime examples as to the NRC's total disregard of the Regulations approved by Congress. My areas of responsibilities were quite narrow and focused only in the area of Instrumentation. One can only wonder how many other issues in the nuclear, electrical and mechanical areas are also being intentionally ignored presenting a major safety risk to people in this country.

Many environmental, public, and industry studies of nuclear power have been conducted during the past twenty years and have questioned whether or not the safety risks to the general public and the environment were warranted for the generation of electricity. Conclusions were that the risks were acceptably low because of self policing and strict enforcement of Federal Regulations approved by Congress.

Numerous members of Congress have questioned the NRC's response time and enforcement of regulations and have repeatedly been assured by this Commission and the NRC Staff that strict adherence to regulations and self-policing was protecting our country's people from ever being threatened by a Chrenobyl-like disaster. When the Regulations are being ignored as with this issue and many others, we have no idea as to the acceptability of the present risks of nuclear power.

Recent actions by this Commission have made it obvious the NRC not only ignores Regulations affecting common mode failures of vital safety systems but several IG Reports and Congressional reports have proven the "cozy relationship" between the NRC and the industry.

I appreciate this opportunity to express my views before this Commission and welcome any questions. Thank you.

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[9]Supplementary Information Regarding RPV Water Level due to Noncondensable Gas in the Cold Reference Legs of BWRs dated May 1993

May 28, 1993

SECY-93-151

POLICY ISSUE
(Information)

FOR: The Commissioners

FROM: James M. Taylor
Executive Director for Operations

SUBJECT: PROPOSED NRC BULLETIN TITLED "RESOLUTION OF THE ISSUES RELATED TO REACTOR VESSEL WATER LEVEL INSTRUMENTATION IN BWRs"

PURPOSE:

To inform the Commission, in accordance with the guidance in the December 20, 1991, memorandum from Samuel J. Chilk to James M. Taylor regarding SECY-91-172, "Regulatory Impact Survey Report-Final," of the staff's intent to issue the subject bulletin. The staff prepared this bulletin to inform the addressees about new information on level indication errors during normal depressurization and to request actions in response to this information. A copy of the proposed bulletin is provided as Enclosure 1.

DISCUSSION:

During a normal plant cooldown on January 21, 1993, operators at the Washington Public Power System, Unit 2 (WNP-2), observed a sustained level indication error of 32 inches that gradually recovered over a period of approximately 2 hours. The licensee determined that errors of this type could result in failure to automatically isolate a leak in the residual heat removal (RHR) system during shutdown cooling operation. Level indication errors of this magnitude during a normal (as opposed to rapid) depressurization had not been reported to the NRC previously.

Because of the event reported by the licensee at WNP-2, the NRC staff requested the BWR Owners Group (BWROG) to evaluate the effect of level indication errors on events, such as reactor pressure vessel (RPV) drain-down, initiated from low-pressure conditions. In response to the NRC request, BWROG submitted a report, "Supplementary Information Regarding RPV Water Level Errors due to Noncondensible Gas in Cold Reference Legs of BWRs," to the NRC on May 20, 1993. The BWROG determined that the most limiting drain-down event is an RPV drain-down to the suppression pool through the low-pressure coolant injection suction flow path. The BWROG report indicated that, for this event, the core could reach 2000 °F in as little as 16 minutes if there is no makeup to the coolant system.

CONTACT: Amy E. Cubbage, NRR
504-2875

NOTE: TO BE MADE PUBLICLY AVAILABLE AT COMMISSION BRIEFING ON JUNE 1, 1993

On the basis of the assessment of the NRC staff and the information provided by BWROG, the staff concluded that additional compensatory measures are needed for normal cooldown evolutions. Although the interim procedures currently in place are appropriate for events initiated from full power, they are not adequate for providing protection against events initiated during cooldown when automatic safety systems may be defeated by level instrumentation inaccuracies.

In the proposed bulletin the staff requests the addressees to take short-term compensatory actions to ensure that potential level errors will not result in improper operator actions during transients and accident scenarios initiated from reduced pressure conditions. The staff also requests that each licensee implement hardware modifications necessary to ensure the level instrumentation system design is of high functional reliability for long-term operation.

Existing rules, in particular General Design Criterion (GDC) 13, "Instrumentation and control," GDC 21, "Protection system reliability and testability," and GDC 22, "Protection system independence," of Appendix A to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR Part 50), and Section 50.55a(h) [10 CFR 50.55a(h)] require that the instrumentation and equipment associated with the reactor protection system shall be accurate and reliable under normal operating and postulated accident conditions. The level indication errors that have been observed in plants and in the BWROG test program during normal and rapid depressurization conditions have shown that the accuracy and reliability of the existing designs can be affected by the accumulation of noncondensible gases in the reference legs of the level instruments. This bulletin requests the addressees to take actions to achieve compliance with the existing regulations. Therefore, no new rulemaking is necessary.

A notice of opportunity for public comment on the proposed bulletin was not published in the Federal Register because the staff determined that the new information concerning level indication errors during normal depressurization warranted expedited handling of the bulletin. The staff considers this bulletin to be a Category 1 action in accordance with Section III.D. of the Charter of the Committee to Review Generic Requirements (CRGR). The bulletin will be published in the Federal Register after it is issued.

The proposed bulletin was endorsed by the CRGR during its meeting on May 27, 1993. The staff has incorporated all comments provided by CRGR in that meeting.

The Office of the General Counsel reviewed this bulletin and had no legal objections.

The staff has issued this bulletin.

A second enclosure is an additional staff vu-graph which will be used at the June 1 Commission meeting to summarize the actions requested by the staff in the enclosed bulletin.

James M. Taylor
Executive Director
for Operations

Enclosures:
1. Proposed Bulletin Titled "Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs"
2. Staff Vu-graph Titled "Requested Actions"

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

May , 1993

NRC BULLETIN 93- : RESOLUTION OF ISSUES RELATED TO REACTOR VESSEL WATER LEVEL INSTRUMENTATION IN BWRs

Addressees

All holders of operating licenses or construction permits for boiling water reactors (BWRs) with the exception of Millstone, Unit 1, and Big Rock Point.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this bulletin to (1) notify addressees about new information concerning level indication errors that may occur during plant depressurization, (2) request that all addressees take certain action(s), and (3) require that all addressees report to the NRC if and to what extent the requested actions will be taken and notify the NRC when actions associated with this bulletin are complete.

Background

As discussed in NRC Information Notice 92-54, "Level Instrumentation Inaccuracies Caused by Rapid Depressurization," and Generic Letter 92-04, "Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs Pursuant to 10 CFR 50.54(f)," the staff is concerned that noncondensible gases may become dissolved in the reference leg of BWR water level instrumentation and lead to a false high level indication after a rapid depressurization event. Generic Letter 92-04 requested that addressees determine the impact of potential level indication errors after a rapid depressurization event on how the plants are operated. Generic Letter 92-04 also requested that addressees take short term compensatory measures to mitigate the consequences of potential level indication errors after a rapid depressurization event and provide the staff with plans for long term corrective actions, including any proposed hardware modifications. The generic letter requested that addressees implement the long term corrective actions during the first refueling outage commencing after November 19, 1992.

The industry, through the BWR Owners Group (BWROG), requested a delay in the implementation of the long term corrective actions until a de-gas test program could be completed. The test program was intended to gather data to support the design of any necessary hardware modifications. On December 2, 1992, the staff agreed to extend the deadline for the submission of addressee plans for the long term actions to July 1993, with implementation at the earliest opportunity.

Description of Circumstances

During a normal plant cooldown on January 21, 1993, operators at the Washington Public Power System, Unit 2 (WNP-2), observed a sustained level indication error of 0.81 meters [32 inches] that gradually recovered over a period of approximately 2 hours. The licensee determined that errors of this type could result in failure to automatically isolate a leak in the residual heat removal (RHR) system during shutdown cooling operation. On April 8, 1993, the staff issued Information Notice 93-27, "Level Instrumentation Inaccuracies Observed During Normal Plant Depressurization," to discuss level indication errors that may occur during normal plant depressurization.

Discussion

Following the event reported by the licensee at WNP-2, the NRC staff requested the BWROG to evaluate the effect of level indication errors on events, such as reactor pressure vessel (RPV) drain-down, initiated from low-pressure conditions. Several paths have the potential to drain the RPV. Operator misalignment of one or more valves can establish a flow path resulting in a drain-down of the RPV. Several events of this type have occurred at operating BWRs. Automatic isolation signals based on low RPV level are normally credited for terminating these events. However, automatic isolation of the RHR system, and other systems, will not occur if there are large level errors in multiple instruments.

In response to the staff request, the BWROG submitted a report, "Supplementary Information Regarding RPV Water Level Errors due to Noncondensible Gas in Cold Reference Legs of BWRs," to the NRC on May 20, 1993. The BWROG determined that the most limiting drain-down event is an RPV drain-down to the suppression pool through the low-pressure coolant injection suction flow path. The BWROG report indicated that, for this event, the core could reach 1100 °C [2000 °F] in as little as 16 minutes if there is no makeup to the coolant system.

On the basis of the assessment of the NRC staff and the information provided by BWROG, the staff concluded that additional compensatory measures are needed for normal cooldown evolutions. Although the interim procedures currently in place are appropriate for events initiated from full power, they are not adequate for providing protection against events initiated during cooldown when automatic safety systems may be defeated by level instrumentation inaccuracies. In addition, BWROG has completed a reference leg de-gas test program. Although the data are still preliminary, initial results of the test program show that large errors in the indications from the level instrumentation are possible. This information and the event at WNP-2 confirm that the noncondensible gas problem is real and not theoretical, and that the problem applies even to slow depressurizations. Therefore, for longer term operation this problem needs to be addressed promptly with hardware modifications and immediately with compensatory measures for cooldown conditions.

Millstone, Unit 1, is exempt from this bulletin because Northeast Utilities, the licensee, has already implemented a hardware modification to prevent the buildup of noncondensible gases in the RPV level instrumentation reference legs. Big Rock Point is exempt from this bulletin because the RPV level instrumentation system installed at that facility is not susceptible to the de-gas problem described in this bulletin.

Requested Actions

1. Short Term Compensatory Actions

   (a) Within 15 days of the date of this bulletin, each licensee is requested to implement the following measures to ensure that potential level errors caused by reference leg de-gassing will not result in improper system response or improper operator actions during transients and accident scenarios initiated from reduced pressure conditions (Mode 3):

      (1) Establish enhanced monitoring of all RPV level instruments to provide early detection of level anomalies associated with de-gassing from the reference legs.

      (2) Develop enhanced procedures and additional restrictions and controls for valve alignments and maintenance that have a potential to drain the RPV during Mode 3.

      (3) Alert operators to potentially confusing or misleading level indication that may occur during accidents or transients initiating from Mode 3. For example, a drain-down event could lead to automatic initiation of high-pressure emergency core cooling systems (ECCS) without automatic system isolation or low-pressure ECCS actuation.

      Facilities that are in cold shutdown during this 15 day period are requested to complete the above actions within 15 days of the date of this bulletin or prior to startup, whichever is later.

   (b) By July 30, 1993, each licensee is requested to complete augmented operator training on loss of RPV inventory scenarios during Mode 3, including RPV drain-down events and cracks or breaks in piping.

      Facilities that are in cold shutdown as of July 30, 1993, are requested to complete this action prior to startup from that shutdown.

   All of the short term actions described above shall remain in effect until the hardware modifications described below have been implemented.

2. Hardware Modifications

   Each licensee is requested to implement hardware modifications necessary to ensure the level instrumentation system design is of high functional

reliability for long-term operation. This includes level instrumentation performance during and after transient and accident scenarios initiated from both high pressure and reduced pressure conditions. The hardware modifications discussed here are the same as the modifications requested in Generic Letter 92-04. Since the level instrumentation plays an important role in plant safety and is required for both normal and accident conditions, the staff requests that these modifications be implemented at the next cold shutdown beginning after July 30, 1993. If a facility is in cold shutdown on July 30, 1993, each licensee is requested to implement these modifications prior to starting up from that outage.

Reporting Requirements

Written reports are required as follows:

(1) Addressees choosing not to take the requested short term actions must submit a report within 15 days of the date of this bulletin containing a description of the proposed alternative course of action, the schedule for completing it, and a justification for any deviations from the requested actions.

(2) By July 30, 1993, all addressees must submit a report providing:

(a) the description of the short term compensatory actions taken, and

(b) a description of the hardware modifications to be implemented at the next cold shutdown after July 30, 1993. If an addressee chooses not to take the requested actions specified in the Hardware Modifications section, the report shall contain a description of the proposed alternative course of action, the schedule for completing it, and a justification for any deviations from the requested actions.

(3) Within 30 days of completion of the requested hardware modifications, a report confirming completion and describing the modification implemented.

Address the required written reports to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555, under oath or affirmation under the provisions of Section 182a, Atomic Energy Act of 1954, as amended, and 10 CFR 50.54(f). In addition, submit a copy to the appropriate regional administrator.

Backfit Discussion

The level errors that could result from the effects of noncondensible gases in the level indication reference legs may prevent the level instrumentation systems in BWRs from satisfying the following regulations:

(1) General Design Criterion (GDC) 13, "Instrumentation and control," of Appendix A to 10 CFR Part 50 which states: "Instrumentation shall be provided to monitor variables and systems over their anticipated ranges

for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety." Existing instrumentation may not accurately monitor reactor vessel water level under normal cooldown or accident conditions.

(2) GDC 21, "Protection system reliability and testability," which states: "The protection system shall be designed for high functional reliability...commensurate with the safety function to be performed." The instrumentation may not be reliable during and following normal depressurization and rapid depressurization.

(3) GDC 22, "Protection system independence," which states: "The protection system shall be designed to assure that the effects of natural phenomena, and of normal operating, maintenance, testing, and postulated accident conditions...do not result in loss of the protection function." Degassing may cause a loss of the reactor vessel water level indication function during and following normal depressurization and rapid depressurization.

(4) Section 50.55a(h) of Title 10 of the Code of Federal Regulations (10 CFR 50.55a(h)), which requires that protection systems, for those plants with construction permits issued after January 1, 1971, meet the requirements stated in editions of the Institute of Electrical and Electronics Engineers Standard, "Criteria for Protection Systems for Nuclear Power Generating Stations" (IEEE-279). Section 4.20 of IEEE-279 states: "The protection system shall be designed to provide the operator with accurate, complete, and timely information pertinent to its own status and to generating station safety." The water level instrumentation for the reactor vessel may not be accurate during and following normal depressurization and rapid depressurization.

The hardware modifications discussed here are the same as the modifications requested in Generic Letter 92-04 and, therefore, the modifications are not considered to be additional backfits beyond those requested in Generic Letter 92-04. The short term compensatory actions requested by this bulletin are considered necessary to ensure that the addressees are in compliance with existing NRC rules and regulations. Therefore, this bulletin is being issued as a compliance backfit under the terms of 10 CFR 50.109(a)(4).

A notice of opportunity for public comment on this bulletin was not published in the Federal Register because of the urgent nature of the short term compensatory actions requested by this bulletin and because the hardware modifications requested are the same as those previously requested in Generic Letter 92-04.

Paperwork Reduction Act Statement

This bulletin contains information collection requirements that are subject to the Paperwork Reduction Act of 1980 (44 U.S.C. 3501 et seq.). These requirements are covered by Office of Management and Budget clearance number 3150-0012, which expires June 30, 1994. The estimated average number of burden hours is 200 hours per licensee response, including the time for

reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for further reducing reporting burden, to the Information and Records Management Branch (MNBB-7714), U.S. Nuclear Regulatory Commission, Washington, D.C. 20555; and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-3019, (3150-0012), Office of Management and Budget, Washington, D.C. 20503.

Compliance with the following request for information is purely voluntary. The information would assist NRC in evaluating the cost of complying with this bulletin:

(1) the licensee staff time and costs to perform requested inspections, corrective actions, and associated testing

(2) the licensee staff time and costs to prepare the requested reports and documentation

(3) the additional short-term costs incurred as a result of the inspection findings such as the costs of the corrective actions or the costs of down time

(4) an estimate of the additional long-term costs which will be incurred in the future as a result of implementing commitments such as the estimated costs of conducting future inspections or increased maintenance

If you have any questions about this matter, please contact the technical contact or the lead project manager listed below or the appropriate Office of Nuclear Reactor Regulation project manager.

James G. Partlow
Associate Director for Projects
Office of Nuclear Reactor Regulation

Technical contact: Amy E. Cubbage
(301) 504-2875

Lead project manager: James W. Clifford
(301) 504-1323

Attachment:
List of Recently Issued NRC Bulletins

ENCLOSURE 2

REQUESTED ACTIONS

* WITHIN 15 DAYS IMPLEMENT INTERIM COMPENSATORY ACTIONS FOR MODE 3

  - ENHANCED MONITORING OF LEVEL INDICATION

  - ADDITIONAL ADMINISTRATIVE CONTROLS
    - RESTRICT VALVE MOVEMENTS
    - VERIFY VALVE POSITION
    - LIMIT MAINTENANCE

  - ALERT OPERATORS TO POTENTIALLY CONFLICTING INDICATIONS DURING A MODE 3 TRANSIENT

* BY JULY 30, 1993 TRAIN OPERATORS ON DRAINDOWN EVENTS AND THE IMPLICATIONS OF WATER LEVEL ERRORS

* IMPLEMENT HARDWARE MODIFICATIONS AT 1ST COLD SHUTDOWN AFTER JULY 30, 1993