NUCLEAR REGULATORY COMMISSION

ORIGINAL

COMMISSION MEETING

In the Matter of: PUBLIC MEETING

DISCUSSION OF REPORT ON TASK FORCE ON EVALUATION OF GINNA EVENT

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

DISCUSSION OF REPORT OF TASK FORCE ON

EVALUATION OF GINNA EVENT

PUBLIC MEETING

Nuclear Regulatory Commission
1130 H Street, N. W.
1717 H Street, N. W.
Washington, D. C.

Wednesday, April 14, 1982

The Commission met, pursuant to notice, at 2:00 p.m.

BEFORE:

NUNZIO PALLADINO, Chairman of the Commission
VICTOR GILINSKY, Commissioner
JOHN AHEARNE, Commissioner
THOMAS ROBERTS, Commissioner

STAFF MEMBERS GIVING PRESENTATIONS AT MEETING:

S. CHILK
F. REMICK
S. TRUBATCH
W. DIRCKS
H. DENTON
T. MARTIN
R. HAYNES
G. HOLAHAN
S. REYNOLDS
J. NEHEMIAS
J. WIGGINS
R. ZIMMERMAN

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DISCLAIMER

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P R O C E E D I N G S

CHAIRMAN PALLADINO: The meeting will please come to order.

The Commission meets this afternoon to hear a briefing on the NRC report for the January 25, 1982, steam generator tube rupture at R. E. Ginna nuclear power plant.

The report is the product of an NRC task force composed of representatives of the Office of Nuclear Reactor Regulation, the Office of Inspection and Enforcement, the Office of Analysis and Evaluation of Operational Data and the Regional Offices of Region I and Region III.

The licensee was not provided an opportunity to review or recommend changes to the report but cooperated fully with the task force effort and provided information as requested.

The report documents the circumstances surrounding the January 25th steam generator tube rupture event at the Ginna plant. It focuses on the period from 9:25 a.m. of January 25 when the tube rupture occurred to 10:45 a.m. on January 26 when the plant entered the recovery phase.

The report is intended to describe factual information and significant findings associated with the event and thereby provide the required information for detailed analysis and recommendations by the various NRC offices. This latter effort and the resulting dissemination of information will ensure that NRC and the nuclear industry continue to profit from operating an accident experience.

Unless my fellow Commissioners have any other opening remarks they would like to make, I suggest turning the meeting over to Mr. Dircks.

COMMISSIONER AHEARNE: I have a question I would like to ask Mr. Dircks.

Bill, is this report the response to the Chairman's request of task force for the evaluation of January 29th?

MR. DIRCKS: Yes.

COMMISSIONER AHEARNE: What the Chairman had asked for is an interim report to the Commission with findings, conclusions and recommendations. I had difficulty coming across the conclusions and recommendations. I don't think they are there.

MR. DIRCKS: Let me talk about that right away. This is in response to the Chairman's memo of January 29th. I talked to Ron Haynes on February 1st and give him a go-ahead on the thing. In the meantime we had several other activities underway, the longer-term look at steam generators by the Steam Generator Task Force and the review of those problems in that area.

What the task force has done was to do as complete a factual summary of the event at Ginna as possible. The offices have reviewed the factual summary thus far and they have no immediate recommendations for immediate action.

The next step in this phase is for the offices to go through a more in-depth look at this report and see if there are any longer-term actions to be taken. In addition to that, what we want to do is turn the report over to the Steam Generator Task Force and for them to review it from their perspective.

Another point that Harold wants to do is to distribute the report widely to all the licensees to take a look at the operator actions involved.

So there are no immediate recommendations in here. The longer-term recommendations will follow as each office goes through the report in a very in-depth manner.

COMMISSIONER AHEARNE: But I guess what you are saying is that a conclusion is that there is no immediate action that you can see being needed and so the recommendation is to support that conclusion to take no immediate action and then to turn this report, as you say, over to the longer-term effort.

MR. DIRCKS: Yes.

Those are the only points in response to your question that I wanted to make. It is a factual summary. There is no need to take any immediate actions. If there were, we would have made those recommendations even before you got the report today.

CHAIRMAN PALLADINO: This is a factual report of just the period that I described?

MR. DIRCKS: Yes.

CHAIRMAN PALLADINO: It does not go into the facts that were obtained as a result of later inspections and therefore doesn't include metallurgical information and the like.

MR. HAYNES: We do cover some post-event work there and we do have some photographs of where we stand at this time on the metallurgic aspects.

MR. DIRCKS: There is certainly information in here that the Steam Generator Task Force should be reviewing during the course of their deliberations.

Ron.

MR. HAYNES: May I just lead off. Mr. Chairman and Commissioners ---

CHAIRMAN PALLADINO: For the benefit of the public it might be well just to identify yourselves since we didn't introduce all the people at the table.

MR. HAYNES: My name is Ronald Haynes and I am the Regional Administrator at the Philadelphia Office of the NRC called Region I.

On last January 28th I provided a preliminary briefing to you about the Ginna steam generator tube rupture event which occurred on January 25th. I had just then returned from the Ginna site and my report to you was necessarily brief and limited to a broad look at the major operational and radiological events which had occurred.

On January 29th, Mr. Chairman, that you spoke to earlier, you directed Mr. Dircks to establish a task force to review and evaluate the Ginna event. On February 1st Mr. Dircks discussed this assignment with me and then later he confirmed our discussion in a memorandum of February 5th which appointed me to organize and direct this effort.

Now to carry out this assignment I functioned as chairman of a five-person steering group comprised of senior managers from the Offices of NRR, OIE, AEOD and Region I. On February 4th the steering group met for the first time in Bethesda and documented a charter for the task group effort. This charter delineated the scope of the work, as you described previously, Mr. Chairman, and a preliminary outline of the report was then developed to document it.

The effort was really to obtain and report the relevant facts of what occurred during this period between 9:25 on the 25th and about 10:45 on January 26th, plus bring in some post-event activities that took place that were of interest, particularly with respect to the steam generator, and what was found at that time with what happened to the tube and the cause of the leakage as best could be determined. What we wanted to do with this report was then to be able to provide a data base, if you can, for detailed analyses and consideration by the other offices in the NRC.

On February 8th with advice and concurrence of the steering group I appointed Mr. Tim Martin as the leader of the task force and detailed him full time to the assignment. Mr. Martin is a Senior Manager in Region I. He is Director in charge of Division of Engineering and Technical Programs.

He was on leave in Hawaii during the event when it occurred and so the task force was his first involvement with this incident. He came on that Monday and got the assignment.

(Laughter.)

MR. HAYNES: Now during the execution of this assignment the steering group met several times with Mr. Martin and members of the task force and provided guidance.

COMMISSIONER AHEARNE: Jim, he really didn't have to throw that in, did he?

(Laughter.)

MR. HAYNES: They provided the guidance as requested and this report which we have here, NUREG 0909, also includes information and input from the Federal Emergency Management Agency.

As you know, we did this to be able to obtain a fuller understanding of the governmental response to the event. As you know, FEMA did respond to the site on January 25th and worked with us to the 26th, and I am happy to say that their cooperation has continued throughout this period on the work of the task force in developing the information.

Now if I can at this time, I would like to turn over the major part of the presentation to Mr. Martin. As most of you know, Tim is well known an experienced leader in investigating technical events at operating nuclear power plants. He performed a key role at several investigations associated with the Three Mile Island II accident as well as the Indian Point II flooding event and as well as security problems we h out at the Beaver Valley facility.

Tim, if you will.

MR. MARTIN: Mr. Chairman, Commissioners, my name is Tim Martin. I am the Director of the Division of Engineering and Technical Programs in Region I. I received this assignment on a Sunday back in February.

I met with the steering group and received my charter on the following Monday, and I want to reiterate that we were to document the facts and findings of facts. We were not to make recommendations and we were not to come to conclusions. This was to be a mother document, a document to be provided to other offices who would do more detailed review, evaluation and ultimately to develop recommendations. That was the charter we operated under.

I will take exception to one thing relative to the steam generator tube documentation in the document. Obviously all the examination of events was done post-event and all the things that are reported in there reflect back to that period. The tube did rupture during the period we were chartered to look at and therefore we provided the best information we had about the tube rupture that occurred during that event. So the document basically reflects that period.

Now the Section 7 in the document does reflect some post-event activities, but they are necessary to put the earlier event into perspective and they were therefore provided for that reason.

COMMISSIONER AHEARNE: Tim, since you do end up discussing some of the examination of the tube, this is information current as of?

MR. MARTIN: I have to turn to Sam Reynolds.

Mr. REYNOLDS: As of three weeks ago.

MR. MARTIN: The NUREG was put together by a task force of 13 principal authors and I want to in a spirit of regionalization let you know that we had four representatives from NRR, we had one from AEOD, we had three from I&E, we had two from Region III and three from Region I.

We were also assisted by FEMA, by our contactor, Battelle Northwest, by the Jet Propulsion Laboratory and their computer enhancement of our video, and also we had abundant assistance from all the offices represented by the members who provided us calculations, analayses, reviews and recommendations. It was a team effort of all NRC and we are very appreciative of the cooperation we got.

We also had three excellent techical editors provided by Mr. Besaw'shop who worked some damn long hours and they really deserve a lot of credit.

The information that you see in this document was generated as a result of a two-week visit to the site. We made observations, we performed some tests, we made some measurements, we conducted interviews, we analyzed data, we monitored audio tape generated both by the licensee and by us, we took video tape that was generated by the licensee and subjected it to computer enhancement, we took some procedures and walked through them to see what the problems might be with them and we reviewed a lot of documents.

Basically the first two weeks was spent on site to gather the data which was then brought back to the offices to do the analysis.

The final document was ready on the 8th of April. At that time I send it to the printers. I sent it to the various NRC staffs who would need to review it in preparation for this briefing today and I sent it to the licensee and the vendor. That was the first time they saw it. It was sent to them with a cover letter saying this is for proprietary review only. We did not solicit any further review. In fact, it was being printed as they were reviewing it.

We got our release on Monday the 12th for the proprietary purposes. The Ginna plant did coordinate the vendor review and report to us. The safeguard release was done by our Nuclear Material Safety and Safeguards Office and we got that about the same time.

So at this time the green document is ready for release. There are minor differences between the yellow document and the green document. Section 572, we noted an error on Friday. I think it was about the 9th. It had to be corrected and it had to be right in the document that was printed. So what you see is a result of my staff pointing out a problem and we got that fixed. There are also some typos that are corrected. So that is the major difference.

With that lead in I would like to start with slide one.

(Slide presentation.)

The first two slides are really for the purpose of giving you a lay of the land and pointing out the equipment which is a problem. The reactor vessel is near the center toward the bottom. The things to point out in the reactor vessel are the thermocouples that were located at the exit of the core and in the upper head were of extreme value to the operators.

Coming out through the hot leg on the B side, and the B side has the faulted steam generator, we have the let-down line to the CVCS system, the chemical volume and control system. This was the major source of water that ultimately caused the rupture of the pressurizer relief tank disk.

Working my way around the reactor coolant pump and then the injection point for the charging flow from the CVCS, this injection point along with the safety injection, which really come in almost on top of each other, are the major source of cool water into the B loop and we will address that later when we talk about how we tried to resolve what kind of thermal transient that the reactor vessel saw.

This plant has one peculiarity. There are no TH or hot-leg indications inside the control room. They do have RTDs located in the hot legs and they do compute a delta T, but they do not bring out hot leg. The fact that that information was not available caused us some confusion over the emergency notification system as we kept asking for the information and they didn't have it.

There is cold-leg information though. The cold-leg RTDs are located almost right on top of the safety injection and charging points. The RDT sticks about one inch into the pipe. This is a 27 and a half inch pipe. So you don't get a hell of a lot of good information from it.

The temperature dropped very low shortly after natural circulation stopped in the B loop and this was probably caused by the cold water coming in. The safety injection water, by the way, was running at the tank about 69 degrees and we believe that it probably heated up to around 90 degrees from pump heat and from the heat tracing, but still there was very cool water being injected at this point.

Coming on around the diagram we have the pressurizer. The pressurizer heater controls tripped the heaters very early in the event as the pressurizer voided. They will not be restarted until after a decision is made to restart the reactor coolant pump and it will be a while before the pressurizer actually gets a bubble back in it.

On the pressurizer you will notice there is one pressure transmitter. That is the narrow-range pressure transmitter. It is used for safety circuits for reactor protection and safety injection circuits. It is the only safety related pressure transmitter indicator on this system. I will talk about the other one shortly. It so happens that this one bottoms out at about 1700 pounds. In the majority of the transient and in the majority of the recovery this instrument was on this lower scale. It was the only safety indication of pressure that they had.

Coming off the top left of the pressurizer you see a number of valves with motor operated valves in front of them. These are the PORVs, the power operated relief valves. There are two of them. They have a dual purpose. One for controlling transients that you don't want to challenge your code safeties, and, two, they are used for low-pressure overpressure protection, or low temperature pressure protection.

The PCV-430 you see there is the one that did fail. It failed in the open position, and I will talk about it a little bit later. It was due to a failure in the pneumatic system, not the valve itself. The valve functioned probably three times, but on the fourth time started to shut and then reopened by itself and this was a result of the control system malfunction.

The motor operated valve, the block valve did fuction properly. It takes about 40 seconds for it to close. So there was some discharge. Again, I reiterate, it is not the major source of water to the pressurizer relief tank. In fact, the major source is going to be from the let-down system, and I will talk about that in a second.

On the line from the power operated relief valve there is a temperature element. The temperature element did indicated elevated temperatures for a significant period of time and caused the operators to suspect that the PORVs were leaking so they shut both block valves. So both the PORVs were isolated very early in the event.

Coming on around now, right above the pressurizer relief tank which is in the upper-right-hand side you see the line that leads down to it has letdown relief feed into it and seal return relief. The seal return relief lifted almost immediately after containment isolation because you have cut off charging flow.

Your primary system is now bleeding back through the seals. It pressurizes the line to protect the low-pressure piping downstream and the seal relief opens. It is about five GPM max and probably closer to one GPM actually. You can actually watch the level trace on the pressurizer relief tank and you can see it come up, but it is a very small contribution. The major contribution will be the letdown relief and we will talk about that in a little bit.

Going on down, the pressurizer relief tank rupture disk did rupture during the event. It dumped approximately 1,320 gallons to the containment sump. I guess that is all I want to say about that.

Coming on around now and we are back to the A loop, you see the other pressure instrument located off the hot log of the A loop. This one is a wide-range instrument, zero to 3,000 pounds. It was used by the operators to determine if they had saturation conditions, it was used by the operators to determine the delta P from the primary system to the steam generator for leak control and it was used by the operators to determine when they could go into the RHR mode so they wouldn't pressurize the low-pressure piping. It was a very important instrument. It is not safety related. Yet, they had to have it and this was the only one they could use.

Slide two, please.

CHAIRMAN PALLADINO: Can I ask Mr. Dircks a question. Do we have line diagrams of these of every plant at least in this much detail available?

MR. DIRCKS: I don't think we have it in that detail. I think we should.

CHAIRMAN PALLADINO: Yes, I think so because this would help. Thank you.

MR. MARTIN: Mr. Chairman, one of the things we did note from this event. We expected the Westinghouse plant to have a TH indication. It caused a great deal of confusion as we kept asking for it and they kept not being able to give it to us and we didn't understand why. The ultimately ended up giving us core exit temperatures and that caused further confusion because the core exit was reading less than the cold leg temperatures just because of the calibration problem.

CHAIRMAN PALLADINO: But now you had a cold leg temperature.

MR. MARTIN: Yes, sir.

CHAIRMAN PALLADINO: You had the delta T.

MR. MARTIN: We had the delta T. Going back to the TMI experience we knew that calculated values are subject to errors. So we didn't have a great deal of faith in calculated values. We wanted the raw information.

CHAIRMAN PALLADINO: In other words, the sum of delta T and T cold did not satisfy you.

MR. MARTIN: It did not.

This next drawing is shown for two purposes. One, to show you where the atmospheric relief paths are and also to point out some things that are going to play a major part in the following discussion.

The two steam generators, they feed out. There are pressure instruments located on both the main steam lines. They have an atmospheric relief that is normally set at 1050 pounds. It has a manual block valve. Then there are four code safeties. Three of them are set at 1140 and one is set at 1085. So the atmospheric power operated relief valve on this one is around 1050. Normally you would use it and it would prevent challenging your code safeties. If it fails you have always got the block valve. On the code safeties you don't.

We have noted that during this event the operators did isolate the block valve on the faulted steam generator atmospheric PORV. It certainly is not going to stop the pressure from increasing. The code safeties were subsequently challenged. Had they failed, and we believe that they did fail to recede on several instances, there was no way to isolate them. So they removed one line of defense.

Release points, obviously to the condenser you have the air ejectors. Any of the code safeties relieving, and one of them did on the B, so that is a release point. The exhaust to atmosphere from the auxiliary feedwater pumps was also a release point. I will show these to you on a diagram later on and how they fit in with the plume.

One comment I would like to make on the configuration of the main steam line. The main steam line comes out of the steam generator and rises several feet, turns horizontal, snakes around for a thermal expansion, goes through the containment wall and then dives down 20 or 30 feet, turns horizontal and then all these connections for the safety valves and the PORV and the tap-off for the feedwater pump are located in a horizontal run. Then you have got your main steam isolation valve.

This configuration resulted in when we had flooding filling that line. We probably ended up with a gas bubble at the top of the high point and we probably had partitioning of the radionuclides and the volitiles ended up in the gaseous space. You had water now sitting up against your code safeties. So when they ultimately relieved we had water relief versus steam relief which is assumed in the analysis that we do for steam generator tube rupture events.

With that lead in, then I would like to go to slide three.

We chose, after examining the event, to divide it into nine phases. The nine phases were chosen because during each phase similar things seemed to be going on. The trends of the parameters were somewhere and it seemed to divide into that.

Initially we were at steady state. We were operating at 100 percent power and everything was copacetic. There was no, and I repeat, there was no indication, no warning that there was a leakage into the steam generator. The blow-down monitors didn't show anything. The air ejectors didn't show anything. The chemistry didn't show anything.

COMMISSIONER AHEARNE: And there was no indication of leakage in any previous ---

MR. MARTIN: In years past they had had leaking tubes which they had been able to detect.

COMMISSIONER AHEARNE: But there was none for this particular tube?

MR. MARTIN: None for this one, sir.

COMMISSIONER AHEARNE: And you are saying that just prior to this event there was no ---

MR. MARTIN: No indication.

COMMISSIONER AHEARNE: Now is there an instrument with a set point at a certain number of gallons per minute that they should have picked something up, or does it alarm at some point?

MR. MARTIN: Roy, can you answer that?

MR. ZIMMERMAN: The air ejector alarm would probably be the most sensitive. My name is Roy Zimmerman. I am Resident Inspector at Ginna. The air ejector alarm would be an aid along that line. They did have some leakage from B steam generator in their previous cycle but it was a very small leak. There was nothing in this present cycle.

COMMISSIONER AHEARNE: There is no instrument that would alert them that there is a leak in the steam generator at some certain number of gallons per minute loss rate?

MR. HAYNES: You would do that on a water balance, Commissioner, and there is no direct reading.

MR. MARTIN: They are able to monitor for the tech spec limits on leakage using the water chemistry and also the blow-down monitor which is probably a little less sensitive than the air ejector. I can't tell you what the alarm on the air ejector equates to in terms of gallons per minute. Obviously it is strongly dependent upon the activity in the primary system.

So Phase I steady state operation.

Phase II was the tube rupture and depressurization. The depressurization, it started at 9:25. The initial indications were the air ejector alarm. They had a steam flow feed flow mismatch on the steam generators, on the B steam generator specifically. They had a pressurizer level alarm, a low-pressure alarm. They ultimately had at 9:28 a scram. Shortly thereafter there was a safety injection. Shortly thereafter, in fact almost coincidentally, a containment isolation, noting that the safety injection pumps had started, that they were scrammed and pressure was dropping. They tripped the reactor coolant pumps at 9:29. The pressure continued to drop. It dropped below 1200 pounds, probably at 1150 or something like that. The safety injection pumps were then taking hold and pumping water in.

During the Phase III, which we call the natural circulation repressurization, you can see the effect of the safety injection. You can also see the effect of the cool-down which is occurring in natural circulation on both A and B steam generators because at least in the initial part of this the generators have not been isolated. They are still trying to determine.

At 9:33 they have already notified the NRC that there was a steam generator tube rupture event. They choose at this time not to say that it is in the B generator because they are not confident. They know they have had one. They think it is a B but they are doing some further checks. Some of those further checks includes a radiation reading on the main steam lines. It confirms for them that it is the B steam generator. By 9:40 they have isolated the B steam generator.

The level continues to rise in the B steam generator and finally goes off scale in another 15 or 20 minutes.

CHAIRMAN PALLADINO: What was it that led them to conclude it was the B generator?

MR. MARTIN: The initial thing that told them was they got a steam flow feed flow mismatch on that generator, a slight perturbation in level. I think one of the things that probably confused them and didn't make them take immediate action was on the subsequent scram both steam generators observed shrink to about the same level. It was only then the subsequent radiation reading on the main steam lines confirmed for them that it was the B steam generator. So at 9:40 they did shut the main steam isolation valve and that was really the last thing, the isolator on that generator at that time. The taps were all isolated and the auxiliary feed was all isolated and everything else was taken care of.

COMMISSIONER AHEARNE: Do you find disturbing or not much of a problem that it took 15 minutes to reach that conclusion?

MR. MARTIN: No, I do not find it disturbing. Quite frankly, I find these operators extremely well trained.

COMMISSIONER AHEARNE: I am not talking about the operators.

MR. MARTIN: That it took them 15 minutes?

COMMISSIONER AHEARNE: That it took them 15 minutes.

MR. MARTIN: No, I don't think so. If they had bottled the wrong one and then had to bottle the other, you know that would cause them a significant problem. I think they took prudent action.

COMMISSIONER AHEARNE: But in that type of time period you had reached the conclusion that it was which generator ---

MR. MARTIN: I am sure for them this went by in about a half a minute.

COMMISSIONER AHEARNE: I am not asking that.

MR. MARTIN: I do not find fault.

COMMISSIONER AHEARNE: I recognize that. I have read your report, I have recognized that you have reached the conclusion that the operators did very well. That wasn't my challenge. My question really was do you find that to take 15 minutes to reach that conclusion, do you think that that is an adequate amount of time? Let's say our procedures or the procedures are such that they lead you on every one of these scenarios you go through to conclude it will take 15 minutes. Are you satisfied? Is that a reasonable amount of time?

MR. MARTIN: I have no problem with it. I can also point out that the FSAR assumes an hour would be nice but four and a half hours is okay.

CHAIRMAN PALLADINO: Is the 15 minutes dependent on a number of factors? Could it have been longer or shorter?

MR. MARTIN: I think if it had been a smaller leak it would have been more difficult to determine. This turns out to be probably your bounding leak. We will talk about it later, but it comes out at about 760 gallons per minute initially. If that is not right on the maximum, it is awful close.

CHAIRMAN PALLADINO: What do you mean if that is not right on the maximum? Why couldn't it be more?

MR. MARTIN: You would have to shear more tubes. You are basically at the critical flow.

CHAIRMAN PALLADINO: More tubes is what I was thinking about.

MR. MARTIN: I want to point out here that in a review of the data after the event in the quite of our offices we were able to say that there was probably a bubble formed in the top of the reactor vessel during this initial depressurization. We wouldn't expect the operators to spot it. It wasn't there very long.

The temperature indications in the upper head show that during the repressurization had there been a bubble formed early it would have gone away very quickly. Because the pressurizer level was dropping like a rock because of the break they would have never been any perturbation in the pressurizer level.

Containment isolation was reset at about 9:57. They needed that to regain instrument air so they could regain control of valves inside containment and also to gain control of the safety injection system.

This initial part, their main thrust is to do a very rapid cool-down to no-load temperatures, around 490 degrees, so they then can subsequently depressurize. Unfortunately, natural circulation doesn't give you very good mixing in the upper head and so the temperature up there will remain hot.

At approximately 10:07 they had met all the conditions they felt necessary to start depressurization. They are going to use the power operated relief valve on the pressurizer because the reactor coolant pumps had been tripped much earlier. So they don't have that spray available to them.

They successfully cycle it three times. Now the reason they have to go through a cycle operation is there is like six or ten feet between the instrument they have got to read and the switch you have got to control. So there is a two-man operation. The guy bumps it, how is that; you know, he bumps it, how is that.

After three successful operations they try the fourth one, the valve opens, they go to shut and the valve starts to shut and then reopens by itself.

Our investigation subsequently has determined that this probably was related to a restriction that the licensee had put in the exhaust from a solenoid valve which controls the power operated leak valve. The restriction was put on the exhaust port. If you look at the technical manual associated with that solenoid it says do not put a restriction on that because it can lead to malfunction.

To get the type of transient that was seen in this valve there had to be some particle or something blown into the restriction. Basically what you have to have is a down-pressure transient followed by a repressurization. The valve did stroke partially closed, then reopened, stayed open for two days and then went shut by itself.

They were removing the shield blocks on top of the pressurizer cubicle when it finally went shut and this could have caused vibration which shook it free. But that is pure speculation and I have not got the piece of dirt in my hand to show you.

So after the fourth operation, had they been successful and had the valve shut, it probably would have secured safety injection right there. They had met all the requirements. But the with the stuck-open PORV and the block valve traveling shut, they probably had no consideration of stopping the safety injection at that point. Safety injection repressurized the system and now you see we enter into the Phase 5 which is prolonged safety injection.

At this point they got a pressurizer which is going full scale and reading off scale high. They know they have a bubble in the top of the reactor vessel. They verified the thermocouple readings in the upper head. They show a saturation condition. The pumps are essentially sitting there on a shut-off head. We have been able to do the calculations from pre-op test data on the pumps and the charging just about matches what we calculate is the flow through the break. I think that came out about 400 gpm.

During that period, if you note the B steam generator transient, you will notice that during the power operated relief valve opening you see that the steam generator pressure did drop. There was actually reverse flow through the break during that period.

Subsequently you will see two more jogs before the end of the prolonged safety injection. Those were actually reliefs of the code safety on the B steam generator, the lowest set point, the one that is set at 1085 pounds.

After the first opening you will notice a long period of essentially flat pressure in the B steam generator. We believe this is during a period where you have steam leak out that code safety.

The subsequent transient you will see it as a slow build-up. So basically we see the valve as completely receded during that period.

The third opening which occurs right at the end of the prolonged safety injection phase at about 10:38 you will notice that the pressure drops much further than the two previous openings. We believe at this point that the code safety has seen two-phase flow. As the valve opens this is the time when they terminate safety injection in trying to cut down releases to the atmosphere.

At about 10:40, right at the end of the prolonged safety injection, they have secured the last condensate pump on the condensers. This causes the steam generator ejectors to trip off the line. This causes them now to shift to using the A steam generator steaming to atmosphere through its power operated relief valve.

Interviews indicate that the reason they did this was to pervent further contamination of the in-line polishers, the demineralizer system and also the condensate storage tank.

During the following period, which we call Phase 6, leak reduction, here they are trying to reduce the leakage between the primary system and the secondary system. They are in a paradox. They are in a procedure which says you have got to secure safety injection and you have got to regain normal pressurizer level control before you restart the reactor coolant pump.

They know they have a bubble in the top of the reactor pressure vessel and they want to deal with that. They don't want it to grow too large so that it would hamper natural circulation. A good demonstration that the core is cool the thermocouples indicated. The pressure in the A steam generator and the fact that they are able to steam the A stream generator clearly indicates that natural circulation is occurring. The delta T indicates natural circulation is occurring.

So they want to start a reactor coolant pump to re-establish some normalcy in the primary system and to expedite the cool-down and recovery phase. About 11:19 they start a safety injection pump for the purpose of an anticipated pressure transient which they expect when the reactor coolant pump is started. They leave that on for a little while and it causes another code safety to lift.

Unfortunately, we lose a lot of data at this point.

COMMISSIONER ROBERTS: What happened?

MR. MARTIN: The computer crashes. It is a Prodac 250. You can see the dotted line there.

COMMISSIONER ROBERTS: Twenty minutes.

MR. MARTIN: The only information we have during that period is really the information we have from the strip chart, the one non-safety related strip chart from that pressure transmitter located on the A hot leg. That is really what you see on the dotted line there. So the reactor coolant pump starts during the period when we haven't got any really good data.

Subsequently after the reactor coolant pump has been restarted, if there was any residual bubble left, and we don't really believe there was much of one left because they had operated the safety injection system and they had pumped it up pretty well. Also, the thermocouple readings up in the upper head told us that at maximum it couldn't be much greater than 300 cubic feet at that time anyway. The reactor coolant pump starting would have caused good circulation in the upper head. Any bubble that had been there would now have collapsed and be gone.

COMMISSIONER GILINSKY: Collapsed for what reason?

MR. MARTIN: Because of the cool water you are now injecting. The water in the head was running 480 or 490 and your temperature of your water in your cold leg of your "A" was running much less than that. In fact, I think I have a graph of that later on.

COMMISSIONER GILINSKY: You are essentially cooling the bubble?

MR. MARTIN: Exactly. There are actually flow holes that inject cool water up into this area even through a normal operation. So once the reactor coolant pumps start the turbulance and all then these injections should cause cooling of that bubble if it is still there and collapse it.

COMMISSIONER GILINSKY: Because the increase of pressure by itself wouldn't do it.

MR. MARTIN: Understood.

Subsequently after the computer comes back up you will notice that there is again a wide difference between the primary system and the steam generator. We have had another safety valve lift. This time it is probably seeing pure water and it doesn't recede well. We know the lines are full. If the lines are full and you have got this kind of leak that this delta P implies is going into the steam generator it has got to be going some place.

We say it probably went out the safety valve. The licensee probably wouldn't have been able to see it though because he is steaming off the "A" steam generator and the plume side by side and you wouldn't know where it is coming from. The valves are right side by side. So we wouldn't expect the operators to note this.

So you go through the period of the leaking safeties. Subsequently at about a little before 12:30 it seems to seep, the valve seems to seep. Subsequent to that they establish a long-term cool-down. They go onto RHR about 7 a.m. the next morning and they are in the cold shutdown at about 7 p.m. the next evening.

CHAIRMAN PALLADINO: Tim, somewhere along the line I got the impression that the safety relief valves on the secondary side have lifted only for a few minutes. Now this indicates that they had lifted ---

MR. MARTIN: The original numbers, about two minutes, was the operator's recollection from overhearing the noise. They are not very quiet. Actually the majority of water that we found leaving the system is during these periods of leaking.

For instance, in period eight, we believe that the safety is leaking about a hundred gallons per minute during that period of time. That is about a 50-minute period so that is a significant amount of water.

Our total number of water loss from the system runs around 18,300 gallons. That is around 117,000 pounds.

CHAIRMAN PALLADINO: What did you say the leak rate was during period eight?

MR. MARTIN: About 100 gallons per minute. I think that is an underestimate. It is a little higher.

CHAIRMAN PALLADINO: How about when they first opened?

MR. MARTIN: Between 10:19 and 10:28 that would have been only steam leaking out which would be equivalent to about 20 gallons of water. Basically what you have got there, you have got about 20 gallons of water leaking in. You really just displacing volumes. You are moving the same amount of volume in steam as you are replacing with water.

The system at this point, our calculations of inventory show that the steam lines would not yet be full. So they are filling at this point and steam is being vented. The equivalent of about 20 pounds of water would have been vented from the safeties during this period of time.

Now a little bit later I have got some graphs of leak rates. In fact, I think it is the next one.

May we have the next slide, please.

This slide represents our calculations of leakage rate flow, if you will, through the steam generator. Our maximum rate computer was about 760 gallons per minute. You can see that there was a period where it went negative. That was during the period the power operated relief valve got stuck. You can see in general that it ran 200 or 300 for a considerable length of period out there.

We also did a tank balance. By the way, the data generated by the plant is for operations. It is really not for post-event analysis. The tank information we had was minimal. Safety injection flows were minimal. You know, if somebody remembered to write them down we had them but that is the only way we got them. The charging flows the same way. Temperatures, there is a lot of information that it was difficult to come up with and in many cases had to be implied.

CHAIRMAN PALLADINO: Tim, during the early part of the accident I was told the leak rate was something around 75 I guess it was gallons per minute. Do you remember that?

MR. HAYNES: Yes.

CHAIRMAN PALLADINO: I don't see any of this ---

COMMISSIONER AHEARNE: We passed through it several times, Joe.

CHAIRMAN PALLADINO: What is that?

COMMISSIONER AHEARNE: We pass through 75 very rapidly.

(Laughter.)

MR. HAYNES: As I recall, Mr. Chairman, around 11 a.m. or shortly thereafter we reported 75 gallons per minute and that was based upon what the plant was experiencing as their charging flow at that time of 75 gallons per minute. So it was an inferred type reading.

CHAIRMAN PALLADINO: Yes. It looks like it was certainly higher than that at that particular time.

MR. HAYNES: Yes, it does.

CHAIRMAN PALLADINO: As a matter of fact, except for that one dip, it was always higher.

MR. HAYNES: Right.

MR. MARTIN: We of course have had two months to come up with these numbers.

CHAIRMAN PALLADINO: Yes, I appreciate that. I was thinking that one of the things you try to estimate during the course of an accident is how bad it is. I was wondering how you felt about having an estimate of 75 and trying seeking overall that it was much more rapid? Is there anything we can do to improve our estimating as a result of what we learned at this accident?

MR. HAYNES: I am sure there is. Like I say, it was an inferred reading of what they got from the charging flow and safety injection flow and how much is throttled. I can well imagine it is very difficult for the operators. As Tim said, the plant is really designed for operator as opposed for post-event or accident analysis.

COMMISSIONER GILINSKY: It seems to me the point is they reported an inferred reading on the basis of the charging flow and that is probably the best you can do rather than report it as the leak rate.

MR. HAYNES: That is right.

CHAIRMAN PALLADINO: Yes. I was just trying to find out if the next time we get something like that that we have to worry that it is considerably higher. Maybe that is something we can look at later.

MR. MARTIN: May we have the next slide, please.

This next slide represents our attempt ---

COMMISSIONER GILINSKY: I think there is an important point there. Often in these occasions we have had things reported without it be made clear just what the basis for the particular report is. I think by conveying that as well it gives it a little bit of a context and it is easier to place it in your mind and fix the importance of it.

MR. HAYNES: That is a soft number and you go get a harder number.

COMMISSIONER GILINSKY: Yes.

CHAIRMAN PALLADINO: Well, I remember having discussions later. I said, well, I heard 75 gpm, and he said, oh, it was up much higher than that. I was trying to get a feel for how we get information during the course of an accident. I agree.

MR. MARTIN: This next slide represents the task force's attempt to quantify the thermal transient that the reactor vessel may have seen. After the reactor coolant pumps were tripped the "A" loop very quickly established a natural circulation. We estimate it to be about 8,000 gallons per minute.

Using only the "A" loop's temperature trace you come up with a cool-down rate of about 100 degrees per hour, 116, or something like that. So the majority of the reactor vessel would have seen that type of temperature transient. That was really the maximum during the early part of the event. Subsequently it is certainly much lower than that.

Until the "B" main steam isolation valve was shut and the feedwater flow to the "B" steam generator was isolated, it, too, saw about 8,000 gallons per minute natural circulation flow. Subsequent to securing feeding and subsequent to shutting the main steam isolation valve the "B" steam generator basically heated up to whatever TH was and we stagnated natural circulation and then the "B" loop when through some type of transient. You see here what the RTD on the cold leg showed us happened in the "B" loop.

Again, I want to remind you this sticks only like an inch into the pipe. It is 27 and a half inches in diameter and it is almost right on top of the injection point of this water coming from the RWST.

COMMISSIONER AHEARNE: But you are dropping from something like 535 or 540 down to a minimum there of about 270 over a period of, what, 30 minutes.

MR. MARTIN: That is true. But remember this is back in the loop. This is a considerable distance in the loop.

COMMISSIONER AHEARNE: Yes, I understand that. But you didn't talk about the significance then of that later pump.

MR. MARTIN: That is a true statement.

COMMISSIONER AHEARNE: Now what your data seems to imply then is that you have something like a 260 degree drop in half an hour.

MR. MARTIN: In the loop right by that RDT.

COMMISSIONER AHEARNE: Right. Then you have to talk about how much of a drop, how rapid a drop do you have as you go back further. I agree. But it is correct that your data has a 260 degree drop in half an hour.

MR. MARTIN: This is what the data would suggest. That is correct, and that is only on the "B" side.

What we did then was we looked at what was happening in the "B" loop. We had a break in the loop. There is going to be flow to the loop. It is going to come from the hot leg and it is going to come from the cold leg. Using a very simplified assumption that the water is going to be mixed real well before it goes by this RTD, we were able to match the temperature transient seen by the RDT by assuming a reverse flow in the cold loop of approximately 400 gallons per minute. With that assumption and the known safety injection flow and the known charging flow you can see how the dark black line lays very closely on top of the transient that you actually experienced in the loop.

Now if that really occurred that way, what that suggests is that it is like 400 gallons per minute coming out of the reactor vessel toward the break sweeping the safety injection and changing flow toward the break and therefore the reactor vessel would never see the transient that you are seeing in the "B" loop.

Now what are the problem with that? Well, first of all, the break flow at max was calculated to be about 400 gpm at this point already. So 400 gpm plus the safety injection flow, which is about 200 gpm, plus the charging flow certainly can't be flowing back that way.

Well, the next place you draw back is well, maybe there is not complete mixing. If there is not complete mixing you could get the same transient by doing some mixed mean. But the bottom line is we can't tell you. I cannot tell you today that that vessel right below the "B" loop didn't see a significant thermal transient greater than the average that they experienced. We try it and the instrumentation just does not provide us the information to give you that answer.

COMMISSIONER AHEARNE: That is then the interpretation. I noticed the language in your report seemed to be carefully chosen that suggested that the flow to the faulted loop may not have ---

MR. MARTIN: We are confident that there was flow toward the faulted loop but certainly not of this magnitude. I can't today tell you that it didn't happen, that there wasn't a significant, this 200-and-some-odd degree drop that you pointed out.

COMMISSIONER GILINSKY: Let's see, where does this leave us?

COMMISSIONER AHEARNE: Let me go back to a point I raised earlier before you came here, Vic. I guess I am disturbed that there is no conclusions or recommendations out of this. I recognize, Tim, that your charter was not to have conclusions and recommendations, but you have had this group of people, very knowledgeable people, spend all this time digging through this and I guess I feel on several of these points that you come across that it short of cries out for a "therefore," therefore more work or therefore this is our conclusion or therefore the plant management ought to do this or therefore NRC ought to do this. This is one area that seems to need a "therefore."

MR. DIRCKS: The "therefore's" are coming.

COMMISSIONER AHEARNE: But I would have felt that this report ought to have had ---

MR. DIRCKS: But you make a choice. Do you want the report fairly quickly and with the facts laid on the table or do you want the "therefore's" and get it three or four months later.

COMMISSIONER GILINSKY: Is there another report in the works?

MR. DIRCKS: Yes. What we are going to do is take this report and get it back to the program offices to come up with a ---

COMMISSIONER AHEARNE: But, Bill, these people did do this report. This group now has spent all this time digging through this. I guess I would liked to, and in fact I know I would have liked to, and in fact given that the Chairman's letter said that it would have conclusions and recommendations ---

MR. DIRCKS: I think you are going to get recommendations. I think the report lays out a very exhaustive and comprehensive statement of what happened there.

COMMISSIONER AHEARNE: Is there some reason why the writers of the report couldn't put down their recommendations?

MR. DIRCKS: Well, I think we have had experience with trying to assemble facts and coming up with a series of recommendations that become then a driving force for agency actions that when we go back and take a look at a year later we say, well, really were we pressed by time to come up with that recommedation or pressed by some other reasons? I think it is better to say what are the immediate actions that we have to take as a result of this? The answer I get is no.

Then if there are no immediate actions let's go back and do an exhaustive analysis of the facts and then come in with a statement of recommendations that have a ---

COMMISSIONER AHEARNE: Are you going to let these authors at least whisper to this longer-range group?

MR. DIRCKS: Many of the authors are actually now going back to review the statement from the longer-term, and I hate to use the term, action plan connotation.

(Laughter.)

CHAIRMAN PALLADINO: Tim, are there any analyses that you think might be made to give us a better handle on what happened to ---

COMMISSIONER AHEARNE: Careful, that sounds like a recommendation.

(Laughter.)

CHAIRMAN PALLADINO: I am sympathetic with your point of view so I am trying to be careful. But are there some analyses that we could make that would give us a better handle on what might have happened in the reactor vessel, the reactor vessel temperature?

MR. MARTIN: I believe there is certainly capability in the agency or with the contractors to do a computer modeling of it and do a lot more than we were able to. We have the facts to feed into that model. We know approximately what the safety injection and the charging flows were and we have the temperature information.

If I might, I am going to turn to Gary Holahan who can probably answer that better.

Gary.

MR. HOLAHAN: I am Gary Holahan from NRR. What you see here are basically hand calculations from the data available from the plant. Certainly more detailed calculations could be do with any of a number of computer codes that are available. A basic one-dimensional calculation could be done with a code like RELAP or a comparable code that Westinghouse would have, or an even more complicated sophisticated calculation could be done with the TRACK code from one of our contractors.

COMMISSIONER AHEARNE: What kind of confidence do you have in those codes?

MR. HOLAHAN: You always have to be somewhat skeptical, but in this case you have got the data. If the code can match the data without too much fine-tuning of the code then I think you could live with the answers.

MR. DIRCKS: Let me make one point though on the recommendations. The restart review for Ginna is now ongoing. So you are going to pick up the actual content here in the restart review. Many of the members who worked on this report are participating in the restart review. So that is one vehicle in which you get recommendations or recommended actions to be taken in regard to this particular reactor.

What I was talking about before is recommendations cutting across action that may have a generic meaning for many reactors. That is what I was talking about before.

CHAIRMAN PALLADINO: Bill, will some further attempt be made to evaluate what we think the rate of temperature drop for various parts of the vessel have been?

MR. DIRCKS: That I am sure is going to be part of the analysis during this restart review.

CHAIRMAN PALLADINO: That is what I was

getting at because the implication that part of the vessel got something like a 260 degree drop in a half hour seems extreme and may not bear any resemblance to what actually took place.

MR. DIRCKS: Anything in here is not going to be overlooked and particularly in the restart review.

MR. DENTON: I think that particular area is one in which the steering group did press the task force to make as definitive statement as they could and it is one that we are going to have to follow up on very closely. They have pushed as hard as they could within the time frames they have had to get answers and we will pick it up from there and see what else we can do to better establish what did happen to the vessel. I think it is a key issue to be resolved before restart and we will do that.

CHAIRMAN PALLADINO: Is that being done in NRR?

MR. DENTON: Yes.

MR. DIRCKS: Witl a good deal of contribution from Region I.

MR. DENTON: Of course, Mr. Holahan who just spoke is in the Division of Licensing and will be heavily involved in that proceeding.

CHAIRMAN PALLADINO: Do you want to proceed.

MR. MARTIN: The next slide, please.

This particular slide which I am going to use to talk about the radiological information, you are looking to the northwest. The lake is to the right and at the top and you are actually looking right at the plume.

CHAIRMAN PALLADINO: Right at the what?

MR. MARTIN: Right at the plume. The wind during the majority of this event, during the time when the releases occurred actually came right across the plant towards you.

The tower which you see behind the plant is the primary meteorological tower. There is a back-up meteorological tower off the picture to the left.

Some important things. If you will notice the large building closest to the lake. In the northeast corner you will see a little pipe sticking up. That happens to be the air ejector exhaust. That was where the first releases came from.

Subsequently if you look in to the large square building which is a little further to the south, you are looking inside the facade which goes around it. Reading from west to east across the north facade, you have the auxiliary turbine exhaust which very early in the event had some releases, the "A" steam generator PORV, and then almost in the eastern side of that facade the "B" steam generator code safety that released the majority of activity.

Now in the south face of that facade you will notice that it drops straight down and runs into another building. There is actually a space between that building and the facade that you can crawl under and it happens to be right here where the auxiliary building ventilation suction is located.

Now that is important because in the wake that occurs from this plume that actually tumbles over the edge of the building, this ventilation system picks it up and low and behold we do get radiation particulate and iodine alarms from the monitors which are located on the exhaust from the auxiliary building ventilation system.

CHAIRMAN PALLADINO: Did I follow that correctly? I thought you were saying they were picking up radioactivity from the outside?

MR. MARTIN: They are actually sucking it back into the building.

CHAIRMAN PALLADINO: That is a new invention.

(Laughter.)

COMMISSIONER AHEARNE: Not necessarily desirable.

MR. MARTIN: Coming on out from the plant you see the grove of trees. Just behind the grove of trees we have our maximum verified on-site reading of about three MR per hour, and it was right up against the fence.

Then in the middle of the field that seems to be circled by that road you see the white spot. That white spot happens to be the location of the two TLD's which showed significant readings, the licensee reading which gave 21.7 M-rad integrated dose and the New York State TLD which read 9.4 millirad.

CHAIRMAN PALLADINO: Where is that?

MR. MARTIN: This is the white spot in the middle of the field which you see circled by the road. Now I am also waiting for this answer so let me turn to Mr. Nehemias.

Would you tell me why those two read differently?

MR. NEHEMIAS: Principally simply that the state dosimeter was higher.

COMMISSIONER AHEARNE: How much higher?

MR. NEHEMIAS: About eight feet for the state and about four and a half feet for the licensee.

COMMISSIONER AHEARNE: And the three and a half foot difference is the reason?

MR. NEHEMIAS: Yes.

MR. MARTIN: I have been waiting for that answer.

MR. HAYNES: There is snow on the ground.

MR. MARTIN: Yes, there is a lot of snow on the ground here.

COMMISSIONER AHEARNE: Four feet?

(Laughter.)

MR. MARTIN: I think one of the points we should make here is this was a very cold day, high humidity day, there was snow and almost all the activity that was condensable or was entrainable by moisture feel right out on the plant and the plant property on site. This circular drive is still on site. All these readings are on site.

Now there was one significant reading off site just off the lower left-hand side of the picture. At the intersection of Lake Road and Ontario Road at about mid-day there was a reading of 1.2 M-rad per hour, but that was the only off-site dose of significance that was measured.

To give you some feel for the releases. Our computation indicates about 90 curies of nobel gases were released, about 0.4 curies dose equivalent of Iodine 131 and 1.3 curies of particulate, including cobalt, molybdenum, barium and cesium. There was also about 25 curies of tritium most of it in the form of water.

I just want to point out that the nobel gases and the Iodine 131 releases do not exceed design analysis numbers. Particularly I want to focus in on the iodine since it has the largest effect.

CHAIRMAN PALLADINO: What was your iodine reading?

MR. MARTIN: It was 0.4 curies dose equivalent iodine. If you just add it up, you know, the total of the iodines, it came to around five curies. I do want to point out though that this plant was running only a few percent of its tech spec limit of iodine in the primary system. Therefore, there wasn't that much ready for release.

A review of the chemistry data before versus around 12:50 that afternoon when another sample was taken, there appears to have been no iodine spike which is assumed in the analysis.

CHAIRMAN PALLADINO: There is something you said that I guess I don't understand. You said the total of how much iodine?

MR. MARTIN: Total of about five curies.

CHAIRMAN PALLADINO: Now what was the four-tenths?

MR. MARTIN: The four-tenths is the dose

equivalent Iodine 131. In other words, if you were looking for what is the equivalent amount of Iodine 131 which would cause the same effect to a human, then it comes out 0.4 curies.

MR. HAYNES: And I believe the technical specification is in dose equivalent.

CHAIRMAN PALLADINO: Is in what?

MR. HAYNES: Is in dose equivalent for Iodine 131, the longer half life.

MR. MARTIN: Actually the way it works out is it is dose equivalent for the activity in the primary system and you really end up with dose equivalency because of the way the tech spec is worded.

Now one thing that we did note here was that there was water released from the safeties versus steam which is assumed. Because there was water released you do not get the partitioning of the iodine into much smaller releases per cc of matter. Also, you get particulate that you would not normally expect in a design analysis. It was of interest to us and that is what we found.

Basically it was forced on the plant because of the configuration of the piping and the fact that they did allow the piping to flood and fill.

There is one other point to make on this picture. You will notice the building in the middle off site to the left. That is the licensee's evacuation center. It also was in the plume and the licensee did evacuate people into the plume to this location. He did not have an alternate evacuation site nor does NRC require one.

I wonder if I can have the next slide, please.

I wanted to show you this slide to give you some feel for where the water came from that ruptured the PRT rupture disk. During containment isolation the valve on the right-hand side, FC-371, that gets a "T" signal goes shut if it is ntainment isolation valve. The valves inside at to the left do not get a signal.

The valve, 427, which is coming from the reactor coolant system, that valve goes shut when the pressurizer level goes out the bottom. Basically this is a level control system, if you will. So when the initial transient caused the pressurizer level to drop, the valve 427 went shut.

When it goes shut the selected orifice valve, the 200A, 200B and 202, whichever one is selected, would also go shut. So while the pressurizer level is off-scale low these valves would all remain shut.

Further, on containment isolation you kill the instrument air inside containment and therefore the valves assume their fail position. So the orifice isolation valves all fail closed so they would stay closed and 427 would subsequently drift open.

When the containment isolation was reset you don't open the valves immediately. All that does is allow you now to take manual control of the valves.

One of the valves that was opened after containment reset was instrument air, opening instrument air then pressurized the system. You would expect 427 to go shut because the pressurizer level was still off-scale low and you would expect the orifice valves to assume whatever position was commanded for 427.

When the pressurized came back on scale on opening the PORV 427 would stroke open. When it strokes open the reactor coolant system pressure comes in through the orifice valve. Since there is no flow the orifices don't follow your pressure any and this line starts to pressurize. Relief valve 203 then opened and you can watch the pressure trace and the level trace on the PRT and it very quickly starts to fill.

Now pressure didn't go up that much as a result of filling because apparently there was some leakage in the vent valve that goes back to the vent header. The vent header is a gaseous waste treatment system. But subsequently when the PRT went solid, was full of water, then the pressure, basically as seen reactor coolant system pressure ruptured this loop. This was the major contributor to the inventory increase in the PRT.

May I have the next slide, please.

This is a slide of the steam generator at Ginna. There are a couple of points I want to point out to you.

Coming down the right-hand side you will see a downcomer flow resistance plate. That flow resistance plate was put in the generator to control recirculation in the generator and actually can be moved up and down and can shut off the loop circulation flow.

In 1975 the licensee made a modification to the steam generator at the recommendation of Westinghouse and cut the orifice plate out, just flame cut it out. We have looked at the procedure. The one thing the procedure doesn't have although it has tools in and tools out type inventory, it didn't have make sure you have got all the ring out in your hands.

COMMISSIONER AHEARNE: Was that a modification which was unique to Ginna?

MR. MARTIN: No, sir, I do not believe it is.

COMMISSIONER AHEARNE: Was it a modification requested of Salem?

MR. WIGGONS: It is not a generic modification.

CHAIRMAN PALLADINO: They took that whole ring out?

MR. MARTIN: Yes, sir.

CHAIRMAN PALLADINO: Except for ---

MR. MARTIN: Well, you are getting to the punch line.

(Laughter.)

CHAIRMAN PALLADINO: They were supposed to take the whole ring out.

MR. MARTIN: The other part of the steam generator I would like to point out to you is the wrapper plate inside the shell comes down I think it is about 17 inches above the tube sheet and then you can see the tubes inside. The tubes that are going to be of interest to us are going to be the peripheral tubes, the ones located on the outside and in fact those on the hot leg. So you see the primary coolant inlet. That is where the hot leg tubes come up there.

COMMISSIONER AHEARNE: Tim, let me ask a question. This is a generic action that was taken?

MR. MARTIN: That is my understanding.

COMMISSIONER AHEARNE: But the procedures that Westinghouse put on didn't specifically address taking out the ---

MR. REYNOLDS: The procedure included a provision for putting in a protective system to prevent dropping things into the steam generator. That was in the procedure. The procedure did not call for reassembly of all of the parts of the ring to make sure you had 100 percent of all of the volume of the ring when you took it out.

COMMISSIONER AHEARNE: To you knowledge, has any other licensee run into the problem of parts of that left inside the steam generator?

MR. REYNOLDS: Westinghouse has indicated there is no indication of similar peripheral tube problems on any other steam generators.

COMMISSIONER AHEARNE: I wasn't asking whether there was any similar tube problems. I was asking whether you had any indication of any other licensee having found any pieces that had been left behind after that modification?

MR. REYNOLDS: Not to my knowledge?

CHAIRMAN PALLADINO: How many steam generators were there in which this modification was made or how many plants?

MR. REYNOLDS: I believe all the 44 series were similarly modified. Now I can't say for sure.

CHAIRMAN PALLADINO: What, half a dozen, or more or less?

MR. MARTIN: I don't think we can answer that, Mr. Chairman.

CHAIRMAN PALLADINO: I was just wondering if anything peculiar was happening to those plants.

MR. MARTIN: Could we have the next slide, please.

CHAIRMAN PALLADINO: Maybe I am asking the question too soon. Was one of the pieces or one or more of the pieces that was found in there, did it come from this ring or was it presumed to come from this ring?

MR. MARTIN: We believe it is and I have a picture here very shortly to show you.

MR. HAYNES: Mr. Chairman, you question about whether anything peculiar was happening at the other plants ---

CHAIRMAN PALLADINO: On this modification.

MR. HAYNES: Yes. I believe Sam did try to address that because the information he got from Westinghouse is that none of the other plants that had undergone the modification had shown indications with peripheral tube problems like Ginna has experienced.

CHAIRMAN PALLADINO: Well, did Ginna have any precursor symptoms before ---

MR. MARTIN: Yes.

MR. HAYNES: Oh, yes.

CHAIRMAN PALLADINO: --- someone addressed that something like that was happening?

MR. MARTIN: Yes.

CHAIRMAN PALLADINO: So if it was not happening at the other plants you might have a higher assurance that there is no similar problem.

MR. MARTIN: Yes.

On this slide, what we have here is a picture of the tube sheet for just the hot side. The circled areas are those that have plugged tubes. The ones with "x's" have sleeves in them. The ones in the center part of the semicircle are basically sludge related problems, chemical problems. They can either be in the sludge area above the tube sheet or in the crevice area below it.

CHAIRMAN PALLADINO: Some of these are dark circles. What does that mean?

MR. MARTIN: The dark circles mean it is simply plugged. The circles with an "x" through it means it is sleeved.

CHAIRMAN PALLADINO: The dark circle with an "x".

MR. MARTIN: That means it is sleeved.

CHAIRMAN PALLADINO: And the plain circle?

MR. MARTIN: The plain circle means just plugged.

CHAIRMAN PALLADINO: Means what?

MR. MARTIN: Plugged. It has a plug that prevents flow through it.

CHAIRMAN PALLADINO: That is if it is solid. What if it is just an open circle?

MR. MARTIN: If it is just an open circle that is a flow hole. It basically is a place where flow can go through.

The ones in the center ---

COMMISSIONER ROBERTS: What are we looking at here? This isn't a tube sheet ---

MR. MARTIN: I am looking right down at the tube sheet.

COMMISSIONER ROBERTS: This is the tube sheet.

MR. MARTIN: This is the tube sheet and it is showing what are the different tubes. Basically at the intersection of each line there is a tube there. For those that we chose to put black marks, that is a plugged tube at that location. For those that have black marks with an "x" through it, that means it is sleeved. Those that have simply little circles, those are flow holes.

Mr. Haynes has brought something to my attention. If you look around the periphery of the semicircle you see the pattern of little open circles. Those represent tubes. You notice those little dots. Those are the flow holes we are talking about.

Sam, is that right?

MR. REYNOLDS: The dots around the outside are the outer boundary of the flow holes in the tube support plate.

COMMISSIONER AHEARNE: That is the dots. There are dots and circles.

MR. REYNOLDS: The dots on here indicate the extent of the flow holes. They have flow holes inboard of that but not outboard of that.

COMMISSIONER AHEARNE: And the circles also ---

MR. REYNOLDS: Oh, these circles are just the tube holes.

COMMISSIONER AHEARNE: So then you legend down in the middle isn't correct.

MR. REYNOLDS: That really should be a dot.

COMMISSIONER AHEARNE: Okay.

COMMISSIONER ROBERTS: What do you mean by a wedge area?

MR. MARTIN: The tubes are supported at six locations I believe coming up through the steam generator. Basically they are perforated plates the tubes pass through and those plates have to be supported from the wrapper. At the wedge areas is where you actually have supports.

Now there are 12 wedge areas around the wrapper. Each tube sheet has six support points. The lowest tube support is supporting each even number wedge area, the next one at each odd, et cetera. So the wedge area is simply for location purposes.

It just so happens that the problem we experienced this time was in the No. 4 wedge area. It is a locational aid, if you will, at this point.

CHAIRMAN PALLADINO: I almost followed you and then I got lost about one-third of the way through.

(Laughter.)

CHAIRMAN PALLADINO: Could you start over.

MR. MARTIN: The tubes are supported by tube support plates and there are about six of them.

Can I go back to that previous slide.

CHAIRMAN PALLADINO: Are they complete plates?

MR. MARTIN: Yes.

If you will notice the tube support plates marching up the bundle. Now each one of these tube support plates is hung from the wrapper and they are hung by wedges. Each tube support plate has six wedge positions and they alternate.

CHAIRMAN PALLADINO: What do you mean hung by wedges.

MR. MARTIN: So there are 12 locations total around a wrapper.

CHAIRMAN PALLADINO: What do you mean hung by wedges?

MR. MARTIN: They actually are wedged into place. There are three little wedges that are knocked in and after the wedges are put in place then the support plate is welded to the wedge and the wedge is then welded to the wrapper.

CHAIRMAN PALLADINO: I see, and there are how many wedges around?

MR. MARTIN: For a support plate there are six support points and a total of 12 wedge locations becase they alternate as you go up the bundle.

CHAIRMAN PALLADINO: So going around the periphery you use one, two, three, four?

MR. MARTIN: That is correct.

CHAIRMAN PALLADINO: So now when you talk about wedge area No. 4 it is on a particular peripheral position?

MR. MARTIN: Yes, sir.

CHAIRMAN PALLADINO: Thank you.

COMMISSIONER ROBERTS: Well, is there any significance to the fact that the plugged holes at least in the periphery are almost always in a wedge area?

MR. MARTIN: The majority of them seem to be.

COMMISSIONER ROBERTS: Does that tell us anything?

MR. MARTIN: The licensee originally attributed the failures he was experiencing to a stiffness in that area. I am not sure he still does today. I have not seen his latest analysis nor have we completed ours. But you are correct. It does seem in the majority of cases on the periphery to locate in these areas.

COMMISSIONER ROBERTS: What is the basis for your earlier statement, and I am not disputing it, but how do you know that it was a sludge problem on these middle tubes.

MR. MARTIN: Let me turn to my expert.

Sam.

MR. REYNOLDS: That is the typical sludge location. They have sludge. The characteristics that they had at phosphate water treatment were similar to the standard sludge phosphate water treatment problems. Eddy Current was the one that told them that they had indications to tubes, sir.

COMMISSIONER ROBERTS: Okay.

MR. REYNOLDS: We didn't go into that in great detail in the NUREG because it is well documented in other NRC documents.

COMMISSIONER AHEARNE: Now your previous point, Sam, that you had mentioned that there were no other plants that had experienced anything similar. You mean they had not experienced tube degradation out in the far perimeter? Is that your point?

MR. REYNOLDS: They did not experience tube degradation problems of say a cancerous growth mode like this on peripheral tubes. I can't say that they didn't have any peripheral tube problems that may have been denting or some other mechanism. I can't make that statement because I just don't know.

COMMISSIONER AHEARNE: So you are not sure if you had a similar chart of other plants that you might get this pattern on the outside?

MR. REYNOLDS: What I am saying is I certainly cannot say categorically that if you looked at other series 44 steam generators that you would not find an occasional peripheral tube plugged, but you would not find a pattern of tube plugging ---

COMMISSIONER AHEARNE: A large number of them.

CHAIRMAN PALLADINO: Why wouldn't you find them?

MR. REYNOLDS: Excuse me?

CHAIRMAN PALLADINO: Why wouldn't you find them in other steam generators?

MR. REYNOLDS: They have not been found by any kind of testing in any other plants and there is no ---

MR. MARTIN: They haven't experienced the same set of problems.

COMMISSIONER ROBERTS: Because it happened in this one doesn't mean that ---

CHAIRMAN PALLADINO: But he made it sound like it was so obvious that it wouldn't happen.

COMMISSIONER AHEARNE: What I was trying to follow was the line that if they made this change generically did other plants perhaps have this stuff drop in, and I think his counter was if it had then you would have expected to see the peripheral tubes or a larger number and they haven't seen them.

MR. MARTIN: This particular drawing shows the situation prior to the event. The problems that had been experienced in the No. 4 wedge area had been basically progressing inward toward the center of the figure.

Sam, can you tell me the approximate time the first one appeared in the No. 2 wedge area, the first problem?

MR. REYNOLDS: 7/77.

MR. MARTIN: 7/77. The original modification was made in '75 on the orifice plate. If the part that was found truly came from there it could have been sitting in there from that time.

The next slide, please.

No, hold that slide.

This slide shows a picture of the largest piece that was removed from the "B" steam generator. Although you can't see it real well in this photograph, the piece has markings on it, parallel grooves that are spaced at approximately the spacing you would find on tubes and they are basically indented just as if it had been sitting and bounding against the tubes like that.

The drilled hole corresponds to approximately the kind of and size hole you would expect to find in the orifice plate. The material is magnetic.

Is that true?

MR. REYNOLDS: It has the appearances of carbon steel.

MR. MARTIN: We have not performed a chemical analysis of it.

COMMISSIONER ROBERTS: How thick was the orifice plate, half inch?

MR. REYNOLDS: Yes.

MR. MARTIN: Everything seems to point to this being a part of that plate.

COMMISSIONER AHEARNE: You say you haven't done a metallurical examination. Has the licensee or Westinghouse?

MR. REYNOLDS: They are in the process of analyzing it, yes, to the best of my knowledge.

MR. MARTIN: It also has the appearance of being flame cut.

COMMISSIONER AHEARNE: Wait. Excuse me.

Do we know whether they are or not?

MR. WIGGINS: They are.

COMMISSIONER AHEARNE: Thank you.

MR. MARTIN: The thing also has the appearance of being flame cut as the procedure called for in 1975.

MR. HAYNES: It has got the thickness. It has got the curvature. It has got the small hole, the orifice hole. [illegible] is made of the same material. It is very similar.

MR. MARTIN: The next slide.

This particular picture shows a tube and not the ruptured tube, although obviously this one is ruptured, that was found in the generator. You see several rotations of it showing the structural damage that has occurred. This particular tube was one of the tubes that had been previously plugged.

Sam, do you remember why this one was originally plugged?

MR. REYNOLDS: I will have to look on the list.

MR. MARTIN: Basically you can see the structural mechanical damage that occurred to this particular tube.

The next slide, please.

COMMISSIONER ROBERTS: Excuse me. What do you mean "White dot points outward"? I am confused. What is the terminology at the bottom of the slide?

MR. MARTIN: The white dot, Sam.

MR. REYNOLDS: They cut a hole in the shell and the wrapper and reached in and put a paint marker at that point. They could only get outboard so they called this zero degrees and then these are the degrees based on that outboard direction.

MR. MARTIN: Sam, do you want to comment on some of the markings on those tubes?

MR. REYNOLDS: They are rather classic fretting wear marks on tubes, like this one, for example. You can see all the flat marks on there.

CHAIRMAN PALLADINO: What are all those edges down at the bottom?

MR. REYNOLDS: That is where the tube was detached at the bottom from the rest of the tube.

CHAIRMAN PALLADINO: That is where it was broken.

MR. REYNOLDS: Yes, detached it.

MR. MARTIN: Let me point out this was not the ruptured tube because this one, as I understand it, had been previously plugged and Sam will find out what they said.

MR. WIGGINS: There is an indication above the tube sheet. It was an indication of inner surface metal loss.

CHAIRMAN PALLADINO: They plug them at both ends?

MR. MARTIN: They plug both ends. Of course, it then no longer has the primary side pressure on the inside to help support it. Whatever the mechanism was that ultimately caused it to fail it wasn't as defendable as it was before.

CHAIRMAN PALLADINO: Were there in a position to be struck by the other pieces of metal?

MR. MARTIN: The metal was found at a location which was displaced azimuthally from this but dragging the lights through it could have moved the large pieces.

CHAIRMAN PALLADINO: In other words, they are in a position though ---

MR. MARTIN: It is certainly below the wrapper and in a place where it could have been ---

CHAIRMAN PALLADINO: It could have been beat up by the ---

MR. MARTIN: It could have been.

MR. REYNOLDS: That is a peripheral outer tube.

MR. MARTIN: That is an outer tube?

MR. WIGGINS: That is an outer tube.

CHAIRMAN PALLADINO: Was the one that broke an outer tube?

MR. MARTIN: No. Would you go back to the previous slide, please. The one before that.

The arrow points toward the ruptured tube. Sam's comment about a cancer, basically the problem developed initially on the outside and kind of worked its way in. There is precautionary plugging and other things that were done.

CHAIRMAN PALLADINO: Are you saying that it might have been beat up by the extraneous pieces of metal?

COMMISSIONER AHEARNE: Or could it have been beat up by a broken tube?

CHAIRMAN PALLADINO: Yes.

Go ahead.

MR. MARTIN: Again, Sam loves this.

CHAIRMAN PALLADINO: I mean initiated by a broken tube.

MR. MARTIN: Sam, what is your opinion?

MR. REYNOLDS: The wear marks on the tube that you see are in my opinion tube-to-tube fretting wear marks. The damage at the bottom of the tube could possibly have been associated with the loose foreign object.

COMMISSIONER AHEARNE: Well, by tube to tube, do you mean one tube rubbing against or banging it?

MR. REYNOLDS: Yes.

COMMISSIONER AHEARNE: But that would have meant that one of the tubes would have had to have been broken off at the bottom.

MR. REYNOLDS: Yes, sir. There were tubes that were broken off completely between the first tube support plate and the tube sheet.

COMMISSIONER ROBERTS: But they were plugged?

MR. REYNOLDS: There were previously plugged tubes that were subsequently broken off.

CHAIRMAN PALLADINO: But I think it is an important observation if true. I am not saying that you have proven that. I understand this particular tube had been checked at the previous inspection and was found to be within our tolerance limits.

MR. MARTIN: Using the standards they had it indicated about 20 percent and they had a 40 percent criteria.

CHAIRMAN PALLADINO: So what I am saying is had this been a corrosion problem or if I were to conclude that it was a corrosion problem, then it cast doubt about our ability to inspect and the frequency of inspection giving us any assurance that the tubes were all right. If, however, it was a result of something beating outside tubes that in turn beat this one, I don't get comfort from it, but at least it gives me some feeling that we still can rely on inspection for the more normal corrosion process.

COMMISSIONER AHEARNE: Agreed.

Could you take a minute and perhaps talk through what, from your group and perhaps Sam the expert, what was the progression that led to the rupture.

MR. REYNOLDS: I can only give an opinion.

MR. MARTIN: That is what he is asking for.

MR. REYNOLDS: There is a group that is working on this.

COMMISSIONER AHEARNE: I understand. I am just asking what your opinion is.

MR. REYNOLDS: I certainly don't think there is any question that a large foreign object on a periphery of the tube would cause tube damage, would cause changing of the shape of the tube which could possibly cause collapsing of the tube once the tube is no longer round and has a pressure on the outside of it which then can change a lot of things, the natural frequency of the tube.

There is no direct evidence that we can see of going from the first damage on the outside of the tube through to the final rupture. The final rupture is apparently due to failure by another tube and not by the foreign object because it has fretting wear marks on it that are longer than nine inches and that are of the geometry that you could only get by two orbiting tubes touching each other on the surface giving you the score marks that are horizontal to the tube.

So that is all I can say.

MR. MARTIN: You might be able to see this on the next slide.

Can we have slide 12, please.

Sam, do you want to point out points on there.

MR. REYNOLDS: This is the tube that did rupture. It is worn to the point of an almost knife edge. You could cut your finger on this portion of the rupture right here. We originally reported that visually there was less than five percent wall thickness and there are some spots where it is considerably less than that.

The total length of the rupture is similar to the length of the indication that was previously reported on the Eddy Current examination as a 20 percent defect. This obviously is flats on the tube. The characteristic of the failure are similar to the characteristics that you have when you had mixed span collision of tubes, for example, in a surface condenser, in that it is somewhat symmetric and runs out. The rupture stops at roughly 50 percent of the wall thickness of the tube.

There are indications on this tube of fresh fretting wear marks and fretting marks that are not fresh that have an oxidized appearance. So this tube was being worked on in another location actually before this location when all the way through the tube.

COMMISSIONER AHEARNE: Tim, do you know the perimeter at the break?

MR. MARTIN: It is about what, seven-eighths?

MR. REYNOLDS: The opening here is about three-quarters of an inch and the diameter is 1.05.

COMMISSIONER AHEARNE: Do you know the perimeter of the metal that is left in the break? What

I was wonder is that when a rupture occurs sometimes it isn't just a complete rupture. What first happens is you begin to get enough stress that you actually get some metal flow.

MR. REYNOLDS: Oh, sure, it balloons.

COMMISSIONER AHEARNE: It stretches, ballooning, and then it breaks.

MR. REYNOLDS: It increased from seven-eighths of an inch to 1.15 inches measured across here.

COMMISSIONER AHEARNE: What I was wondering is you mentioned how thin the material is at that break point. It wasn't clear to me that that thinning was due to wear or whether it was due to the ballooning and the stretch.

MR. REYNOLDS: In my opinion, it was due mostly to wear. Certainly when you have got excessive deformation of the tube in ballooning that some thinning resulted from that, too.

MR. MARTIN: That is my last slide.

COMMISSIONER AHEARNE: Before you get through with that slide. Where is that tube being examined?

MR. REYNOLDS: That particular tube is being examined at Westinghouse Research Labs. At least it was there three weeks ago. It is being obviously metallurgically examined which means it is being cut up into pieces and the pieces are being examined.

MR. MARTIN: I have some concluding remarks relative to the operators and the licensee management. I think that this event demonstrated that they understood their plant, that they understood their procedures and that they understood the philosophy of coping with a steam generator tube rupture event.

They paid particular attention to assuring that the core was adequately cooled. When they ran up against problems in their procedures which didn't see to fit the situation they did not just leap in and change things. They assessed the situation. They made a determination of what was the best course of action. They did leave their procedures. They did deviate from their procedures when they weren't appropriate and they re-entered the procedures later on when it was.

COMMISSIONER AHEARNE: Now I gathered from somewhere in your report though, I thought I ran across where the operators did not think they did deviate fro the procedures.

MR. MARTIN: That was their statement. I disagree with them. I think they reacted prudently.

COMMISSIONER AHEARNE: In other words, they believe they didn't deviate and you believe they did but they were correct in deviating?

MR. MARTIN: That is correct.

CHAIRMAN PALLADINO: Is that because the procedures can be interpreted a couple of different ways?

MR. MARTIN: I think that their interpretation is that in all cases we will act prudently, that the procedures simply are a guideline. If I have to jump from this procedure to that procedure to that procedure to get around a hurdle in a procedure, that is following my procedures. Another interpretation of the same thing. I think they acted prudently and that is what I was looking for.

MR. HAYNES: The procedure itself didn't cover all of the situations what were facing the operator. When it didn't cover that situation then they stoped and thought and said well ---

COMMISSIONER AHEARNE: I was just puzzled by the way that the report seemed to read. It was as though the operators did very well. When necessary they deviated from their procedures and that deviation that they took was appropriate. On the other hand, the operators were saying no, we did not deviate from the procedures.

CHAIRMAN PALLADINO: It is important for us to begin to understand what we mean by the words "following procedures."

MR. MARTIN: I think their response was partially defensive. There had been a lot of publicity relative to NRC's original assessment of their performance with charges that they had not followed procedures.

CHAIRMAN PALLADINO: But you sort of give them a little justification in saying what they said because you said the procedures aren't all inclusive and you have to select which procedures to use at what time. Maybe we have to look a little closer at procedures and what we mean by the words, but that is the least of my worries.

(Laughter.)

COMMISSIONER AHEARNE: The impression I had is they were saying look, you guys, there was a newspaper flap about we were wrong, and also we know the tendency perhaps of you guys to jump down our throats if we do something wrong. We followed procedures.

MR. MARTIN: That may have been the response. I think that there was some apprehension when our task force arrived. We were not investigators. We were a task force.

(Laughter.)

MR. MARTIN: There are two other comments I would like to make.

The licensee did provide adequate notification to both local, state and federal officials.

Finally, our emergency notification system wasn't of the quality and reliability that we would like to have during an emergency.

CHAIRMAN PALLADINO: Which notification?

MR. MARTIN: This is the emergency notification system, our hot line. We lost it several times. It clicked off on us. The volume and quality of the signal wasn't what we have have expected or hoped for. But even given those detriments, it still is a damned good system and we did get a lot of information over it but it could be better.

That is all I have.

CHAIRMAN PALLADINO: Can I ask you, do you draw a conclusion yet on what led to the failure of this particular tube?

MR. MARTIN: I support Sam's opinion, but that is an opinion based upon -- I am an electrical engineer. So that puts it in perspective.

(Laughter.)

MR. MARTIN: I trust Sam.

MR. HAYNES: The licensee and Westinghouse are continuing to try to get assurance, that they really have got a definitive reason of why did the tube fail, for example, at the tube sheet.

CHAIRMAN PALLADINO: Do they lean toward Sam's approach?

MR. MARTIN: Do you want to give your approach?

MR. REYNOLDS: I have no information as of this moment of exactly what their latest thinking is. It is hard to conclude anything other than what I said.

CHAIRMAN PALLADINO: When might we have a feeling for what Westinghouse and the licensee think?

MR. DENTON: I might mention we have some samples of the tubes being analyzed at Brookhaven. We have retained a number of materials experts and I would imagine within the next month, sometime before restart we will have a definitive view on it. I don't think the staff has a definitive position yet on what the cause was.

CHAIRMAN PALLADINO: Any other questions?

Tom?

MR. REYNOLDS: (Nodding negatively.)

CHAIRMAN PALLADINO: John?

COMMISSIONER AHEARNE: No.

CHAIRMAN PALLADINO: Well, we thank you very much. That was an interesting presentation.

COMMISSIONER AHEARNE: We certainly thank Tim and all the people who worked very hard in putting the information together in a short period of time.

CHAIRMAN PALLADINO: All right. Thank you very much.

We will stand adjourned.

(Whereupon, at 3:55 p.m., the meeting concluded.)

* * *

NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

COMMISSION MEETING

in the matter of: PUBLIC MEETING - DISCUSSION OF REPORT ON TASK FORCE ON EVALUATION OF GINNA EVENT

Date of Proceeding: April 14, 1982

Docket Number:

Place of Proceeding: Washington, D. C.

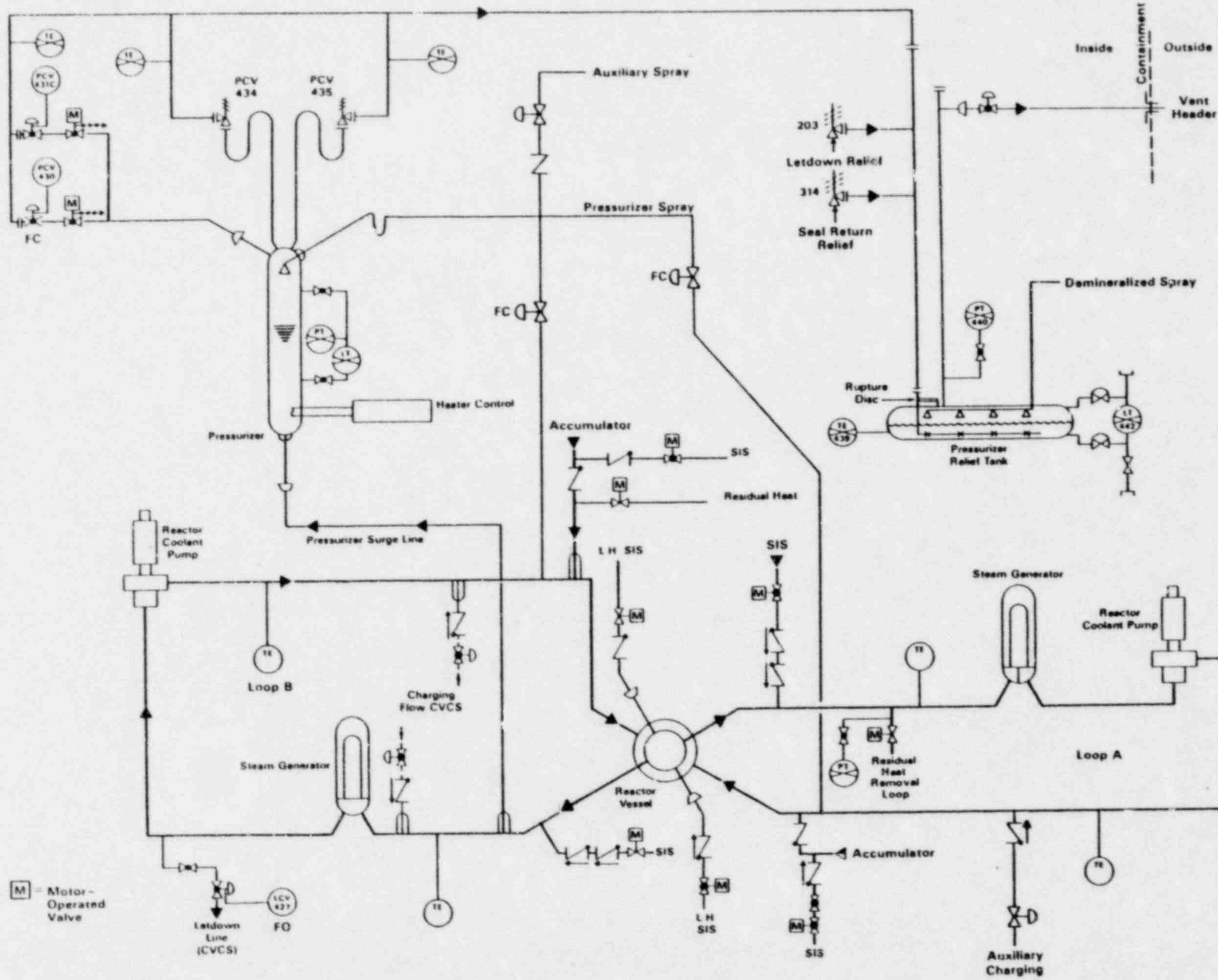
were held as herein appears, and that this is the original transcript thereof for the file of the Commission.

Mary C. Simons

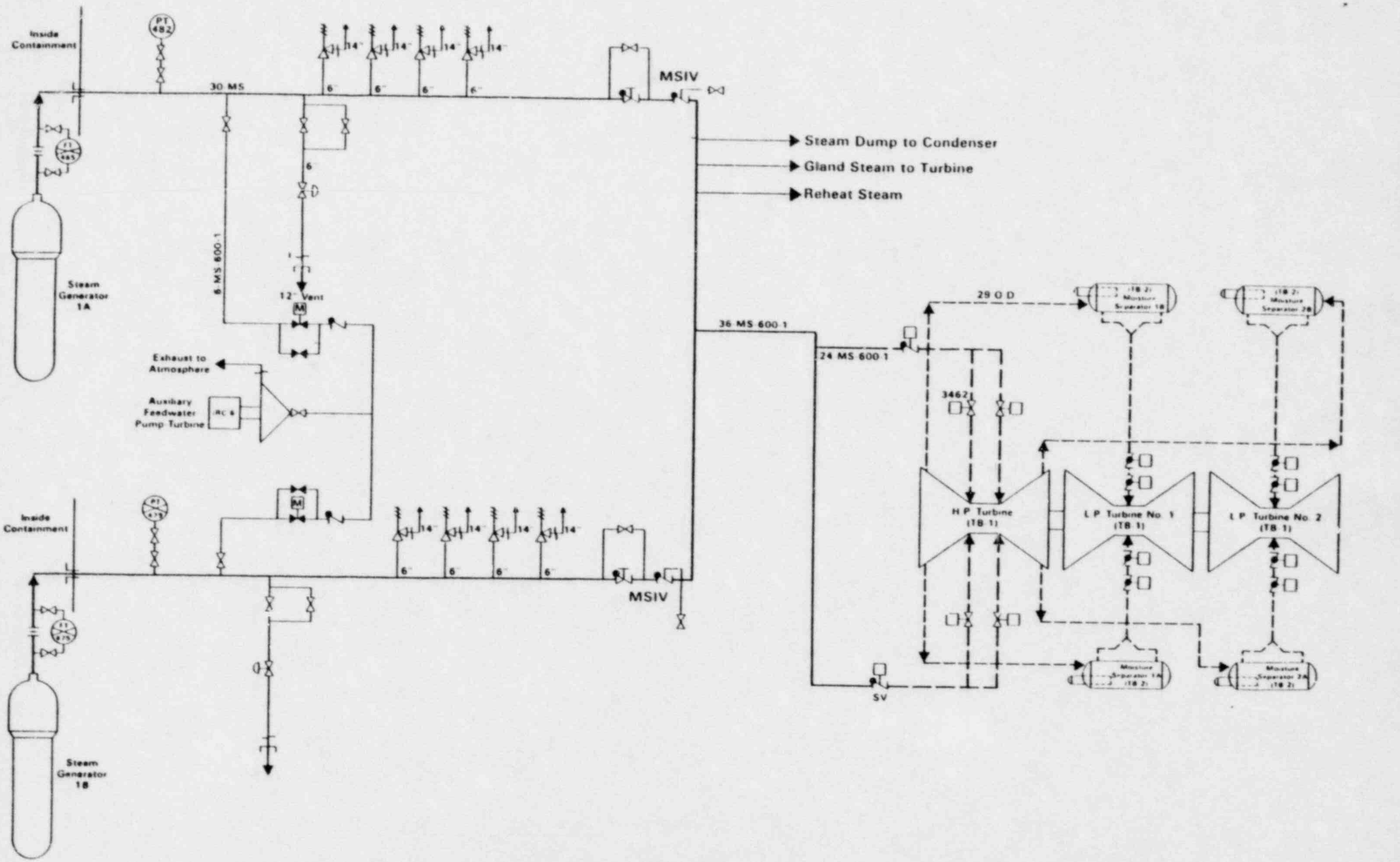
Official Reporter (Typed)

Mary C Simons

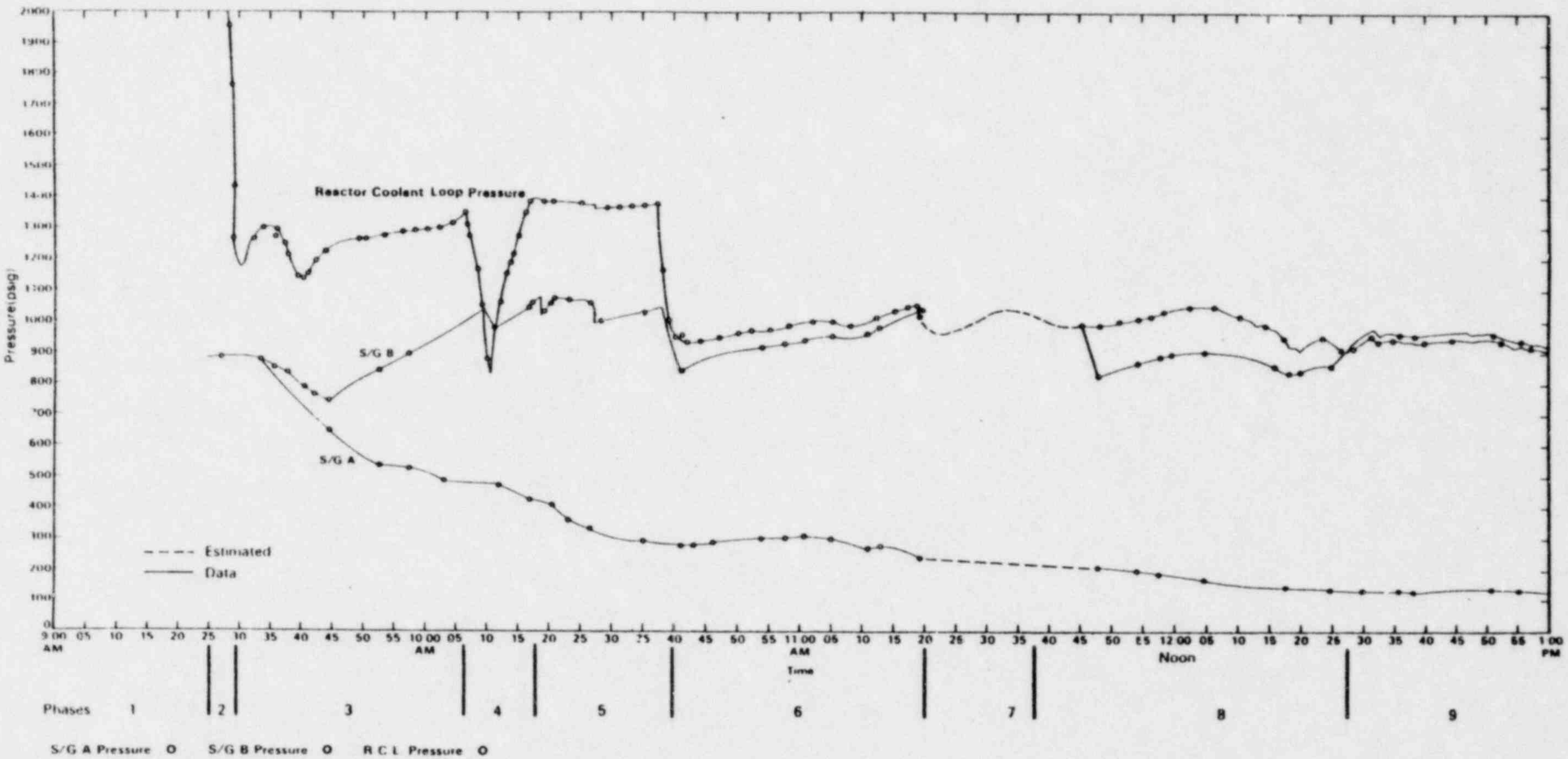
Official Reporter (Signature)



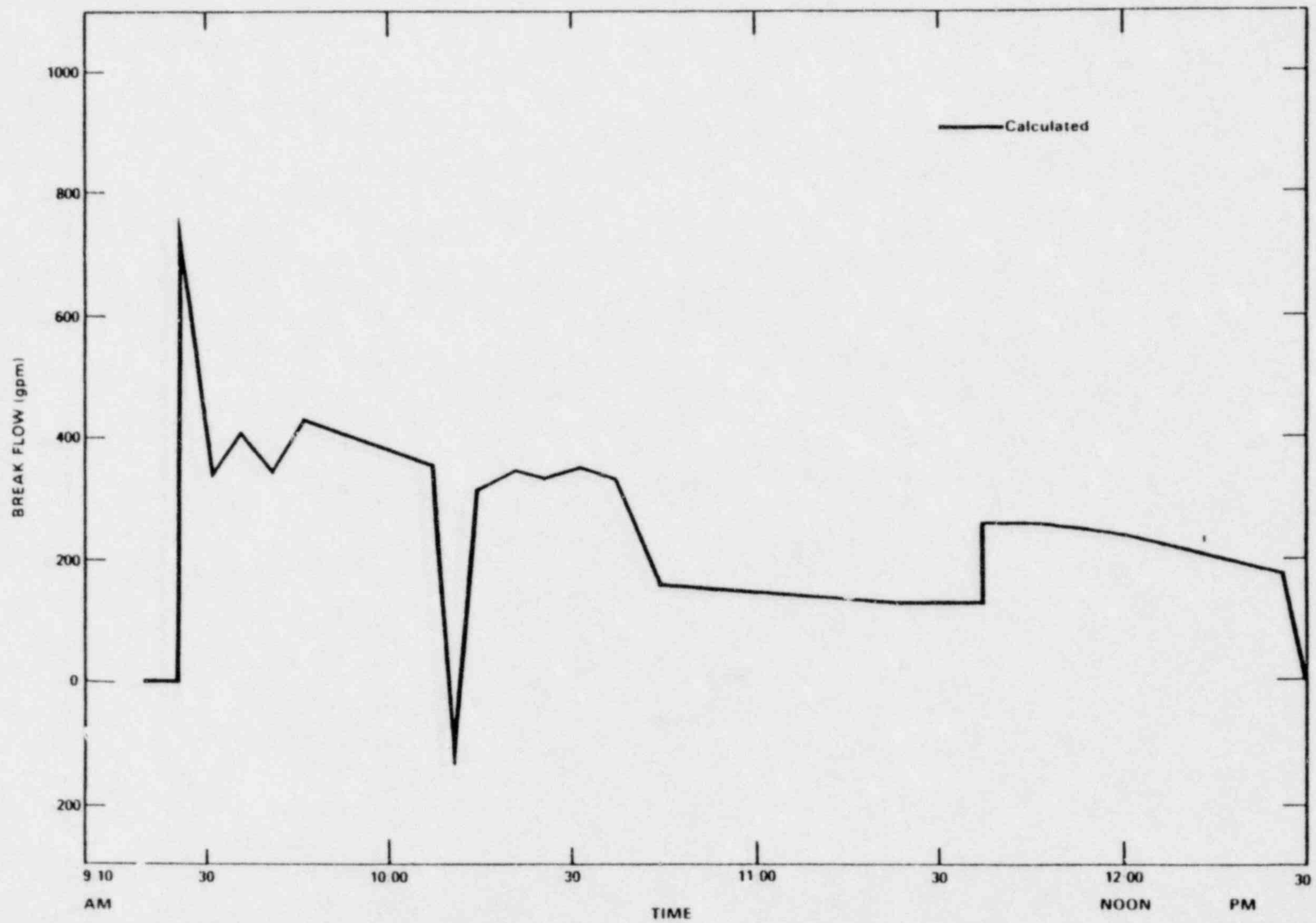
SLIDE 1 Ginna Nuclear Power Plant piping and instrumentation diagram



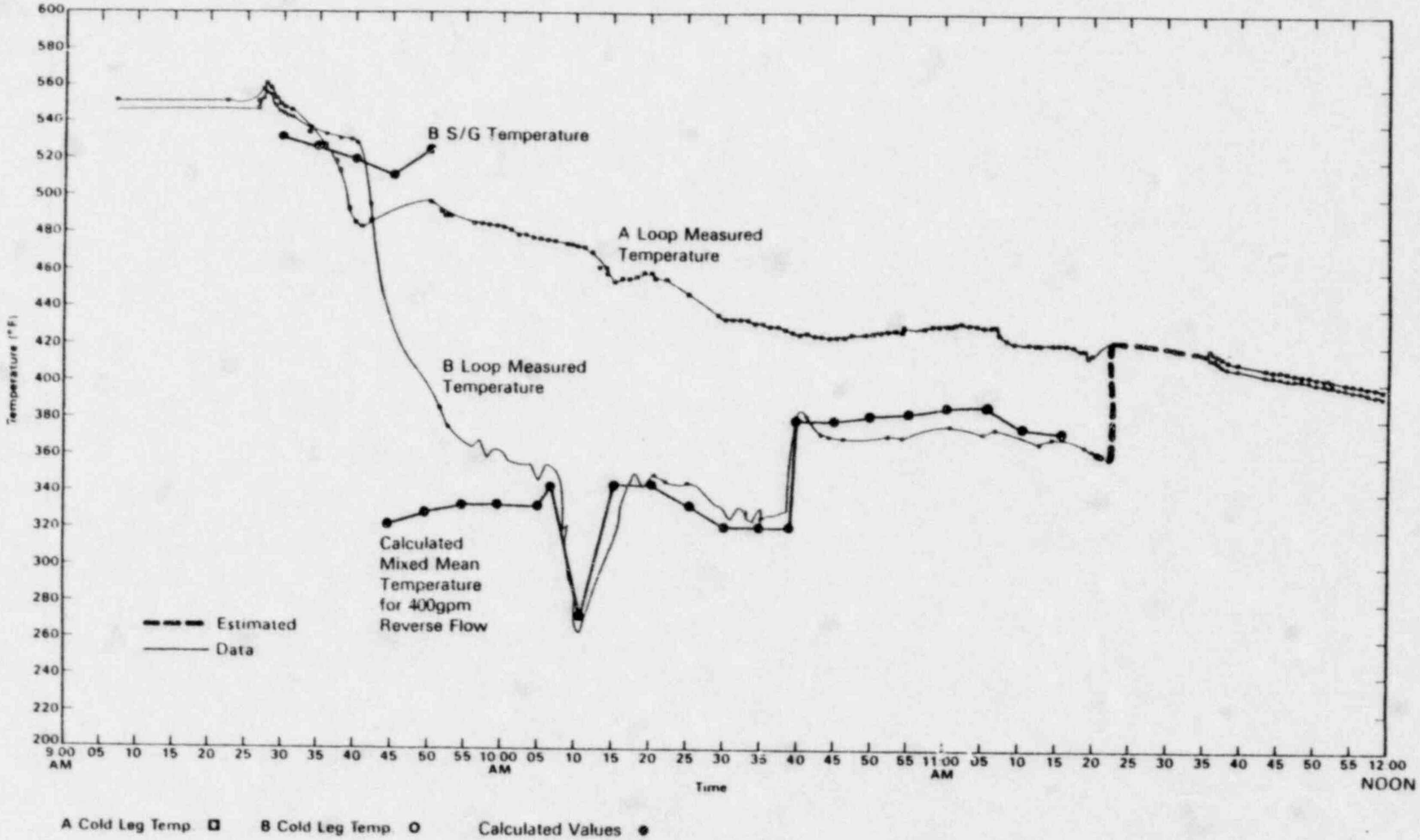
SLIDE 2 Flow diagram of main and reheat steam system



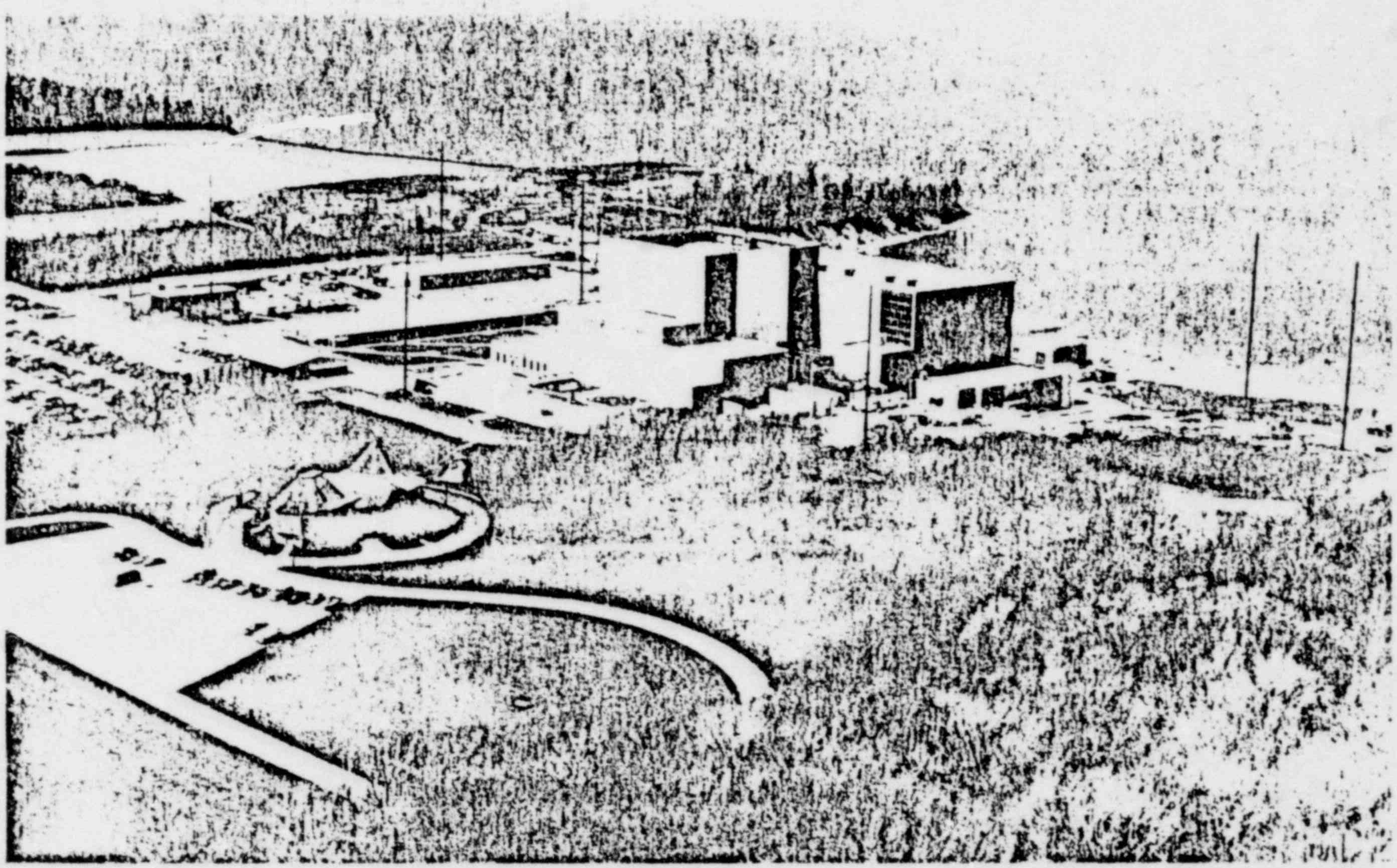
SLIDE 3 **Reactor coolant system and steam generator pressure response as a function of time, January 25, 1982**



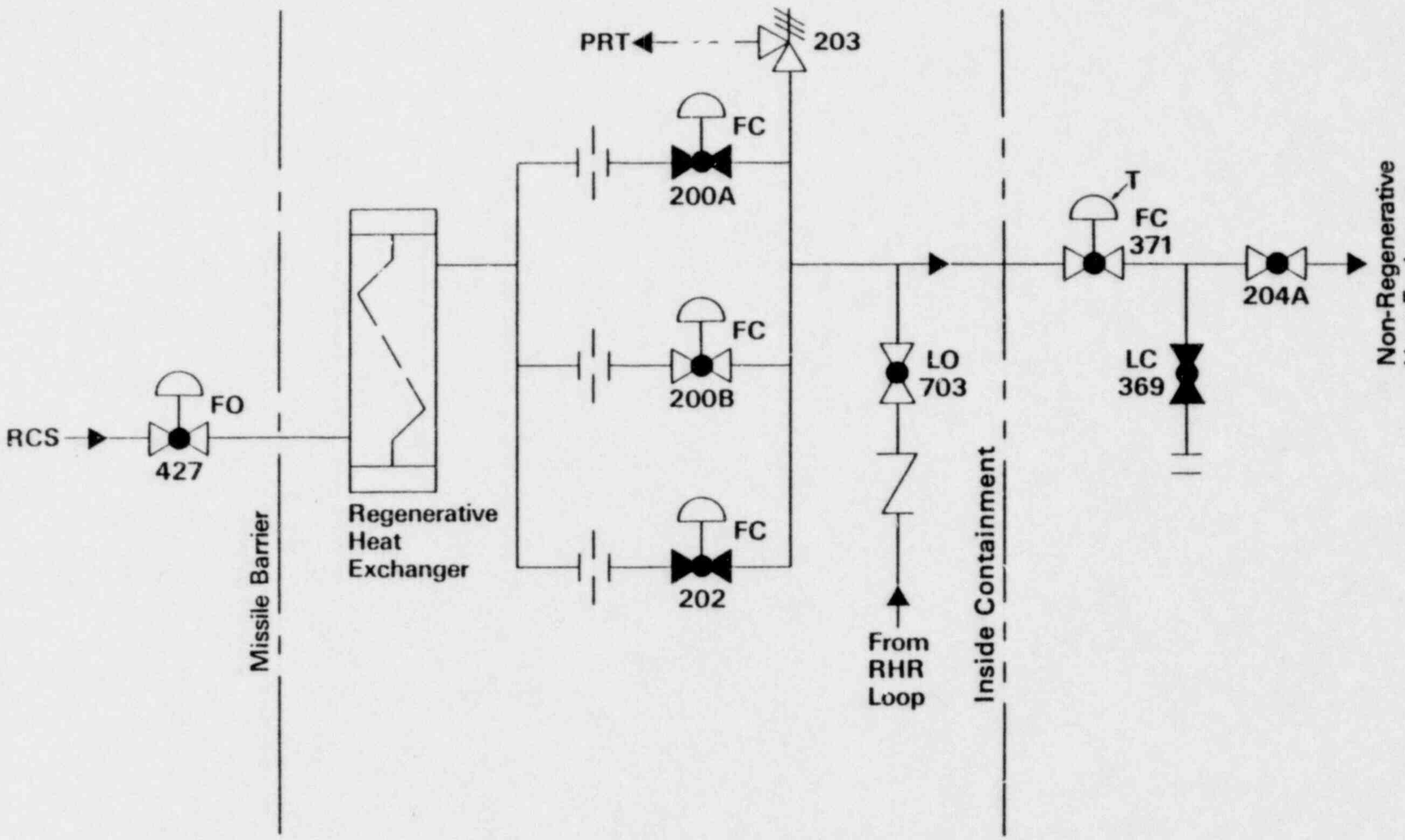
SLIDE 4 Steam generator tube leakage as a function of time. January 25, 1982



SLIDE 5 **Reactor coolant loop cold-leg temperature compared with calculated values, January 25, 1982**

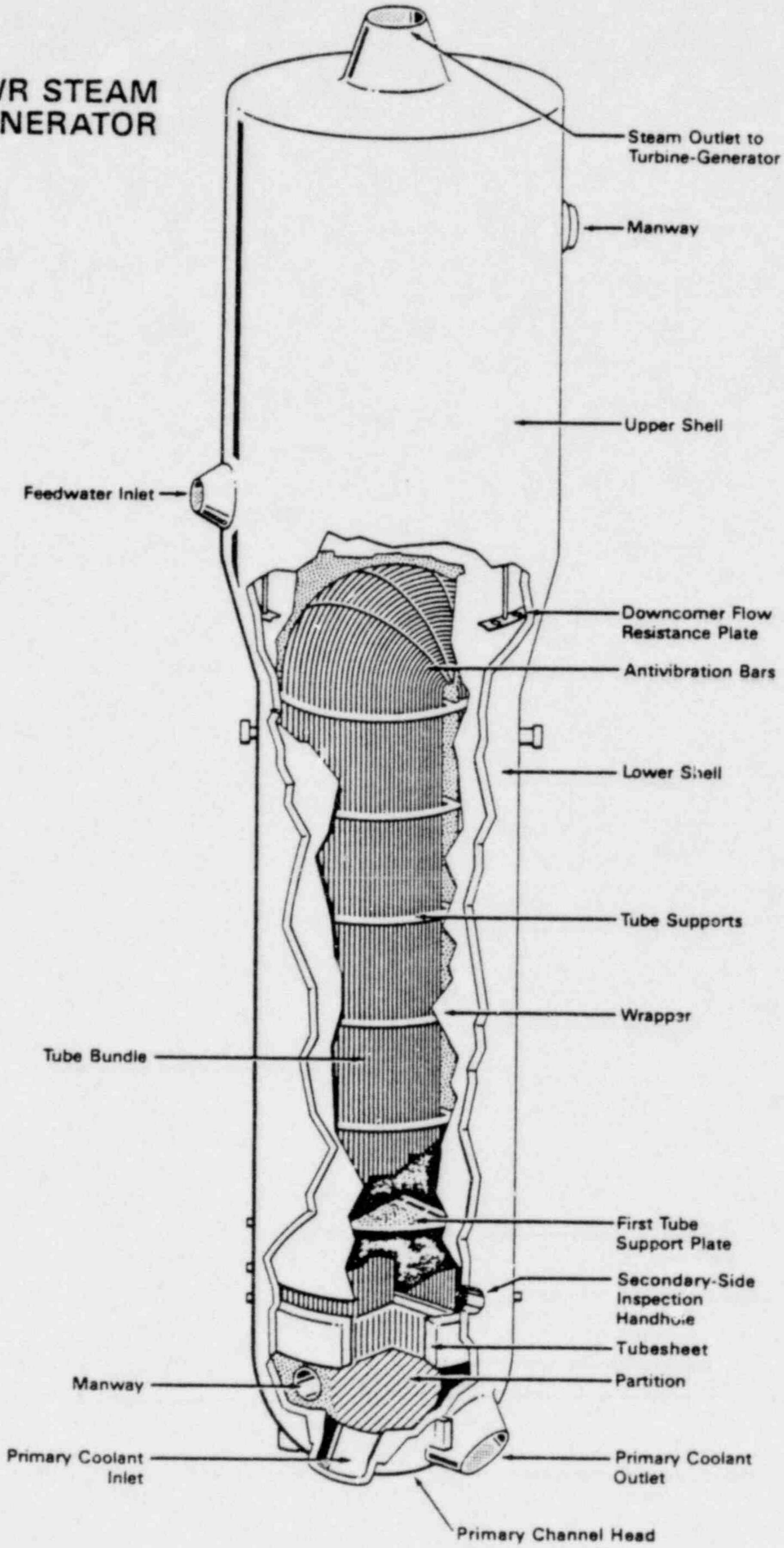


SLIDE 6 **R. E. Ginna Nuclear Power Plant**

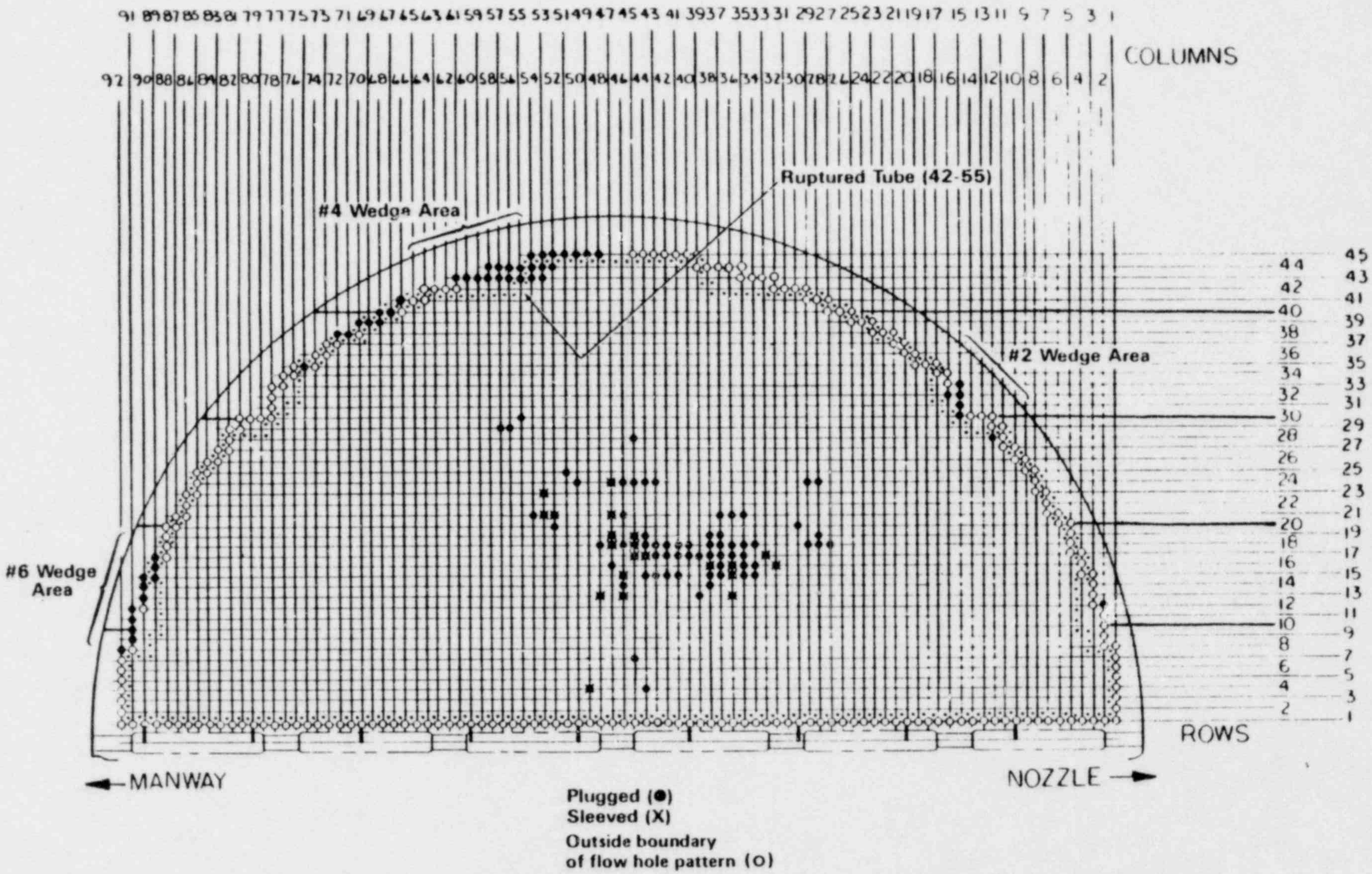


SLIDE 7 **Diagram of letdown line isolation and relief valves**

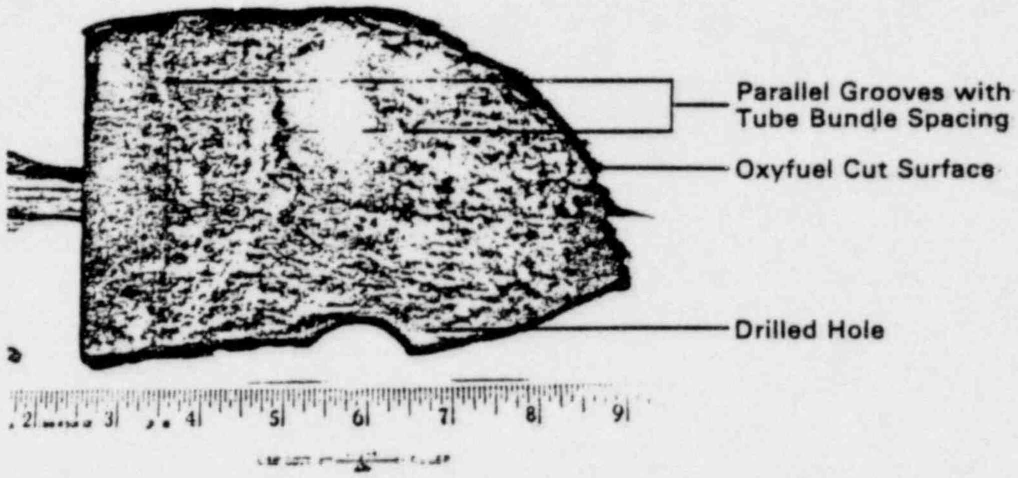
PWR STEAM GENERATOR



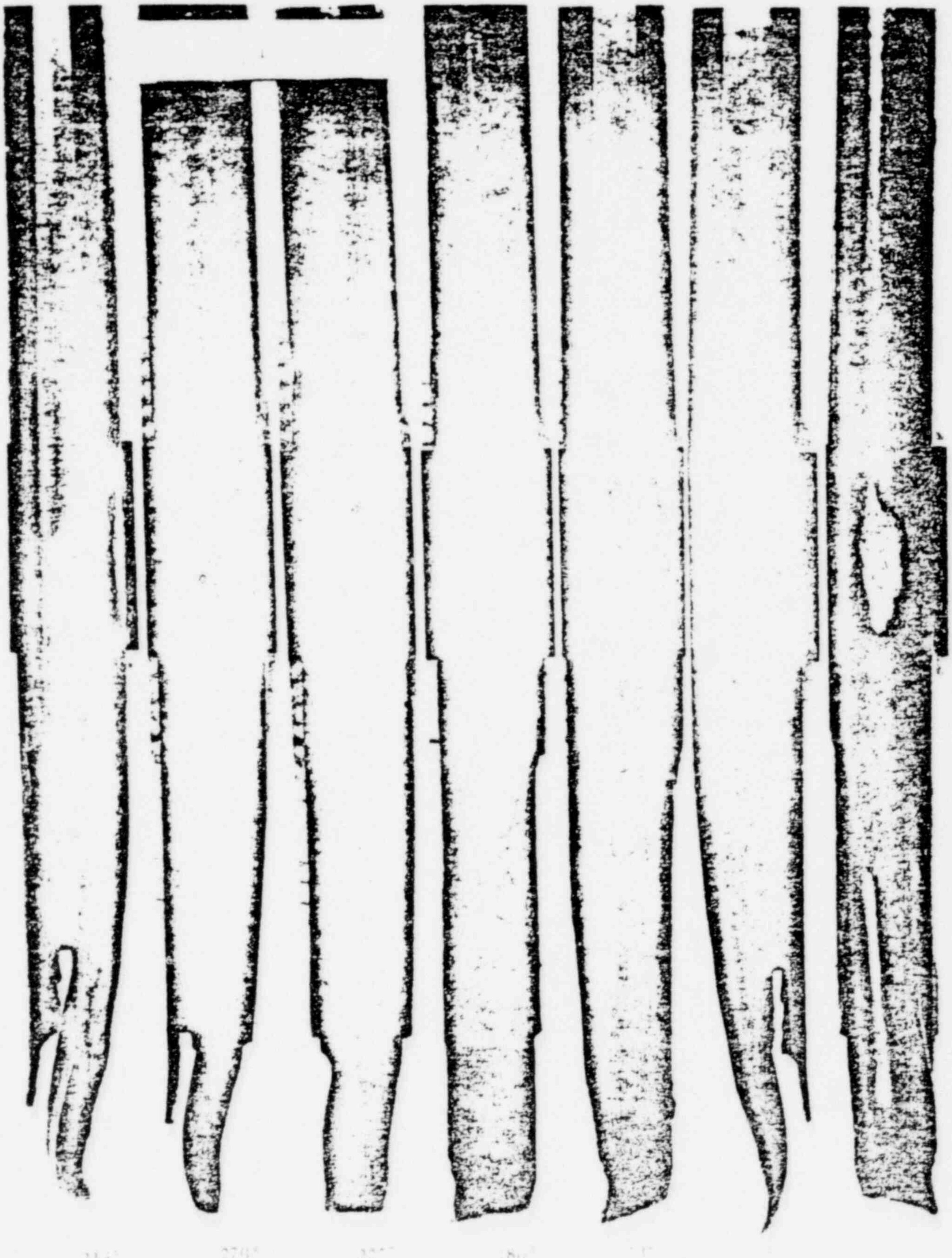
SLIDE 8 Westinghouse Model 44 steam generator



SLIDE 9 **Ginna B steam generator hot-leg tube sheet map before event of January 25, 1982**



SLIDE 10 Large foreign object removed from hot leg of B steam generator (½ in. thick)



SLIDE 11 Radial views of tube R44C55 showing first 9 in. above tubesheet. Tube detached from remainder of tube in tubesheet. White dot points outward.

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Meeting Title: Disc. of Report of Task Force on Evaluation of Ginna Event

MEETING DATE: 4/14/82 Open ✓ Closed ___

ITEM DESCRIPTION:	Copies Advanced To PDR:	DCS COPIES: (1 of each Checked) Original Document	May be Dup*	Duplicate Copy*
1. transcript (w/attached viewgraphs)	1	1		
2.				
3.				
4.				
5.				

(PDR is advanced one of each document, two of each SECY paper.)

*Verify if in DCS, and change to "PDR available."