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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Title: DISCUSSION OF SALEM UNIT 1 RESTART PUBLIC MEETING

Location: ROCKVILLE, MARYLAND

Date: MAY 9, 1994

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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DISCUSSION OF SALEM UNIT 1 RESTART

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PUBLIC MEETING

Nuclear Regulatory Commission
One White Flint North
Rockville, Maryland

Monday, May 9, 1994

The Commission met in open session, pursuant to notice, at 2:30 p.m., Ivan Selin, Chairman, presiding.

COMMISSIONERS PRESENT:

IVAN SELIN, Chairman of the Commission
KENNETH C. ROGERS, Commissioner
FORREST J. REMICK, Commissioner

STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:

JOHN HOYLE, Acting Secretary

KAREN CYR, Office of the General Counsel

JAMES TAYLOR, Executive Director for Operations

WILLIAM RUSSELL, Director, NRR

THOMAS MARTIN, Region I Administrator

ROBERT SUMMERS, AIT Team Leader

CHARLES MARSCHALL, Senior Resident Inspector, Salem/Hope Creek

E. JAMES FERLAND, Chairman of the Board and Chief Executive Officer, PSE&G

STEVEN E. MILTENBERGER, Vice President and Chief Nuclear Officer, PSE&G

JOSEPH J. HAGAN, Vice President, Nuclear Operations and General Manager, Salem Operations, PSE&G

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

2:30 p.m.

CHAIRMAN SELIN: Good afternoon, ladies and gentlemen.

We would like to thank the representatives of Public Service Electric and Gas for coming in to meet with us today. Today's presentation concerns the recent event at Salem, a little bit of the history, the actions Public Service Electric and Gas has taken in preparation for restarting the plant.

After the licensee's presentation, the NRC staff will also make a presentation on their results of the review of the licensee's activities, particularly the AIT that was just conducted.

Copies of the slides for both presentations are available at the entrance to the room.

Commissioners, do you have anything?

Mr. Ferland, thank you for being here. The floor is yours.

MR. FERLAND: Thank you, Mr. Chairman and welcome to the other Commissioners. It's good to see each of you again.

For the record, my name is Jim Ferland and I'm the Chairman and Chief Executive Officer of PSE&G.

I have been extensively involved in the nuclear industry for more than 20 years, including duty as manager of the three unit Millstone site at Northeast Utilities and have held a senior reactor operator license on Millstone Unit 1.

In March of this year, I completed a six year term on the Board for the Institute of Nuclear Power Operations, the last two years as Chairman and I am currently an Executive Committee member of the Board of the recently formed Nuclear Energy Institute.

PSE&G has ownership interest in the Peach Bottom, Salem and Hope Creek nuclear plants and operating responsible for the latter two. These facilities and the investment in them exceeds $6 billion and last year PSE&G's share of their output represented over 43 percent of our total electric generation. The successful operation of our nuclear units is of paramount importance to me and to the organization that I represent and I hope that in my remarks today I can convey some sense of that to you.

In a few moments I'll turn the program over to Steve Miltenberger, our Chief Nuclear Officer, on my right, and then to Joe Hagan on my left, our Vice President and General Manager of the Salem station for a review and discussion of the April 7th

incident at Salem.

Beyond their in-depth discussion of that event, I felt it important to provide a context in which you might consider this event and our response to it. Therefore, I've also asked Steve to describe our very recent history at Salem, focusing on important areas where we've been trying to improve our performance, highlighting improvements where apparent as well as areas where we clearly have not met our own expectations. We'll describe how we are addressing these deficient areas and the means we're using to monitor the effectiveness of the corrective actions that we are taking.

The Salem units and Hope Creek are located on a common site in Southwestern New Jersey. All PSE&G nuclear personnel are located right at that site. The performance of our Hope Creek unit has been outstanding and this plant has been formally recognized by the nuclear industry for excellence in operations in each of the past several years.

Despite its close proximity and despite the common management of many of its activities, we have not met our goal of bringing Salem station to the same level of performance. We're very open about this and within the past few weeks I reported to our

shareholders at our annual meeting that Salem performance had not met our expectations. Over the past several years, PSE&G has committed very substantial resources in terms of both personnel and dollars aimed at improving Salem's performance. Steve will describe in some detail the nature of this commitment.

In general terms, the dedication of these resources was intended to strengthen three aspects of Salem's operations, the performance of our people, including operations, engineering and other support personnel, the physical condition of our plant and its equipment, and the quality of the procedures our employees use to operate and maintain this facility. As Steve will describe, we've improved each of these areas. Some very substantially, others not enough.

I'd like to comment very briefly on the senior level oversight of our nuclear program. I had earlier described the significance of our nuclear program to PSE&G and, not surprisingly, senior management and Board of Director oversight is comprehensive. Information available ranges from computerized executive information systems which provide real time nuclear status reports to very detailed monthly and quarterly performance indicator

reports which address more than 100 measures of performance in key areas, including safety and performance and cost.

A summary review of nuclear operations is provided at monthly board meetings and on a quarterly basis our independently chartered Nuclear Oversight Committee reports directly to our board. That committee is chaired by Doctor Shirley Jackson, a member of the board, and among its other members includes Phil Bayne, Sol Levy, Neal Todreas and Hank Houckle.

At this point I suggest that Steve and Joe provide their portion of our presentation. Following their presentation, I have a very brief summary of the message that we've tried to convey this afternoon.

Being acceptable, I look to Steve.

MR. MILTENBERGER: Thank you, Jim.

I'd like to cover some of the specifics of the April 7th event. I'd also like to talk over some of the issues over the last several years and our overall assessment of the Salem facility.

(Slide) As we take a look at the specifics of the sequence of events from the April 7th event, we see this as a complicated event that challenged my staff. And as I look it overall, with

a few exceptions, my operators in the plant did perform well.

As we take a look at the beginning of the event, both Salem Unit 1 and Unit 2 were at 75 percent power. The reason for holding the plants at 75 percent power was the experience we'd been having earlier in this year due to the grass at the intake structure, causing the intake screens to plug up and the loss of circulating water pumps. Providing the 75 percent power range provided some additional room for the operators in maneuvering the plant and additional cushion based on the loss of circulating water pumps.

On this particular day of April 7th, we experienced a large intrusion of grass into this intake structure. Power was rapidly reduced because of this excessive grass at the circulating water intake structure. We had previously assigned special crews out at the intake structure that were supervised and included both operations and maintenance personnel to maintain this facility around the clock, seven days a week. So, we had provided some additional coverage at the intake.

To give you some flavor of the amount of grass that we were seeing is that we actually monitor and measure the grass through one of our consultants

that we have in the Delaware Basin. Over the last 20 years, we've been taking data and information on it and during this particular year, 1994, it's the highest we've seen in the last 20 years and this particular day one of the very high peaks. We experienced about four times the normal concentration of grass we would see in the highest during a spring activity. This particular winter was exceptional in that the large number of ice storms that we had and experienced created ice back in the back marsh. As you're aware, our plant is surrounded in the Delaware Basin by the marsh and the grass. The significant high tides we had, along with the ice, combined to provide the opportunity for grass to be carried into the river stream.

Power was reduced to less than ten percent. Going less than ten percent enabled the 25 percent reactor trip. At this point, the shift supervisor had made a decision to take the unit off line and was in preparation of doing that. The operator pulled the control rods to raise temperature, causing the plant to trip at 25 percent power.

(Slide) One train of safety injection --

CHAIRMAN SELIN: Before you go on --

MR. MILTENBERGER: Excuse me.

CHAIRMAN SELIN: As I understand it, there was a -- I'll make this a question. Was there a certain lack of synchronization between the reactor operator and the turbine operator's actions up to the point where power dropped to ten percent?

MR. MILTENBERGER: Yes. I'm going to go into that in some more detail and talk about the operator actions and what we found as far as the root cause or causal factors. That was a piece that contributed. The communications between the shift supervisor and the operators contributed to the temperature going low and the turnaround in pulling the rods to have temperature come back up. Trying to do that too quickly caused us to reach the 25 percent power trip.

We had one train of safety injection spuriously actuated and this also caused us to declare the unusual event. This spurious signal that we received was due to a pressure wave on the main steam system which caused an indication of high main steam flow which, combined with low temperature created a very short duration spike into the system of about 30 milliseconds. This very short duration spike caused some of the relays to actuate and others to not actuate, complicating the event. So, one train

actuated, the other train did not.

We went through intensive review and analysis of those timings of the various electronic spikes and found that all of the relays were in spec and that if a real steam flow signal had been actuated or indicated by high steam flow, both safety trains would have functioned as designed.

The pressurizer proceeded to go solid and the power operator relief valve cycled to maintain pressure. There was additional time that was required by our operators in dealing with the emergency operating procedures because of the two different trains now being out of alignment. They had to analyze the conditions, understand what equipment had not functioned, and put that equipment in place as directed by the emergency operating procedures, which they did.

During the next 30 minutes or so, as temperature increased in the primary system and secondary pressure increased due to residual heat, and our operators not manually opening the main steam relief valves, we had a main steam safety valve that opened causing the reactor plant to cool down and a reduction in pressure. This cool down because the pressurizer was now solid is what caused the pressure

in the pressurizer to go down rapidly under a solid condition.

(Slide) That rapid reduction in pressure caused a second safety injection due to that low RCS pressure. The operators went back into the emergency operating procedures as directed, worked their way through them and then shut the safety trains back down as directed by those procedures. We then declared an alert as a precautionary measure to ensure the proper technical support personnel were in place to review the plant shutdown. This was not required by the technical conditions of the plant, but we decided it was the prudent action to take.

Later on, pressurizer level was restored, emergency procedures were exited and normal cool down was initiated and the alert was terminated later in the day.

(Slide) Before we start on the causal factors, let me cover how we view the event relative to safety significance. The event is significant and has been recognized by PSE&G by a thorough analysis and corrective actions that we've undertaken relative to the event. This event represented a number of challenges to our safety systems to include a trip, two safety injections. The second safety injection

was pressurizer solid that repeatedly challenged the PORVs.

Significant challenges to the operations crew during this event with the rapid power reduction and the low power operation, complicated event caused by spurious signal, which led to a misalignment of the safety injection trains. That misalignment significantly contributed to the complication.

Although some errors were made by our operators and a number of challenges from what was going on in the plant, the operators responded well to really diagnose what was happening and shut the plant down in appropriate fashion.

There's a number of important lessons learned for PSE&G and the industry and I will cover those in my corrective actions.

We did both a plant and independent review in accordance with our policies at our facility and directed the plant not be restarted until we thoroughly understood and made the necessary corrections. Our review led us to the following causal factors. I'd like to break these into three components. The first is the reactor trip. The control operator withdrew the control rods too quickly and improperly monitored the plant parameters. In

addition, the shift supervisor inadequately carried out command and control of monitoring the plant parameters and directing the resources to the priority of tasks that were needed. This addresses the earlier piece.

CHAIRMAN SELIN: Except that that's true. That's the tactical problem in what happened at the turbine and the reactor got out of synchronization, but then there's a broader problem which is why did they try to keep power? Why didn't they just scram the reactor at that point altogether? I read a little bit ahead. I cheated. I'm sorry about that. But that doesn't seem to be addressed in the other points.

MR. MILTENBERGER: What we saw is they had already made -- they felt that the plant was stable at the time. We're working through the procedure because they had made a decision to take the turbine off line. They were working vigorously to do that in a very planned, organized fashion and follow the procedures in a methodical fashion to take the turbine off line. Some additional guidance that we provided them is we want them to just take the turbine off and we want them to do it by a turbine trip if that's what's called for because as you look back at this scenario you can see that if they merely would have tripped the

turbine and/or tripped the reactor, which would have tripped all the systems, they very quickly would have come out of this. But they felt that the plant was stable and that they would methodically take the plant off-line and not challenge it by giving it the trip signal.

CHAIRMAN SELIN: I could see a number of possible reasons for that. One is the procedures weren't explicit and they just didn't know what to do. The second is they're going on an assumption that each time you trip a turbine or trip a reactor, something might happen and you should avoid these if not necessary or the third is some kind of an idea that it's embarrassing to have a trip and you should avoid them if you can. Are any of these the cause?

The information I got, and I may pass this to Joe in just a minute, the information that I got is I look at the picture of what they saw. They thought the plant was stable and they did not want to actuate a trip, not from the standpoint of embarrassing or any other situation, but they felt that they did not want to challenge the emergency systems or other systems --

CHAIRMAN SELIN: If they didn't have to.

MR. MILTENBERGER: -- if they didn't have to and they thought they were on a very good path to

methodically take the plant off.

Joe, do you have anything to add?

MR. HAGAN: We asked the operator specifically why didn't you trip the turbine. At the point they were in the scenario, their answer, the senior shift supervisor and the shift supervisor, was that they were concerned about introducing a secondary plant transient until they had recovered the primary system, which was to restore the reactor coolant temperature. We asked them specifically, "Why did you hesitate because that was clearly your plan of attack up until this point in time?" Their answer was that they wanted to make sure that the primary plant was in the condition where they felt comfortable before they introduced a secondary plant transient.

CHAIRMAN SELIN: Are the procedures mute as to what to do in the situation? Is it too specialized a scenario to go to the procedures and find guidance? Do you leave that to the operators to judge? I just think conversely, is it clear that according to their instructions they should have tripped either the turbine or both, but they didn't?

MR. HAGAN: Within the guidelines that they had, the procedural guidelines at the time, it's up to the individual's judgment on when to do that.

What we've done since that time is actually given them explicit direction on when to take the turbine off line in accordance with certain parameters. We also hesitate when we give them direction, but not to be too prescriptive.

CHAIRMAN SELIN: Is a scenario like this one against which people train? Had they seen something like this in their training or is this somewhat new to them?

MR. HAGAN: There's training scenarios that would involve rapid down power scenarios. This particular one, I do not believe we have an exact type of scenario for a loss of circulators that follow the same pattern. There are rapid down power trending that's given.

CHAIRMAN SELIN: In which they normally do trip one or the other of the systems?

MR. HAGAN: In this particular case, I don't know which they would have done. I've not gone back and looked at all the scenario results to see which -- actually what they look at is what the results have. In a certain case --

CHAIRMAN SELIN: Say that again. I didn't understand that. What they look at is what the results are?

MR. HAGAN: What the results were in the simulator scenario for rapid down power. A shift supervisor will make a decision on what to do based on the circumstances they have. This particular circumstance I'm sure we did not have that was duplicated over the loss of the circulators and the way they were going.

CHAIRMAN SELIN: So they were sort of on their own, not just because of the written procedures, but it's your impression that neither the written procedures nor the training really covered something very close to this scenario?

MR. MILTENBERGER: Let me cover that a little bit.

CHAIRMAN SELIN: Okay.

MR. MILTENBERGER: My expectation is through the simulator and the training activities that we go through. I know that when I went through the SRO certification and training program, you go through a number of scenarios not exactly like this, but you go through a number of scenarios where you look at your various plant parameters. When those plant parameters get out of bounds in certain areas, that's what keys you in to make certain decisions about tripping the turbine and/or tripping the reactor

systems. So, within those training scenarios you would find examples that would fit some of the elements of this but not exactly the element of this.

CHAIRMAN SELIN: Which would suggest that they should have tripped the --

MR. MILTENBERGER: Our review of this is that they should have tripped the turbine. That should have been an early on decision. They did make the decision to take the turbine off, but they felt that they were stable enough at the time to do it through a procedural removing rather than reaching up and merely tripping the turbine.

CHAIRMAN SELIN: I'm not trying to ask you what three Ph.D. engineers -- we know better than to trust a Ph.D. engineer -- what three advanced engineers would have done at this point. I'm saying given the total between procedures, training, et cetera, what would you have expected the operators to do, not what you would have done yourself.

MR. MILTENBERGER: What I would have expected the operators to do was trip the turbine.

CHAIRMAN SELIN: Okay. Thank you.

COMMISSIONER REMICK: Elaborate a little bit on the wording that they withdrew the control rods too quickly. This immediately makes me think of a

period scram rather than 25 percent. By too quickly do you mean too far too soon or --

MR. MILTENBERGER: Too far and too fast. They were operating the unit down about eight percent power at the time and they observed that T_{ave} was below set point and below the tech spec requirements for that. They were in the process of recovering that. The operator withdrew the control rods too quickly and too far over a short period of time as he was monitoring temperature and looking at other parameters and hit the 25 percent power trip. We never should have gotten to the 25 percent power trip.

COMMISSIONER REMICK: But if you'd pulled the rods quickly but not too far, you would not have exceeded 25 percent.

MR. HAGAN: The rate is predetermined. It's the amount of control rod you withdrew.

COMMISSIONER ROGERS: I see. That he was aware though that it would trip at 25 percent power. In reading some of the background material, it sounded to me as if the operators were not aware that it would trip when they hit 25 percent.

MR. MILTENBERGER: My understanding is the operator was aware of that, and Joe, you can fill in some data here. Never expected to get close to over

25 percent level, yes.

MR. HAGAN: His intention was not to increase power to anywhere near 25 percent. It's not clear to us that on our review, to make it clear from what we know, we believe the individuals in the interviews realized that they had gone below ten percent power and from their training they know what that means as far as arming P-10. It was not clear to us that they had communicated that amongst the crew so the crew knew that. But from our review of the rod reactivity increase, he had no intentions of bringing power up that high. It was to restore T_{ave}.

MR. MILTENBERGER: Now, you touched on another point and Joe touched on it. That's communications amongst the crew, which is an area that we've done additional work in. They didn't feel that that was a piece and it's part of command and control and that communication fits in with that.

COMMISSIONER ROGERS: Maybe you'll touch on it someplace along the way, but reading background material on this seems to suggest to me that there might have been a team training problem, a question of whether these folks had really -- were functioning as well as they should as a team and been trained as a team as much as they were as being held accountable as

individual operators and individual performers. I'd like you to say something sometime before you're all finished as to how you see the team functioning in the kind of training that you may feel may be called upon to emphasize the team functioning much better than the sum of its parts, which is what you hoped to get and apparently didn't get in this case.

MR. MILTENBERGER: We might as well touch on that now and I'll cover some and maybe Joe will touch on some.

The team training and team aspect of the training is an area that we've provided some additional training and additional work to the individuals and to the groups and all of our crews relative to this from the experiences of what we've learned out of it. The communications piece really ties in significantly with the performance of a crew and how they pull together to have the whole perform better than any one individual. So, that was a piece that we wanted to concentrate in and emphasize on.

There's sort of two different pictures, as I look at it. If I look at the teamwork amongst that team prior to the trip, the number of pieces that they missed and could have improved upon, following the trip and the safety injection, which tended to be a

very complicated event for them at that time, the team seemed to come together as a team, communication seemed to change. We did have one problem later on that I'll talk about, but the team really came together as a team and functioned well to manage the plant and ensure what was going on in the facility. So, we see two aspects of that. That's a piece that we feel we need to work on. So, we did see both aspects of that.

The first safety injection, the operator allowed primary system temperature to go too low coincident with a false short duration high steam flow pulse. This is what caused the misalignment of the safety injection trains and caused the A train to actuate and the B not to actuate. A false high steam flow signal was due to a design vulnerability which we learned from this event and have proceeded to institute design changes to remove that vulnerability from the system. I'll talk about that some more.

(Slide) The second safety injection, the causal factors were less than adequate group communications. We talked about this some and this is a piece in the second half since the trip. Recovery of the temperature, as primary temperature was coming up, secondary pressure was also increasing. The

operator, not taking manual control of the main steam relief valve, which he had been trained to do so, caused us to hit the steam safety valves. The design of the steam relief valve automatic control system, which is a known problem and a design modification that had been planned but was not implemented.

(Slide) I'd now like to cover the corrective actions and I'd like to cover these in three different categories dealing with personnel and training, procedures and equipment. In many ways, those three can tie together, but I'd like to break those into the parts. We've conducted additional simulator training for all of the operating crews to reinforce low power operation, solid plant operation, command and control and communications, resource management, operator actions following an automatic safety injection. In particular, train misalignment.

We have reinforced and clarified management's expectation to all operating crews dealing with low power and rapid power reduction, along with turbine trip and reactor trip that we've already talked about.

In the procedures area, we saw a number of enhancements that we could make to our procedures to provide some additional guidance; enhanced operating

procedures for rapid power reduction and low power operation; revised operating procedures to include minimum condenser vacuum and circulators and service criteria for a manual trip; revised operating procedures for restoration of pressurizer level and these procedural changes were reinforced through the training activities.

In the third area of equipment --

COMMISSIONER REMICK: Excuse me. Am I to interpret those changes had been made where it says "revised?"

MR. MILTENBERGER: Yes.

COMMISSIONER REMICK: Okay.

MR. MILTENBERGER: Those changes in procedures have been made and all of the crews trained on them.

In the equipment, we've made modifications to improve the automatic operation of the main steam relief valves. As I mentioned, this modification was planned, but it could have been implemented earlier. We made modifications to dampen the steam flow transmitter sensitivity to the pressure pulses it sees from the main steam system.

COMMISSIONER REMICK: Was that the design vulnerability that's referred to?

MR. MILTENBERGER: This is the design vulnerability that when the main steam stop valves close on a turbine trip it sends a pressure wave down the pipe and because of the flow transmitter having two taps and it sees that wave, it creates a short duration oscillation amongst those two taps and about a 30 millisecond pulse is what we saw.

We have some planned modifications to the circulating water traveling screens which will enhance their ability to cope with the grass. Even though I talked about the significant amount of grass that we did see this particular year, these modifications are looking at lighter and faster screens, new improved rakes and some other modifications we expect to make in the future.

(Slide) There were some other issues that came out of the various reviews. One of them was the reactor vessel level indication system. Because of the identification of that by the NRC and by my staff in reviewing it, we've extended the utilization to shutdown. That system was never intended for that, but we see it being beneficial and utilized for that.

The pressurizer, power operator relief valves, we're going through an extensive engineering analysis of the valve internals. Our valves did

perform very well, did show some signs of wear and some minor cracking which had to be evaluated and is an ongoing evaluation. There will be some important lessons for us into the future.

In emergency plan communications, we are incorporating some additional guidance to be provided from the NRC, particularly at the unusual event level. There was a request for some additional technical information to be provided we did not have at the time. We intend to include that into our procedural guidance in the future.

Some of the lessons learned are being shared with our Hope Creek unit and with the industry.

(Slide) I would like to move from this specific topic to the broader picture, the Salem station. We recognized a few years ago that Salem plant condition and performance was not meeting our expectations. At that time, we instituted specific improvements to equipment, procedures and personnel. This improvement focus on these three areas. Equipment dealt with materiel condition upgrade, corrective and preventative maintenance and backlog reduction. In procedures, procedure upgrade process, we revised 3500 procedures in a facility and those have been issued. In the people area, it dealt with

supervisory effectiveness, communications, work practice, standards and teamwork.

As I take a look at this perspective, and I'll show you some results in a minute, the equipment side has made some progress and we are pleased with that over the last several years, but we still have room to go. The procedural area is essentially there and has moved to, I'll say, state-of-the-art in the industry. The people side --

COMMISSIONER REMICK: Excuse me. When you say state-of-the-art, does that include human factors considerations in the procedures of simple things like headings and things, make them easier to read and understand?

MR. MILTENBERGER: Yes, it does.

COMMISSIONER REMICK: It's not only correcting them technically, but making them more readable.

MR. MILTENBERGER: This complete rewrite of our procedures was done in a very planned methodical basis. We actually had INPO come in twice early on in the process to review with the guidance that we wanted to not just improve the procedures, we expected those procedures to move to a significant step change from where they were and equal in the

industry and that has been done.

On the people side, we have not made the progress that we expect to make. We recognize this as a very tough issue and is receiving our increased focus. Joe Hagan will cover this area later in the presentation.

I don't intend to cover in detail the next few slides. I intend to go through those fairly quickly.

(Slide) On the materiel condition upgrade side, we've completed for Unit 1 and/or Unit 2 a number of modifications in the facility. Just a couple I would mention. The control room modifications and human factor upgrades amounts to about a $45 million expenditure to do that. The upgrade of 18,000 linear feet of service water piping, safety related, is in excess of $100 million. The switchyard expansion and upgrade is on the order of $77 million.

As I take a look at the total expenditures since 1990, we're somewhere in excess of $300 million on specific upgrades to the facility. That's up to 1994. We expect to expend about $100 million in additional in 1994 and $75 million in '94 as we're moving the equipment to the state we want it to be in.

In addition to that, as we take a look at the design changes that have been implemented, about 100 of those design changes were specifically implemented to assist the operator and operator actions. There's a lot of design changes with that.

I brought with me a very simple before and after book to provide just a couple of pictures. There's only about a picture of before and after in the book and not really intending to cover it in detail, but we could do that. As you flip through here, before is on the left and after is on the right. Those of you that have not been in the plant in awhile, we would invite you to come, pay us a visit and take a look at the plant today.

COMMISSIONER ROGERS: Gee, it looks like you turned the whole plant.

MR. MILTENBERGER: If I could move ahead with some of the slides, since I don't plan to cover those in detail.

(Slide) Corrective maintenance backlog, wanted to some you some history of that. We've moved from the 2500 mark several years ago to the 1000 mark. This does compare favorably with industry standards. Preventative maintenance overdue, similar improvement.

(Slide) Reliability centered maintenance

program, we have instituted on 34 programs at the Salem facility, 34 systems. That project is now complete.

(Slide) As I mentioned, the procedures upgrade program, you can see the progress that we've made over the years and that project is now also complete.

(Slide) As I take a look at the personnel side, and as I mentioned, Joe will cover this in more detail in a minute, we've done work practices and standards expectations, work monitoring by both line management and a secondary monitoring by our QA organization. Work control process improvement, supervisory face to face time, additional root cause training for the organization, supervisor and management training and manager and supervisory dialogues. We now see the personnel area where we had to concentrate on three areas previously. This past year and into the future we see significant concentration of energy and effort on the personnel side.

(Slide) A couple of indicators and I just pulled a couple of licensee event reports, you can see that we've made progress in that, and personnel error LERs at the Salem facility, we've also made progress

in that area.

(Slide) The assessment of results is we see improvement achieved in a number of areas. Personnel performance improvement is noted but is not meeting our expectations. The plant performance is also not meeting our expectations, particularly dealing with uneventful operations and reliability of the facility.

(Slide) Because of this and a number of reviews, we identified the need for a comprehensive performance assessment that was done this past year. This comprehensive performance assessment was done by a full-time multi-disciplinary team of 12 people for four months of dedicated time, reported directly to me and performed a comprehensive assessment of occurrences over the last two years. We looked for broader root causes, failed barriers, contributing causal factors and common threads.

(Slide) The results from that comprehensive performance assessment has defined specific problem statements within three categories: management philosophy, skills and practices; people performing the work and problem solving and follow-up.

(Slide) From the results of that comprehensive performance assessment we have defined

responsibilities for resolution, prepared action plan and schedules for each problem area and identified performance indicators to measure progress and effectiveness at a facility. Such things as work practices and standards and both line and QA supervisory face to face time and leadership feedback results of the performance of our supervisors. This event provided some specific lessons learned but overall fit into our comprehensive performance assessment and the broader picture that we are working on.

At this point, I would like to have Joe Hagan talk about the emphasis on people. Joe is newly assigned to the Salem facility. He was previously Vice President of Nuclear Operations and General Manager of Hope Creek. Joe brings the Hope Creek management philosophy with him and an excellent record of dealing with the people side of the business.

Joe?

MR. HAGAN: Thanks, Steve.

As Steve said on people's performance -- let me clarify one other thing that Steve said. I did work at Salem from 1977 to 1983. I had Salem experience prior to going to Hope Creek. Coming back, my aim coming back was to look at the Salem

performance and the Hope Creek performance and say what's different, why does it seem to work and we're having difficulties on the other, and really look at people's performance and convince people that Salem's performance is truly people's performance because that's what our assessment is. How Salem performs is really a reflection on how well its people perform.

Going in, I talked to the managers, did a personal discussion with the managers who were there. Did my own assessment of where they were, what they were feeling, whether they believed that, whether the change was through the people. Based on the interviews and based on what we saw elsewhere in the industry, I asked the managers to put together a plan of improvement, letting them know that the restrictions were that the -- really the only restriction was the outcome had to be successful. We were looking for successful organization. The conclusion I came to was there was some people -- changes need at the Salem plant. Not only the number of people, but who were in positions at the time. We did the assessments, made some personal changes. Those included most recently here the department heads. A number of the department heads who were reassessed were selected to go to other slots.

Additional people were promoted and brought in. We did bring some of the Hope Creek people over, keeping in mind that they were people who were needed at Salem and were in the position on Hope Creek side as far as performance, were in line for promotion. We decided to give them an opportunity at the Salem plant.

The staffing levels that we talked about I asked the management team to put together the organization, looking from my assessment on three key areas that I saw that needed improvement and we defined them as focus, ownership and teamwork for the individuals in the Salem staff. They put together an organization with no restraints.

Looking at the organization in place is comparatively low as compared to the industry. There's about -- at the time that I became VP of Nuclear Operations, it was 530 line functions, line people. We increased that number to -- it was 570. I may have said 530, it was 570. We took that to 630 people, looked at it again, looked at what the situations were in terms of work load, decided that the organization that would work the best for us was partially unitized for Unit 1, Unit 2 within maintenance, operations and station planning, and with that decided on a number of about 700 people. That's

still up in the air a little bit with a few people, but it's about 700 people, which gives us about 350 people per unit.

Looking at the industry and our experience on Hope Creek side, the line management right now feels comfortable with an organization that's going to do the job for us. As part of the rebidding, I said the Department engineers were reselected here. The next line or next level of supervision is the senior supervisor level. That's a second level supervisor. They're going through an assessment process where we had brought in an outside firm to put together the assessment process for us. We combined that with our own interviews and make selections for the best people or putting the right people in the right jobs, which from what we see right now there's some individuals that are in the process of being changed out. So, we want the right people in that can do the job and get the people behind them as far as doing the work.

Part of the areas that we're looking to improve or we have our emphasis on is the training. As far as people skill training, there's about 2400 individuals in the Nuclear Department. All those individuals have gone through what we call reaching our vision training, which is overall assessment of

what the company is trying to do, what the department is trying to do. We also have a set of team training, we call making the difference. That's being implemented now. We've just started that this year. We've had a number of people through that. They go through as teams. We also have developed the business leadership training for our supervisory personnel. That's a five week program that's spread out over a six month period where you go for a week and then you're back for a month to implement the things you've learned. All the supervisory personnel will go through that training.

The increased supervisory time in the field, one of the major things I'm stressing coming back in is to make sure that we are out in the field doing essentially the supervisory skills that have to be done, the monitoring and assessment of what our people are doing in the field. The managers know my expectation is that they will spend approximately 40 percent of their time in the field doing just that. I won't say that we've been extremely successful in getting the 40 percent time in the field right now, but it is much improved on where it was. I use my assessments when I'm out in the field. My observations are what I'm seeing to judge how well

it's being done.

The accountability through performance appraisals, this is an emphasis on making sure we give honest feedback to people. Too many times in the past we've seen them just used as a checklist. We want honest assessment of people's performance, their ability and direct feedback to the people as far as what the expectations are in terms of performance.

We've developed the dynamics of leadership model, as we call it. It's training that was developed between myself and the human resources personnel with people who we deem to be very successful supervisors and those in the organizations who are supervised and defining what they see as behaviors for excellent supervisors. We developed the training. I personally gave the training to all supervisory people. There's about 440 or so.

(Slide) That's the model on the next couple slides here. The supervisory model is the round model. These are a couple take aways or walk aways that we have for the training.

What we tried to do was to develop the model to build it around the sense of teamwork and the elements are there.

(Slide) The back of the card, the next

slide, are what I call the basic behaviors, to make it very simple, on what's expected. The emphasis is on the identification and the solution of problems. As I said, we tried to keep it very clear in terms of my language, if you will. What it boils down to, if it doesn't look right, feel right, smell right, then say something because it probably isn't right. That's what we emphasize with the supervisors. That's what they have to encourage from their people. This really was our answer to supervisors who say, "Well, how do you want me to supervise? What is it that I am supposed to do?" Very simple form or a clear format on, "Here's what we want to do. Here's what we think is important that you be doing."

COMMISSIONER REMICK: Joe, what's the time period of the performance assessment and then the corrective action that you've been referring to?

MR. HAGAN: The performance appraisal --

COMMISSIONER REMICK: Yes, how recently.

MR. HAGAN: The actual enforcement and the changes that we started in December. So, the changes are in place, but the actual performance appraisal cycle is a year. If there's performance problems there, then it's really -- part of what the training shows, it's up to the supervisor to deem whatever time

frame that is. You can have performance appraisals on a monthly or quarterly basis if the performance warrants that.

COMMISSIONER REMICK: And you mentioned the form of team training that is recent. Your staff in the past had the standard team training that industry developed?

MR. HAGAN: Yes, the operation staff within their training has the team training. We went through the INPO supply team training. That's just for the Ops. staff. This training is for all individuals within the department.

COMMISSIONER REMICK: I see. Thank you.

CHAIRMAN SELIN: Mr. Hagan, how long have you been at Salem?

MR. HAGAN: I've been at Salem as the General Manager since the beginning of March.

CHAIRMAN SELIN: This program predated you, this training program? I'm a little confused on the chronology now.

MR. HAGAN: The actual training program was developed by myself as the Vice President, Nuclear Operations.

MR. FERLAND: Joe, I might be able to help out here. I think I can see where the Chairman is

coming from.

Prior to taking the position Joe is in now as Vice President and General Manager of only Salem Station and focusing all his activities there, he was Vice President of Operations of both units. So he had some influence over Salem, but it was not a full-time commitment. Given the situation at Salem, we just thought it was sufficiently important to get the best person we feel we have in our organization. And this is his full-time responsibility and he's going to stay there until the place is straightened out.

CHAIRMAN SELIN: So you got there a month before this particular incident?

MR. HAGAN: Yes, it was about a month.

(Slide) The next slide is the -- with anything you put in place, any program, you have measurements. The next slide is the measurements that we've put in place, work practices and standards, monitoring by the line management and QA. That's the actual field observation of individuals' work performance to the standards and then the tabulation of those. And the results are shared by the managers with myself and we use that to trend not only that it is being done but what's the quality. What are we seeing? What are the problems that we're seeing? Are

problems correcting or being corrected?

The supervisory face to face time, that's another assessment by another supervisor of how well the time is spent in face to face time, what's being said, what's being discussed.

Human performance, the performance indicators, we look at the incident reports that we have that are related to personnel matters. Those are analyzed in terms of root cause and to see what common threads are there, what changes need to be done in terms of training or reemphasizing to our people on supervisory skills if it is a supervisory issue.

The leadership feedback results are a form that we developed and we have the buy-in from our IBW Union membership that this is really a form that's used to say how we're doing, to tell us flat-out how are we doing. You don't put your name on it. You fill it out and it's an assessment of how we walk and we talk. Are we doing what we said that we would? We think it's important. You tell us.

We talk to the union leadership, that we have their buy-in, and that's something that we're doing. We're doing that on a tabulation right now on a quarterly basis. And we also encourage the supervisors and the people that are supervised to use

that to give feedback to their boss or their supervisor on what they're seeing.

And the comprehensive safety index is an overall performance indicator that we use. It includes such things as safety system availability and reliability, contaminations, radiation exposure, how we're doing against our composite goals.

With that, I'd like to turn it back to Steve for --

COMMISSIONER ROGERS: I have just a question, and this might be a good time to do it, on this emphasis on a unitized organization or unitized organizations at Salem. Can you say a little bit about what the situation was that you felt needed to be corrected by emphasizing taking a unitized approach? Just exactly what does that mean? What does it mean in terms of how the teams in Salem 1 and Salem 2 interact with each other and share information and so on?

MR. HAGAN: We're in the process of actually in implementation now. The Department of Engineers at the department level are the first level to be unitized. This is going to be out over about a year and a half, two year time frame, because we are gathering additional licenses on the operations side

so we can have a unit 1, unit 2 licensed operator organization.

We went out in the industry and looked at a couple plants who are organized. When I stepped back, what I looked at and said what do we need, you know, why, I didn't go in and say we want to unitize the plants. I went in and said, what seems to be missing? And the areas that I came up when I looked for my assessment I felt that needed improvement were the focus.

Say focus, that's the discipline on what you're doing, what you're doing, whether you're cleaning up the floor or you're doing a valve repack or you're doing a surveillance on a solid state protection system, maintaining your focus, or your planning in the outages, keeping the discipline on what you're doing to make sure that what you're doing is the best job that you can do.

The other was the ownership, identification and solution of problems. I just didn't have the sense of ownership, that we can make the difference, this is our plant and we have to do what's right; a reliance, if you will, on somebody else doing it. And therein lies the teamwork aspect of this. I didn't see them working well as a team.

And so, they were the elements. I went in and said, well, what can we do collectively? What can we do to improve the overall performance? Unitization was a piece of the answer.

What I view unitization as is an opportunity for us to improve the areas that I've laid out, just the opportunity. It's there for us to do. We have to do it.

When I looked at the work load, say in maintenance, what comes into maintenance or operations as far as a unit in an outage or not in an outage, therein lay the opportunity to say, well, what can we do in these particular groups to increase that focus, ownership and teamwork? What can we do?

There were a couple of the departments within the station that really didn't fit the unitization from their focus, it seemed to be. That was RAD/PRO Chemistry. RAD/PRO Chemistry can do it equally well whether it's Unit 1 or Unit 2. Also, System Engineering, Technical. There's some unitation right now within Technical, but it's not totally that way.

So the organization itself will be Unit 1, Unit 2, at the department head level all the way down to the technicians within Maintenance, Operations, and

Station Planning.

COMMISSIONER ROGERS: Well, I can see some gains in ownership. I just would like to point out to you, though, that you have to be very careful that this doesn't lead to a competition between 1 and 2 that results in people not sharing information.

I remember one site I visited some years ago where plants were identical and management thought it was a great idea to put one reactor in competition with another reactor and they stopped sharing information and they all went down and they got into real problems as a result of it. So a sense of ownership is great, but I think you don't want to lose the sense that what we learn on Salem 1 can very well be useful to improving the performance of Salem 2.

And if management's view is we'll put 1 and 2 in competition with each other and they'll both do better because they'll be trying harder, there are some very serious negatives that can come out of that by, you know, 1 doesn't want 2 to get ahead of them so they just don't tell them everything, and I think that can be very bad.

So the sense of ownership is great, but I would just caution you to be careful that you don't do anything that disturbs the sense that we're all trying

to make the site the best that it can be and that sharing information that could have safety implications and result in one plant doing a little bit better, one of the two plants doing a little bit better than the other one, is something that shouldn't be -- there shouldn't be any problems with that. There should be very free exchange of information on how to improve performance, and so I'd just caution you a little bit on that because there is a temptation to say, well, let's put them in competition with each other and see who does best and reward that, and that can lead to some serious problems.

MR. FERLAND: Thank you for the caution, Commissioner.

Steve?

MR. MILTENBERGER: Just a brief summary.

We've completed our detailed analyses and reviews.

We've completed our equipment and procedural corrective actions.

We are working on one piece of equipment, which is the pressurizer PORVs, so there's one piece of work still ongoing and we're completing that.

We have completed our required retraining for the operations personnel and we've confirmed the

broader equipment and personnel issues that are addressed by long-term actions. A number of those we've covered today, what we're accomplishing.

Based on our analysis and corrective actions that we've undertaken, I have the confidence in the Salem management team and their ability to safely operate the Salem facility.

Jim?

MR. FERLAND: If I can just sort of summarize, this is a lot of information really in a short time period.

If there were only two things you could come away with from this meeting, I would hope that those would include, one, that the safe and reliable operation of all of our nuclear facilities is of paramount importance to our organization, which it is.

I would hope you'd come away feeling that the senior management and the directors of the corporation are involved and feel fully responsible for the activities that are going on at our facilities.

We do acknowledge the need to further improve Salem's operations. It's not at the Hope Creek quality level yet. We want it to be. We are committing the necessary resources to produce that

result, whatever those may be.

And we have exhaustively analyzed the April 7th event. I think we understand its safety significance and our corrective actions, both the short-term and the longer-term ones that we've described, are responsive, we feel, to the identified deficiencies. With the improvement programs that we've generically had underway for several years that Steve has described adjusted to include some of the lessons learned from this event, we are confident that Salem will continue to operate safely, as it has, and that its performance will continue to get better in the future.

Thank you very much for your time and attention. We'd be pleased to answer any questions you might have.

CHAIRMAN SELIN: First of all, we just thank you for coming. We'd like you to stay until we hear the staff, because there may be some questions for you after they --

MR. FERLAND: Absolutely.

CHAIRMAN SELIN: The message I've gone away with, let me just tell you what it is and you see if you tend to agree.

Number one, you're a proud company, proud

of your personnel practices and what you're doing, and therefore you're embarrassed by the difference between Salem and Hope Creek. I mean, good corporate management should lead to a certain level of continuous performance.

The second, you really weren't surprised by the event. I don't mean the specifics, but you had taken actions a while ago, hopefully right after the turbine event at Salem, because, if you hadn't taken actions, something might happen. And in fact, it did. I mean, you just -- you know, it takes some time. You didn't get to that point, but you probably were quite concerned that something like the April 7th incident would happen. Maybe not exactly that one, but that was the kind of thing you were worrying about.

And third, I think you've said it quite precisely, Mr. Ferland. You've adjusted your plan, but your plan was in place in advance to keep things like this from happening. You may have learned some particulars, but the call to action had gone out already.

Fourth, you've done a whole lot of things right.

And fifth, you still have problems.

So, you're not done there by any means.

Takes some time. But the problems of Salem, they're not enormous problems but they go back for quite a while.

I guess what you're saying is this time you don't want to come here every two years, that this time you really want to get down to the statistically untreatable level of event and no worse than that.

Is that what you're saying?

MR. FERLAND: I don't think, Commissioner, that I'd disagree with anything I heard in there.

Certainly we are a proud company, embarrassed by the fact, frankly, that we'd not been able to bring Salem to the levels of Hope Creek, that we'd not been able to do better than we had.

With regard to expectations on its performance and what we thought, maybe characterize just a little different way than the way you've said that. We have taken a lot of action over the past several years and if you had asked me as recently, I would say, as maybe even the third quarter of 1993, because of some of the results that Steve has pointed out to you today where personnel errors are going down, I would have said things were looking pretty good.

We went into the fourth quarter of last

year and we had one of the units out for an extended outage. We were doing a lot of this backfitting, found a problem with the sleeves on the diesel generators which then carried over and we had to take down the second unit.

Sometimes you learn something when you really stress an organization, which we did. We had one unit down for many months, a second one down, and sometimes if you really stress a unit you learn a few things. When we started looking at some of the data we were rolling up in the fourth quarter of 1993 -- and it's information which INPO has since substantiated and you're own staff, the regional people, have come to -- we started finding some personnel errors and some people not driving for excellence every time, every minute during the fourth quarter, and that caused us some concern and it's why we did decide that we had to take some additional action well before April and shortly after the first of the year we started looking at how we could realign the top management at the station and the people under them.

I don't want to delegate responsibility for our shortcomings strictly to the people at the plant, because I really feel like when you don't get

the results that you want the management of the corporation from the first line supervisor to the CEO has all got some accountability and responsibility for that. I certainly feel responsible for our inability to get that facility where we want.

We think we've taken the steps that are necessary. If we haven't, we're going to learn from everybody we can learn from. We'll adjust it again as we go on down the road.

CHAIRMAN SELIN: Commissioner Rogers?

COMMISSIONER ROGERS: One thing that you said, Mr. Miltenberger, caught my attention and it somewhat connects with just this little discussion here. That was that, in your opinion, if I've got it right, very early on in this event the control room team didn't quite come together the way they should, but as the events unfolded they did, and that the way they ultimately handled the situation was one that you felt was well done and you felt comfortable with it so that you really could look at the event as having two phases in a certain sense with respect to the way the team itself in the control room behaved.

Is that --

MR. MILTENBERGER: That's a good characteristic of it.

COMMISSIONER ROGERS: Well, if that's the case, you know, then it seemed that that's the typical complacency problem, in a certain sense, that the ability to do the job is there and when the pressure gets high enough all of a sudden the best is brought out in everybody and the team as a group functions. But up until that point, somehow they haven't really done as good a job as they're capable of doing, either in being alert to little things or whatever.

If that's the case, it seems to me that that's part of the issue that you have to deal with in corrective action and that is probably the biggest problem of the whole industry, and that is that it is very, very difficult to keep everybody at their peak all the time. It isn't that the capability doesn't exist, but we've seen so often groups of people that are really-- they have the resources, they have the smarts, they have everything, but somehow they slip because they've allowed themselves to not keep that edge that really has to be there day in and day out, hour in and hour out in running a nuclear power plant.

I would hope that somehow that in your program here that you have a way of kind of testing yourselves with respect to how close to peak performance people are actually operating at, because

most of the time you don't need it. I mean, things are running well and you feel pretty good about things, but that team then has to go into operation very, very quickly at its best. Not at its second best, but at its best. That's a very severe challenge to put on anybody or any group of people and yet that's really what one has to strive for.

I don't know whether in your planning and thinking here you've explicitly tried to deal with the question of how do we know that we aren't slipping a little bit? It's a very difficult question. It's not easy at all because the evidences of a slight softening of the crispness that ought to be in an organization is sometimes very difficult to detect. But it seems to me that that's really what management's job is all about, to be able to sniff that out and detect it before it starts to get very far.

So, your characterization of the episode here is one that I think is very interesting, but you may have seen yourself what your job really is.

MR. MILTENBERGER: That's a very good perspective that you provided and it fits in for us, particularly with the operation staff. We had the ability with the simulator and an actual job

performance, us as management, in observing how that's carried out. Just try to see that crispness and, as Jim mentioned, everybody carrying out their function to the top all of the time and to see how that's carried out.

The simulator gives us an opportunity to do that. We have that in place and are continuing with that, but we have some new initiatives we're working on in that area and also actually on the job place and how simulator types of activities are carried out in the work place and how those differences characterize themselves. That's our job as line management, to provide that type of observation and characterization and direction to the staff.

COMMISSIONER ROGERS: And the other one is, I guess we haven't really asked you that question and you really didn't address it, but how ready are you until we start?

MR. MILTENBERGER: Where we are relative to restart, we really are in the process of resolving the PORV issue and installation of some new internals in those valves. Expect that work to be done in the next day or so and then we'd be expecting to start the unit later on this week, early next week.

COMMISSIONER ROGERS: Thank you.

CHAIRMAN SELIN: Commissioner Remick?

COMMISSIONER REMICK: We haven't seen the AIT report yet, but it was my impression that subsequent to the event you found some non-condensibles in the reactor vessel. What was the situation there?

MR. MILTENBERGER: The situation with the non-condensibles dealt -- and I did mention it very briefly in here, but I really didn't cover the kind of detail maybe that you're looking for. That dealt with the RVLIS system identified by the NRC. The RVLIS system was drifting down and then observation and subsequent analysis by our staff determined that we indeed did have in mode 5 of operation in cold shutdown with the unit depressurized and intrusion of nitrogen gas that was coming out of solution in the vessel and gradually moving the level of the vessel down.

Subsequent analysis of that, we did vent that off, determine and measure what it was and it was essentially nitrogen that was coming in from the volume control tank where nitrogen is introduced in that tank and equipment. We subsequently vented that off. It is part of normal plant start-up conditions,

but in the mode we were in it was shut down. We could see that drifting down and had to take corrective action on it.

A lesson learned there for us is the utilization of the RVLIS system in shutdown. It was a system that was not really designed or intended use in that system, but we definitely see that as an opportunity of equipment that is available, can provide some indication of what the level is doing in the vessel. There's some further analysis work and some work with the owners groups for utilization of that equipment, not only with our facility but with other facilities in lessons learned.

COMMISSIONER REMICK: Was this nitrogen dissolved and then carried over and then came out of --

MR. MILTENBERGER: Yes. It was dissolved within the reactor coolant system. It was introduced at the volume control tank, went into solution and because of the difference in pressure between the volume control tank and the reactor vessel, it would come out of solution in the vessel.

COMMISSIONER REMICK: Is there any reason why RVLIS hasn't been used in those conditions before?

MR. HAGAN: We don't instruct our people

to use RVLIS in mode 5 because as advertised it's not a calibrated system. It's not cold calibrated. So, it gives you a qualitative indication of level, but it's not one that you would base your procedures on. As we understand the system, our mode 5 log was not a required log. When the question was asked to the operator, the answer was really in that particular mode they weren't used to looking at RVLIS. They didn't have a crisp answer or understand on the spot what it was because we just don't take that reading.

COMMISSIONER REMICK: So, the indication was available, but they're not used to looking at it in that mode. Is that what you're saying?

MR. HAGAN: Yes, that's essentially it.

COMMISSIONER REMICK: I see. And although not calibrated, it would show changes in level?

MR. HAGAN: Qualitatively.

COMMISSIONER REMICK: Qualitatively, yes.

MR. HAGAN: Qualitatively it would.

COMMISSIONER REMICK: Okay. Thank you very much.

CHAIRMAN SELIN: Let's change places and see what our folks have to say.

Mr. Martin, I have to tell you. I peaked at the slides and we know what an AIT is. So, why

don't you go lightly on the procedural stuff and concentrate on what we learned from the specific event compared to the prepared presentation.

Mr. Taylor?

MR. TAYLOR: Good afternoon. With me at the table are Bill Russell from NRR and from the region, Regional Administrator Tim Martin. Bob Summers, to my right, is the project engineer, and Charlie Marschall, who is the senior resident at Salem/Hope Creek.

The licensee has pretty well outlined the course of the event and our discussion today will concentrate on NRC's response to the event. First, response to the resident and the agency's immediate response, and then through the augmented inspection team.

Tim?

MR. MARTIN: The licensee informed the resident staff of the unit trip within about 15 minutes of it occurring. The senior resident responded to the control room and notified the Region I staff subsequent to that. The senior resident was supported by two resident inspectors, an emergency preparedness specialist who he used to monitor and assess what was going on in the plant, and he later on

dispatched one of the resident inspectors to the tech support center once it was established to monitor and coordinate NRC activities from that point.

Subsequently when the NRC set up their incident response center, we set up the reactor safety management counterpart link which the resident came up on frequently to keep us abreast of what was going on from his assessment.

The resident staff provided continuous coverage and communications for the rest of that evening and until the next morning when the augmented inspection team arrived.

(Slide) Next slide, please.

With regard to the regional response to the event, the licensee declared the unusual event at about 11:00. It would be notified to the NRC formally at 11:31. The senior resident had already informed the branch chief of what was going on. The branch chief informed the deputy regional administrator. The assessment at that point was that it was a trip with complications, clearly something that we needed to monitor and pretty clear it was probably going to result in an augmented inspection team, at least from what we knew at that point in time.

The deputy regional administrator got in

touch with Ed Jordan and discussed what was the proper mode for NRC to respond. It was decided that both region and Headquarters would monitor this situation. The region and Headquarters activated their instant response centers and went into a monitoring of the activities. That continued on until about 9:00 that night.

As you know, the licensee terminated the alert at 8:20 that evening.

With regard to the augmented inspection team, as I indicated earlier we had already decided that one was probably appropriate. The deputy regional administrator contacted NRR and AEOD and it was agreed that an AIT was warranted for this event. That decision was made during the afternoon while we were still monitoring. The AIT was initiated due to the event complexity and the unexpected system response.

The deputy regional administrator informed the licensee of our plans to initiate an AIT once the plant was shut down and in a stable situation. We didn't want to go out there and start the investigation prematurely and cause them problems. We also discussed some expectations of the licensee in establishing stable conditions and maintaining the

plant so that an adequate investigation could be conducted.

The management lead for the AIT was assigned to our Division of Reactor Safety. Bob Summers, who is down at the end, was selected as the team leader and we selected team members from region, NRR and AEOD based upon technical expertise. We also had two state observers who participated in various parts of the inspection activity, but did not stay in a continuous manner.

(Slide) May I have slide 5, please?

The AIT charter was developed and issued on the 8th, which was the day after the event. It required a review of the plant trip and the response of management, operators and systems. It required the development of a sequence of events. It required them to perform an assessment of the personnel, procedures and equipment performance. It required the identification of root cause and the preparation of a report.

(Slide) May I have slide 7, please.

We also issued a confirmatory action letter. As a result of our plan to launch the AIT, the deputy regional administrator formalized our expectations with the licensee and we assured the

licensee was at that point comfortable with us starting the AIT activities. The licensee was committed to keep the plant in cold shutdown, to cooperate and support the AIT activities, and to gain agreement of the regional administrator prior to restart.

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

COMMISSIONER REMICK: Could you explain the purpose of a confirmatory action letter in a case like this?

MR. MARTIN: The purpose was -- the licensee had already decided to go to cold shut down, but we wanted to make sure that we understood the event, that we understood the peculiar system interactions that we saw, and we wanted to make sure we had time to do that before they moved forward and started up. We found no indication the licensee was planning otherwise, but this was the document --

COMMISSIONER REMICK: That's the point of my question. I know it's a routine action for us to take, but I sometimes wonder when licensees appear to be willing to cooperate in all the things we're trying to achieve, why we officially issue a confirmatory action letter? I've asked this question before,

but --

MR. RUSSELL: Yes. I believe from a policy standpoint that it's important to document what are the specific concerns that the NRC has and what are the understandings that exist between the utility. These are voluntary. If the understandings are different and they so inform us, we can take other actions. But this is then recognized as a useful tool to have the short of formal action on the context of orders or other requirements. It does need to be looked at in each case. We don't require it in all, although it has been practice to use a CAL in most cases. It needs to be done early to identify what are the particular issues because as time goes on other issues could be added and you want to have a relatively high threshold for adding other items on.

So, it really constitutes a written understanding between the licensee and the NRC as to what are the issues that need to be addressed and the fact that we are interested in having resolution of those items prior to a restart decision.

COMMISSIONER REMICK: How much is it influenced from an enforcement interest?

MR. TAYLOR: None.

MR. RUSSELL: I can tell you from past

experience that a CAL has been recognized and we did revise our enforcement policy to indicate that that could be used. That was actually supported in a court case where we used a CAL in lieu of orders or other approaches. It's a tool that provides us a basis for documenting what those agreements are and as long as those agreements are followed, that satisfies our need and it's the least --

MR. TAYLOR: It is not really an enforcement action per se.

MR. RUSSELL: It is not an enforcement action, but --

COMMISSIONER REMICK: No, I realize it's not an enforcement action, but does it serve some legal purpose --

MR. TAYLOR: It goes a clear understanding between the management of the agency and the licensee of what the condition is. I think it's very useful. So, we both understand before restart that the issues behind an event are clearly understood by all the concerned parties, particularly the licensee and the agency. That's really what it's intended to do.

MR. MARTIN: Commissioner, I would add, in this particular event we had a desire to interview people. Because of the CAL, it resulted in

negotiations when certain people would be available. They were going off-shift. So, basically it established a protocol for interaction. It basically required them before they took pieces of equipment out and started troubleshooting that we had some discussion so that we wouldn't later on say, "Well, why didn't you let us take a look at that?" So, it resulted in a much more orderly interaction and as a result there were then negotiations with the team leader and the licensee to make sure that expectations were not inadvertently overlooked.

COMMISSIONER REMICK: Yes. And I understand the need for clearly identifying what it is. I guess maybe I associate something with a CAL maybe that I shouldn't. If it's purely agreement of what we agree upon, I guess I've never quite viewed it that way. But if that's it, I certainly understand.

MR. TAYLOR: And in the aftermath of an event, it sometimes is important for this type of thing just to be simply -- it's usually a one page type letter.

MR. RUSSELL: It's characterized as a related administrative action in the enforcement policy in Part C and it simply says a confirmatory action letter are letters confirming a licensee's or

vendor's agreements to take certain actions to remove significant concerns about health and safety safeguards or the environment. So, it's not an enforcement action per se, but it's --

COMMISSIONER REMICK: No. I didn't know if it added some legal protection if the licensee decided to start up without the regional administrator, if it gave us some additional legal --

MS. CYR: Only in the sense of it's a commitment from them about certain actions that they might take. For instance, notify us before they might. It's an agreement between us and them in that sense.

CHAIRMAN SELIN: It's intended to protect both parties. It's not that the licensee would otherwise start up without talking to us. That would be quite a foolish thing to do, but that way in a sense we've said, "Here are our concerns," and the licensee knows when those concerns are met. Then it's up to them. And conversely, it protects us so that equipment is able to be examined or people are able to be interviewed. But it's a kind of a limitation of interest, not just a statement that we have certain items.

MR. TAYLOR: I agree with that.

CHAIRMAN SELIN: There's a question mark at the end of the statement. It is my understanding that --

MR. TAYLOR: I think that's right. We're available around the clock to talk to the licensee. If they were ready at 3:00 in the morning, we'd be ready to act. It isn't meant to inordinately delay in any way.

Want to continue?

MR. MARTIN: (Slide) Go to the chronology, slide 9, please.

The augmented inspection team arrived on the site on the 8th and they would complete their on-site inspection activities on the 26th. The team leader held conference calls daily with regional and Headquarters managers to keep them informed of the status and the inspection findings. The team leader also supported an event briefing on the subsequent Wednesday to make sure that NRR, AEOD and various regional staff were aware of the event and what we knew at that time.

Early that next week, the senior resident identified the fact that there had been a gas pocket that formed in the reactor vessel and that the licensee had not recognized that. That resulted in a

Commissioner assistance briefing subsequently.

The licensee had described their corrective action plans in letters dated 4/25 and 4/29.

COMMISSIONER REMICK: Excuse me. How extensive was the gas pocket? I meant to ask that earlier.

MR. MARSCHALL: The RVLIS was indicating that 93 percent, Commissioner, and it equates to a very, very small volume of gas, nothing of any safety significance at all.

COMMISSIONER REMICK: Thank you.

MR. MARTIN: The team leader also conducted a number of briefings of congressional staff, including Senator Biden's staff, the Senate Subcommittee on Clean Air and Nuclear Regulation and the House Subcommittee on Energy and Mineral Resources. That was conducted on the 24th.

The AIT had their preliminary exit in the public on the 26th at the Salem site. The team has since been involved in the assessment of the findings and report preparation, while the resident staff has been involved in inspecting and verifying licensee actions and preparedness for restart.

On the 5th of May, we briefed Senator

Biden's staff at their Wilmington, Delaware office, and on the 6th of May we had a public meeting at Salem again, to discuss licensee's status and plans for restarting the facility.

As a result of this AIT, we have concluded that there was no abnormal releases of radiation to the environment as a result of the event. The event and the operator response to it challenged the RCS pressure boundary through multiple actuations of the pressurizer PORVs, through multiple operator errors which occurred and complicated the event.

Management allowed problems to persist and that made responding to the event difficult for plant operators. Some equipment was degraded by the event, but overall the plant performed as designed. Operators' use of emergency operating procedures was regarded as good and the licensee investigation and trouble shooting efforts were also good.

With regard to remaining activities, the licensee currently owes us two letters, one to describe their evaluation of the PORV operability and the modifications they've made, and a second to describe why it is not a problem with the main steam flow calibration drift that has been reported in the past which had some role in this event. The second

part is confirming to us their believe that they are ready for restart and their basis for that and requesting our agreement.

The NRC must obviously evaluate the licensee's rationale for restart. We must independently conclude that the plant is ready and we must coordinate with NRR and the EDO's office in releasing the licensee from the CAL.

We plan once the restart has started to provide around the clock inspection coverage until the plant is in a stable mode one situation. We'll use resident and region-based staff for that activity.

We still need to issue the AIT report. That's due later this month. We finally must determine and direct any follow-up activities and that includes some long-term actions that the licensee is committed to relative to that specific site where we have to actually verify that those are completed. There may be some generic issues which we'll need to hand off to NRR using task interface agreements. That's formally tracked. We'll have to examine our inspection plans to see if this event results in us changing or needing to change those inspection plans. Obviously we need to consider what enforcement action we're going to take. We have not made that decision

yet.

MR. TAYLOR: So that concludes the staff's presentation.

CHAIRMAN SELIN: I have a couple questions I'd like to put. Most of the discussion that the licensee put forward had to do with training and personnel and I think that's appropriate. But I was sort of concerned, I am sort of concerned that at the time of the overspeed turbine event there were solenoids that were known to need to be fixed that hadn't been fixed. We have an analogous situation here, the list of -- it wasn't clear to me whether they were overdue actions, but repairs that had been scheduled to be done that hadn't been done.

As I remember the solenoid event, it wasn't that the management had deliberately slowed down the repair, but that communications on the status of some of these repairs was just sloppy and management really didn't know where they stood and he wasn't holding the maintenance folks and the generic people to the schedule.

Was this a pattern or is it a fluke? Are you concerned about this? Are we going to have a -- if there were another event, are we going to find other actions well known but not implemented?

MR. MARTIN: We are concerned about this. This is one of the issues that came out of the AIT. We identified several examples where management knew what the situation was but had made a decision to live with the situation. In other cases, they had not considered the integrated impact upon the operators in trying to deal with the plant when a number of these equipment problems were existing. In other cases, they just hadn't yet sold the operators that the systems had been returned to reliable operation.

So, I'll tick them off for you. The atmospheric steam dump on the main steam -- they lived with that problem for 17 years. Yes, they did have plans to fix it, but obviously didn't get to it in time and it certainly complicated events and was one of the primary causes for leading to the second safety injection.

The fact that the control rod drive system had been worked on for about four weeks. There were some problems with it earlier. The operators saw some early response when they tried to put it in automatic during the event that didn't jive with their expectations based upon their previous concerns and knowing that the trouble shooting hadn't been completed on it. They didn't trust it. So, they

didn't have that there to support them.

CHAIRMAN SELIN: Was that just a bad break or was that something in retrospect? You know, I'm looking at these significant findings and except for the second one about the event challenging the RCS pressure boundary through multiple operations of the pressure-operated release valves, this could have been the finding two years ago at the overspeed. The other one wasn't disaster, but management allowed equipment problems to exist. It was degraded, the plant performed its design, operators did well once they were finally --

MR. MARTIN: The only one that is just clear the licensee tolerated too long was the atmospheric steam dumps. The others, they were working on them. It's a question of priority and considering given all these individual problems, did you consider the overall impact on the distractions of operators and we don't think they did a good enough job there.

CHAIRMAN SELIN: Okay. But it wasn't a cavalier attitude towards --

MR. MARTIN: I don't think so, sir. It appears they made management decisions based upon their assessment of the facts at that time.

CHAIRMAN SELIN: Okay. Second question is normally events which require AITs, I guess, are more serious events. But we tend to have the AIT in hand before the restart comes forward. Are you comfortable that even though we don't formally have a report you've gone through the material and you know what you need to know to permit the restart?

MR. MARTIN: With the exception of their evaluation of the PORV, we believe that we are tracking right with them in terms of their assessment of the problems and our independent assessment of what the problems are. We have examined their corrective action. They committed to corrective actions back in late April. We basically came to the same conclusion those were the right corrective actions. We've been monitoring those corrective actions. They seem to be implementing them well. The thing that remains is they're evaluation of the PORVs and their affirmation that they believe that they're ready to start up. If we don't find any additional problems in the next couple of days and we get that and we independently conclude that evaluation is acceptable, then we will be prepared to support restart.

CHAIRMAN SELIN: The Commission has not taken this responsibility upon itself. We're

monitoring what you're doing. We're not intervening on the restart process.

MR. RUSSELL: I would characterize that there is one advantage also of having the CAL and that is you identify the issues that are of concern, that are under discussion, review between both the NRC and the company and then the process provides that the regional administrator will actually issue in writing our findings as it relates to those matters and the process of releasing from the CAL. Now, there may be other issues that are identified in the process of developing the final report, but we believe the activities of briefings, the exit meetings, the management involvement, the fact that the team leader reports directly to the regional administrator and communicates on these matters, that the mechanism of using the CAL to provide the vehicle for release and documenting our findings is a substitute. It takes us 30 days or so to put the full inspection report together with the findings.

CHAIRMAN SELIN: Well, you certainly had a fair share of public meetings during all of these discussions. I gather you're pretty comfortable with the licensee's description of the situation at this point.

MR. MARTIN: We are, sir, yes.

CHAIRMAN SELIN: Okay. Commissioner Rogers?

COMMISSIONER ROGERS: Yes. If you could say a little bit more about the PORVs. Is the issue a question of whether they were operating correctly or whether they were damaged as a result of the event and correctly repaired?

MR. MARTIN: The question is one of correctly repaired and do we have the right material in those PORVs. The plant was taken to the point where it was full of water. The pressurizer no longer had a bubble in it and the PORVs operated some 200 plus times. As a result of that, we questioned whether there was any damage to those valves. They did open them up and inspect them and, sure enough, there was abrasion on the plug. There was gauling on the stem, and there was a crack on the pin from the stem to the plug.

Their subsequent analysis has shown that they can't be confident that with that crack in there it wouldn't have continued to propagate, so that was a decision on their part that they're going to have to replace that.

There was also a different material in

Unit 1 than there was in Unit 2 and it is speculated that that better material resulted in less damage to the valve and may have actually supported more operations than occurred. The valve never stuck. When it's challenged that many times, that's a plus. But when they went back and did their analysis, they concluded that they're going -- my understanding of their analysis right now is that they are going back to the original material, and we'll have to wait to see what that evaluation says and whether we agree with it.

COMMISSIONER ROGERS: Yes. Okay. I think I understand the situation now.

How much work do you think is necessary for you to be able to feel comfortable with the status of those valves?

MR. MARTIN: We obviously have seen pictures of the valves. We've actually done some inspections of the parts that were taken out. What we need to do is evaluate their engineering analysis and that provided by the valid vendor. Since we don't have that document in hand, I can't tell you how long that's going to take. But other than that, we are certainly following the maintenance activities and the reassembly of the valve. We're satisfied with that,

if we are satisfied with the material. It's the material issue right now that's probably the biggest concern to us.

COMMISSIONER ROGERS: Who was notified? What governmental agencies were notified during the time of this event?

I notice you had state observers with the AIT. You said "observers." Were they from two different states or only from one state?

MR. MARTIN: From one state.

COMMISSIONER ROGERS: New Jersey?

MR. MARTIN: New Jersey Department of Environmental Resources.

COMMISSIONER ROGERS: And what government agencies were informed about this at the time that the thing was evolving?

MR. SUMMERS: Commissioner, in terms of the notifications of the event, the Licensee has their routine notification process. It included the NRC and then we make certain notifications of other government agencies as a result of the alert declaration.

COMMISSIONER ROGERS: Well, I was thinking of the states and communities.

MR. SUMMERS: Yes. States and locals were notified in accordance with the licensee's plan.

MR. TAYLOR: By the licensee.

MR. SUMMERS: By the licensee.

MR. TAYLOR: That's normally the process.

MR. MARTIN: And we are required to back that up when we go the AIT. We did notify both New Jersey and Delaware, because they're both in the ten mile EPZ.

COMMISSIONER ROGERS: Right, but that was pretty well along in the event.

MR. SUMMERS: However, when the Agency was monitoring and we staffed up the region's incident response center, one of the positions we staffed was the government liaison, and so routine contacts were made with the states through that position also during the event.

COMMISSIONER ROGERS: All right. That's all.

CHAIRMAN SELIN: Commissioner Remick?

COMMISSIONER REMICK: I noticed when Chairman Selin started out he had looked through the slides and I think he was concluding there wasn't too much meat in there. It's the same conclusion I had when I sneaked a preview. It was more or less a process, who struck John and what time, and not really until he asked a question and Commissioner Rogers did

the staff get into any detail. And I realize the report is not out. I'm sure your findings aren't formalized. Your recommendation aren't made and any decisions of enforcement, but I guess I'm a little surprised you didn't provide us a little more meat on the findings as they stand at the moment.

Are there other things that you wish to tell us about impressions good or bad that we should know about other than the AIT was formed on this date and we went there and did this and that? I'm more interested in your findings and your feelings at the moment. I'm thinking for the good of the order in the future and so forth, I think we want a little bit more detail.

MR. MARTIN: We obviously had more detail and when -- the licensee actually had two separate investigations they did and we obviously did our own independent investigation. We have found through the number of public meetings we've had that we track almost right on top of each other, and so in the interest of time we did not want to repeat all those.

But I have the team leader here who can amplify on anything you'd like to hear.

COMMISSIONER REMICK: What are some of the highlights that you would like to tell us about from

your findings?

MR. SUMMERS: Okay. In terms of the findings, much as Mr. Martin just said, the independent investigations tracked very closely even though we weren't working together. However, we did share information and toward the end of our inspection I found that the licensee's SERT process, which is their event response team, they had almost the identical charter and had almost identical facts in terms of their development of the sequence of events and the causal factors as the AIT.

In terms of important findings, early on in the event, much as the licensee has responded to your questions today, there was a lack of command and control exhibited in the control room that was compounded by, as Mr. Martin just spoke about briefly, a problem with the rod control system in manual. That was a short-term problem, however during the down-power transient and the rapid down-power transient it did compound the operators' actions, made that transient more complex. It did result in the operators getting out of sync, as one of your questions to the licensee earlier described. That type of problem early on is notably absent after the reactor trip safety injection occurs.

It appears as though the focus of the shift crew in the control room changes. The following of the EOPs is very good. The meeting of the termination criteria of the EOPs was very well established by the crew. So, there is a dichotomy in performance at the beginning of the event and subsequent to the reactor trip safety injection that was a concern of the team trying to deal with that dichotomy of response.

COMMISSIONER REMICK: I assume these were system based EOPs that they were using and they appeared to show familiarity with them?

MR. SUMMERS: Yes. Salem has, I guess, a unique format for PWRs. They use a flow chart format and the operators were very familiar with their use.

There was later on in the event, as the licensee explained, there were a couple of operator errors that occurred later that resulted in the second safety injection in monitoring primary temperature parameters and secondary temperatures and pressures. That was compounded again by the failure of the automatic control system on the steam generator power operated relief valves and not maintaining a no-load set point. The operators were trained on the use of that system so as to ensure that it would control

properly. Operators overlooked that part of their training or forgot that part of their training. I'm not sure that they forgot. It was in the heat of the battle. There were a number of other activities that were demanding their attention.

It was a very complex event for the shift because of the logic response being out of sync where the A train of protection sensed the condition warning safety injection and the B train did not, resulted in many components being out of expected alignment which the operators had to correct. The operators' response to that, that was very good.

COMMISSIONER REMICK: Thank you. As AIT team leader, are there any things that you found about the type of expertise that you were provided or anything about procedures or anything on the AIT process that you would have recommendations on or things that you were pleased with?

MR. SUMMERS: Well, one of your questions earlier, and it was really a policy question on the use of a CAL --

COMMISSIONER REMICK: Yes.

MR. SUMMERS: I as team leader found that the CAL helped establish a very good protocol between myself and plant management in order to ensure that we

would have an appropriate chance to review an activity prior to the licensee going off and completing that activity. That ensured that we were all working from a common work practice and that I had whatever opportunity I needed to review their investigation as well as equipment before they began an investigation on it.

COMMISSIONER REMICK: How about proper expertise on the team in general?

MR. SUMMERS: Expertise in general, I found that the group -- I didn't realize what the complement was until I had the team on site and got to know them. Being from the region I don't always know all of the Headquarters personnel, however I thought that the team that was given to me was an excellent team in terms of expertise as well as previous exposure to these types of events and the investigation thereof, and so I was pleased with the way the team worked.

I think that's about it on that.

COMMISSIONER REMICK: Okay. Thank you very much. Appreciate it.

CHAIRMAN SELIN: Thank you.

In closing, I also am a little concerned how sketchy the results present to us in the AIT. I'm

personally satisfied with Mr. Summer's description. I take that as being an implicit compliment to the licensee for having done really a quite thorough fact finding and not pulling their own punches in dealing with this themselves.

Am I supposed to draw this conclusion? You don't want me to go away with an unnecessarily favorable conclusion of anything, do you, Mr. Martin?

MR. MARTIN: I would tell you that any time the licensee mounts a SERT, they usually do a damn good job.

CHAIRMAN SELIN: Okay. Thank you very much, Mr. Taylor.

(Whereupon, at 4:16 p.m., the above-entitled matter was concluded.)

CERTIFICATE OF TRANSCRIBER

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

TITLE OF MEETING: DISCUSSION OF SALEM UNIT 1 RESTART PUBLIC MEETING

PLACE OF MEETING: ROCKVILLE, MARYLAND

DATE OF MEETING: MAY 9, 1994

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

Carol Lynch

Reporter's name: PETER LYNCH

Public Service
Electric and Gas
Company

MEETING WITH

NUCLEAR REGULATORY COMMISSION

MAY 9, 1994

SALEM UNIT 1 TRIP AND SAFETY INJECTION SEQUENCE OF EVENTS

Plant operating at 75% power.

Rapid power reduction initiated due to excessive grass on circulating water intake screens (10:16 am).

Power reduced to $<10\%$, enabled 25% trip.

Operator pulled control rods to raise temperature causing the plant to trip at 25% (10:49AM).

SEQUENCE OF EVENTS (CONTINUED)

One train of safety injection spuriously actuated - "Unusual Event" declared (11:00AM).

Pressurizer went solid and power operated relief valves cycle to maintain pressure.

Main steam relief valve opened causing reactor plant cool down and reduction in pressure.

SEQUENCE OF EVENTS (CONTINUED)

Second safety injection due to low RCS pressure (11:28PM).

"Alert" declared as precautionary measure (1:16PM).

Pressurizer level restored, emergency procedures exited, and normal cool down initiated (5:15PM).

"Alert" terminated (8:20PM).

SAFETY SIGNIFICANCE

Event significance recognized by PSE&G

Represented challenges to safety systems

Significant challenges to operations crew

- Rapid power reduction and low power operation
- Complicated event caused by spurious signal

Important lessons learned for PSE&G and Industry

CAUSAL FACTORS

Reactor Trip

Control operator withdrew control rods too quickly and improperly monitored plant parameters.

Inadequate command and control.

First Safety Injection

Operator allowed primary system temperature to go too low coincident with a false short duration high steam flow signal.

False high steam flow signal due to a design vulnerability.

CAUSAL FACTORS (CONTINUED)

Second Safety Injection

Less than adequate crew communications.

Operator not taking manual control of steam relief valve.

Design of the steam relief valve automatic control system.

CORRECTIVE ACTIONS

Personnel/Training

Conducted additional simulator training for all operating crews to reinforce:

- Low power operation
- Solid plant operation
- Command and control/communications
- Resource management
- Operator actions following an automatic safety injection

Reinforced and clarified management expectations to all operating crews.

CORRECTIVE ACTIONS (CONTINUED)

Procedures

Enhanced operating procedures for rapid power reductions and low power operation.

Revised operating procedures to include minimum condenser vacuum and circulators in-service criteria for a manual trip.

Revised operating procedures for restoration of pressurizer level.

Procedural changes were reinforced through training.

CORRECTIVE ACTIONS (Continued)

Equipment

Made modification to improve automatic operation of main steam relief valves.

Made modification to dampen steam flow transmitters' sensitivity to pressure pulses.

Planned modifications to circulating water traveling screens will enhance ability to cope with grass.

OTHER ISSUES

Reactor vessel level indication system

- Extended utilization to shutdown

Pressurizer power operated relief valves

- Engineering analysis of valve internals

Emergency Plan communications

- Incorporating additional guidance from NRC

SALEM IMPROVEMENT FOCUS

Equipment - materiel condition upgrade, corrective and preventive maintenance backlog reduction.

Procedures - procedure upgrade process, 3500 procedures issued.

People - supervisory effectiveness, communications, work practices and standards, teamwork.

MATERIEL CONDITION UPGRADES

Completed for Unit 1 and/or Unit 2

Control room modifications and human factor upgrades.

Upgrade of 18,000 linear feet of service water piping.

Secondary chemistry laboratory.

Switchyard expansion and upgrade.

Bus instrument inverter replacement.

Containment steam generator blow down valve upgrade.

Pressurizer insulation replacement.

Safeguards equipment controller installation.

Installation of system to add chemicals to auxiliary feed system.

MATERIEL CONDITION UPGRADES (continued)

Completed for Unit 1 and/or Unit 2 (continued)

Circulating water mechanical upgrades.

Boric acid concentration reduction.

Ugraded boric acid and primary water flow instrumentation.

Small bore piping replacement > 5,000 feet.

Steam generator feed pump control oil system upgrade.

Rod control 24 VDC power supply replacement.

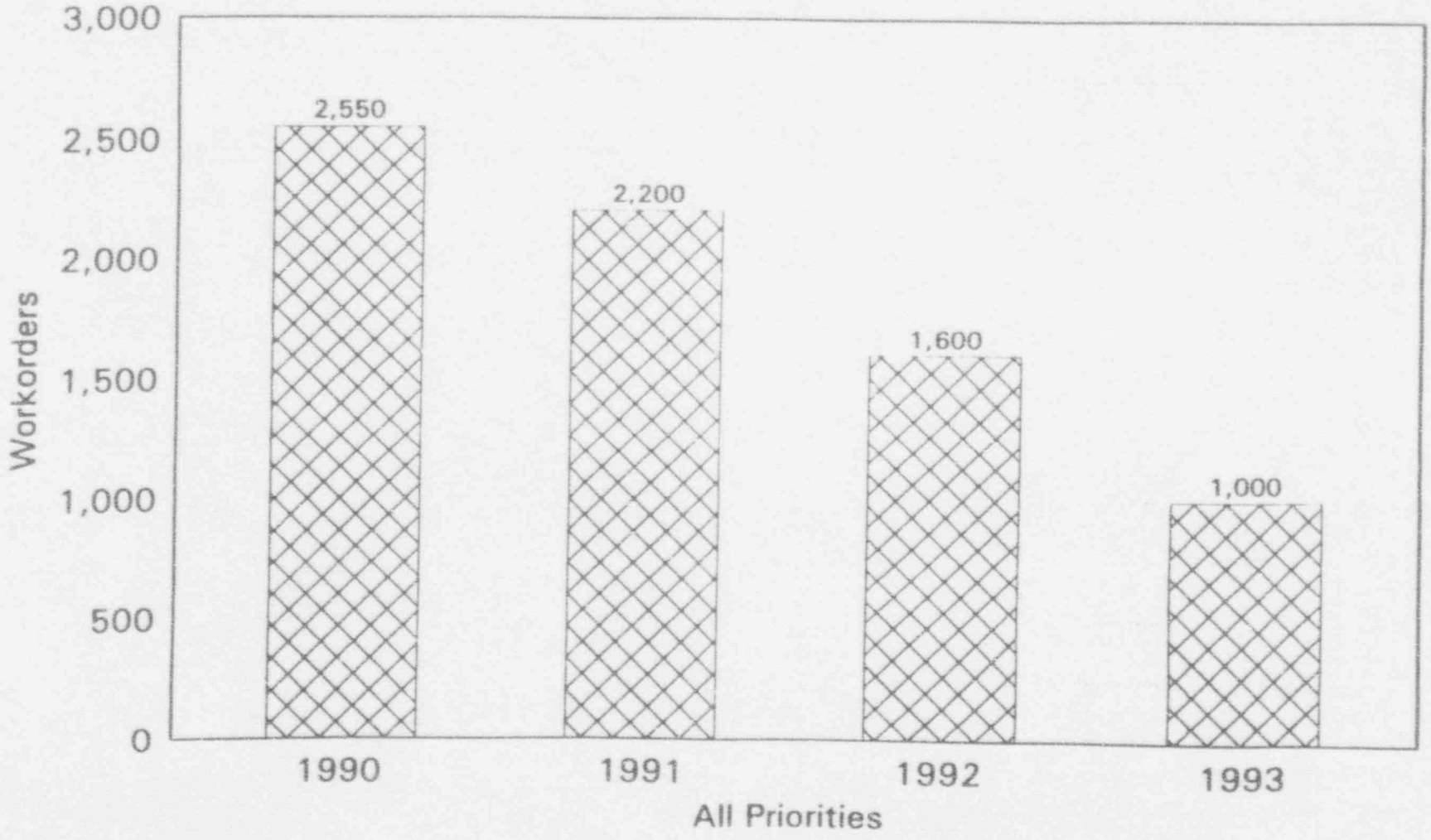
Mid loop instrumentation modifications.

Diesel generator HVAC improvements.

S/G feed pump independent control oil system.

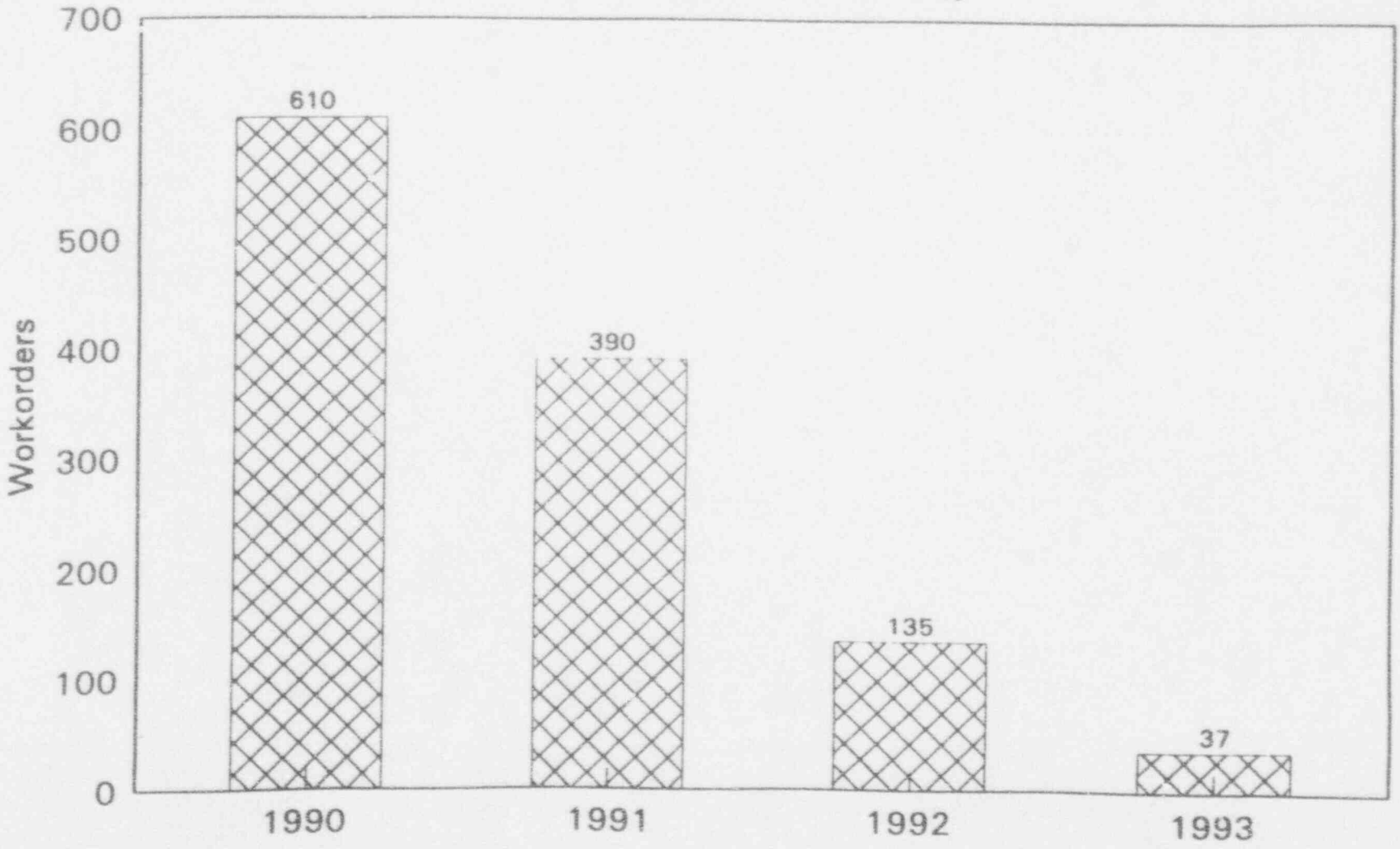
Salem upgrades since 1990 > $300M

Corrective Maintenance Backlog
Salem Station

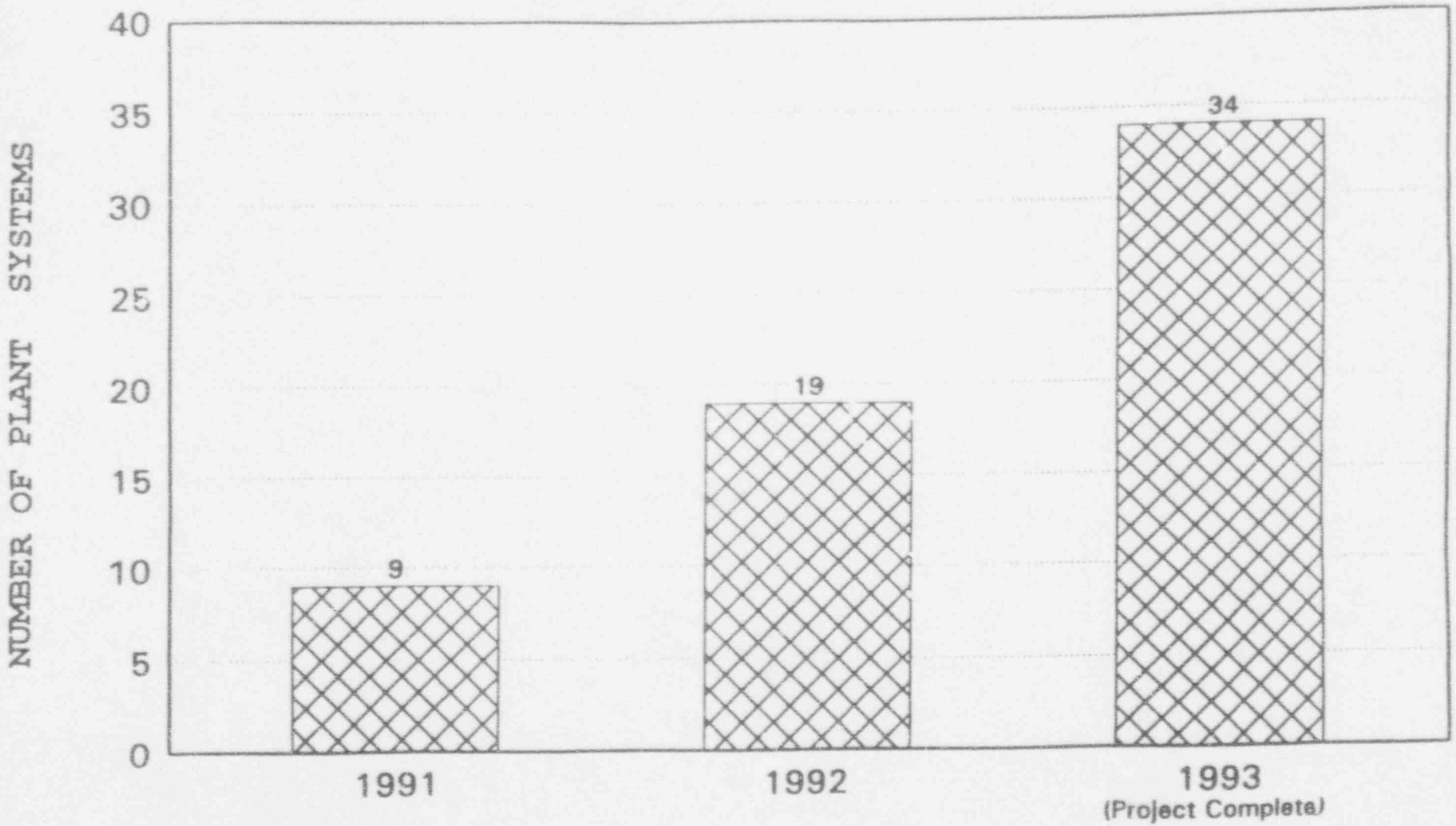


Preventive Maintenance Overdue

Salem Station (Maint Dept)

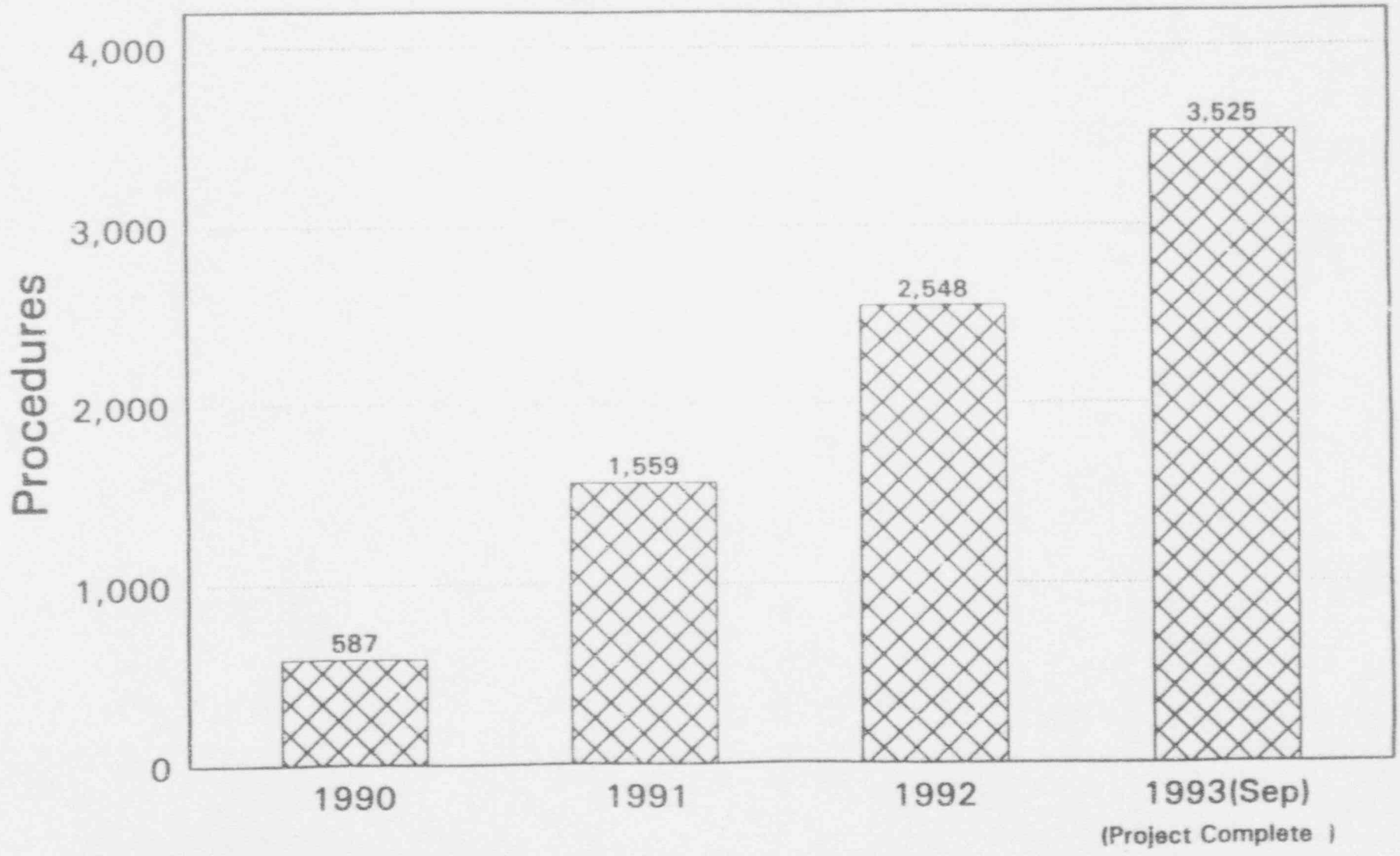


Reliability Centered Maintenance
Salem Station



Procedures Upgrade Project

Salem Station



KEY PERSONNEL ACTIONS

Work practices and standards expectations provided.

Work monitoring by line management and QA.

Work control process improvements.

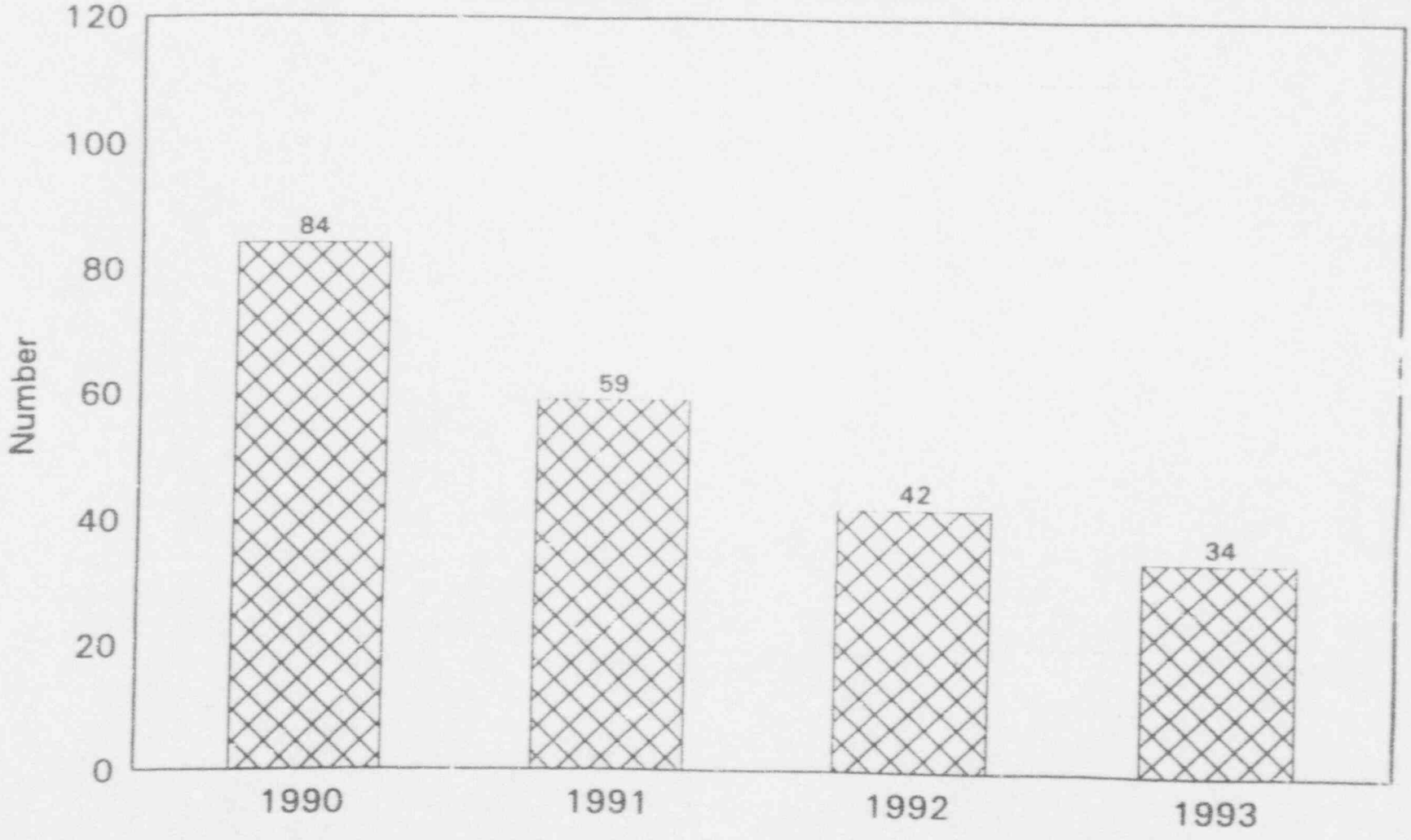
Supervisory face-to-face time.

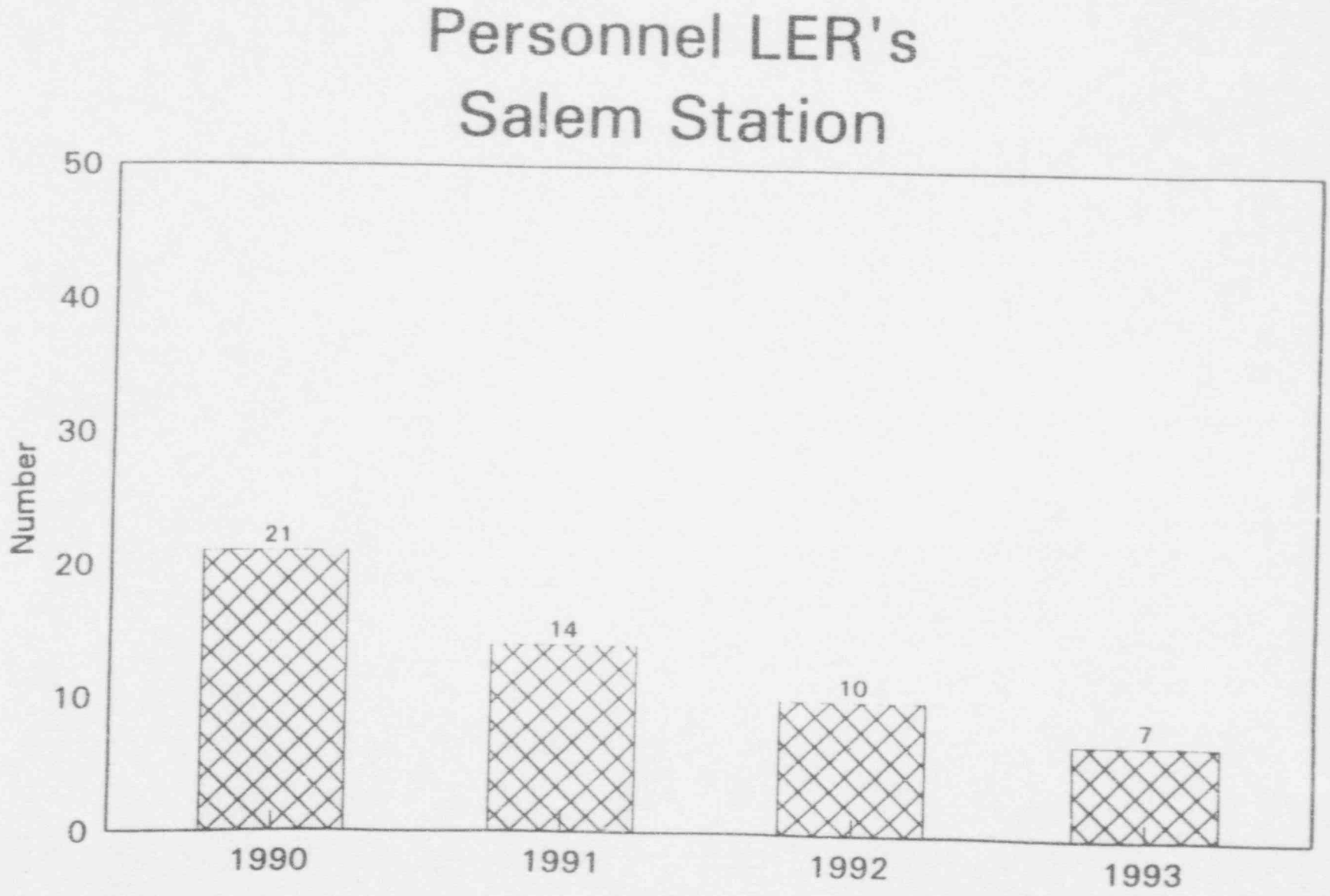
Root cause training.

Supervisory and management training.

Manager and supervisory dialogues.

Licensee Event Reports
Salem Station




Personnel LER's
Salem Station
Number
50
40
30
20
10
0
21
14
10
7
1990
1991
1992
1993

ASSESSMENT OF RESULTS

Improvement achieved in a number of areas.

Personnel performance improvements noted, but not meeting expectations.

Plant performance not meeting our expectations.

Identified need for Comprehensive Performance Assessment.

COMPREHENSIVE PERFORMANCE ASSESSMENT

Process

Full-time, multi-disciplinary, dedicated team of 12 people for 4 months.

Reported directly to the Vice President and Chief Nuclear Officer.

Performed a comprehensive assessment of occurrences over a two year period.

Looked for broader root causes, failed barriers, contributing causal factors and common threads.

COMPREHENSIVE PERFORMANCE ASSESSMENT

Results

Defined specific problem statements within three categories:

- Management Philosophy, Skills and Practices
- People Performing the Work
- Problem Solving and Follow-Up

COMPREHENSIVE PERFORMANCE ASSESSMENT

Actions

Defined responsibilities for resolution.

Prepared action plans and schedules for each problem area.

Identified performance indicators to measure progress and effectiveness of actions.

EMPHASIS ON PERFORMANCE THROUGH PEOPLE

Management and supervisory changes at Salem

Staffing increases at Salem

Unitized organizations at Salem

Re-bidding/assessment - placing right people in right job

Training/development initiatives

Increased supervisory time in field

Accountability through enhanced personnel performance appraisals

Dynamics of Leadership Model

BUSINESS LEADERSHIP DEVELOPMENT

Nuclear Department Dynamics of Leadership

To meet tomorrow's business challenges

PSEG

Nuclear Department Dynamics of Leadership

- Own the identification and solution of problems
- Stay involved - provide timely, accurate and honest feedback
- Good or bad, write it down so you can give valid feedback
- Remove barriers that impede performance
- If it doesn't look, sound or feel right - take action because it probably isn't right
- Explain decisions so people will support them
- Set performance standards
- Know when to let your people decide
- Be a team player - give and get help
- Support decisions
- Expect and give respect
- LISTEN to your people

Consistently among the best...Working together to produce competitive electrical energy through nuclear excellence

MONITORING EFFECTIVENESS OF PERFORMANCE THROUGH PEOPLE

Work practices and standards monitoring by line management and QA.

Supervisory face-to-face time.

Human performance indicators.

Leadership feedback results.

Personnel error Licensee Event Report.

Composite safety index performance.

COMMISSION MEETING
SALEM 4/7/94 EVENT

May 9, 1994

Presented By: Thomas T. Martin

RESIDENT STAFF RESPONSE

- PSE&G informs resident staff of unit trip
- SRI responds to control room and notifies Region I
- Continuous resident staff coverage and communication maintained until Augmented Inspection Team arrival

REGIONAL RESPONSE TO EVENT

- PSE&G declared Unusual Event at 11:00 a.m.; and Alert at 1:16 p.m.

- Region I and HQ activate response center for event monitoring from 1:00 p.m. until 9:00 p.m.

- PSE&G terminates Alert at 8:20 p.m.

AUGMENTED INSPECTION TEAM

- Region I, with NRR and AEOD approval, decided to dispatch AIT
- AIT initiated due to event complexity and unexpected system responses

AUGMENTED INSPECTION TEAM
(continued)

- AIT Team members selected
  - Region I Lead
  - Members from Region, NRR, AEOD personnel selected relative to technical expertise
  - State observers

AIT CHARTER

- Developed and issued on 4/8/94, including:
  - Review plant trip and response of management, operators, and systems
  - Development of sequence of events and associated causal factors

- Assessment of personnel, procedures, and equipment performance

- Identification of root causes

- Prepare report

CONFIRMATORY ACTION LETTER

- (CAL) 1-94-005 issued on 4/8/94, including:
  - Commitment to remain in cold shutdown
  - Commitment to cooperate and support AIT activities
  - Commitment to gain agreement of Regional Administrator prior to restart

CHRONOLOGY OF AIT ACTIVITIES

- AIT arrived on site 4/8/94 and completed on-site inspection activities on 4/26/94
- AIT maintained daily contact with Region and Headquarters managers
- Gas pocket forms in reactor vessel head and identified by SRI

- Licensee describes corrective action plans in letters dated 4/25/94 and 4/29/94

- AIT preliminary findings presented at public exit on 4/26/94 at Salem

- AIT currently involved in assessment of findings and report preparation

- Resident staff involved in inspecting and verifying licensee actions for restart readiness

- Region I staff briefed Senator Biden's staff on 5/5/94

- Public management meeting with PSE&G on 5/6/94 at the Salem facility

SIGNIFICANT AIT FINDINGS

- No abnormal releases of radiation to the environment occurred during the event
- Event challenged RCS pressure boundary through multiple operations of pressurizer PORVs
- Operator errors occurred which complicated the event

- Management allowed equipment problems to exist that made operations difficult for plant operators
- Some equipment was degraded by the event, but overall, the plant performed as designed
- Operator use of emergency operating procedures was good
- Licensee investigations and troubleshooting efforts were good

REMAINING ACTIVITIES

- Licensee confirms restart readiness
- NRC releases from CAL
- NRC augmented start up coverage
- Issue AIT inspection report
- Determine and direct followup activities