UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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NUCLEAR REGULATORY COMMISSION

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BRIEFING BY NUMARC ON PLANT MAINTNENANCE

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PUBLIC MEETING

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Nuclear Regulatory Commission

One White Flint North

Rockville, Maryland

WEDNESDAY, AUGUST 3, 1988

The Commission met in open session, pursuant to notice, at 2:00 p.m., the Honorable LANDO W. ZECH, Chairman of the Commission, presiding.

COMMISSIONERS PRESENT:

LANDO W. ZECH, Chairman of the Commission

THOMAS M. ROBERTS, Member of the Commission

KENNETH CARR, Member of the Commission

KENNETH ROGERS, Member of the Commission

STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:

S. CHILK

B. LEE

C. O. WOODY

G. BRONS

W. PARLER

C. MCNEILL

G. COLVIN

P. BEARD

T. TIPTON

CHAIRMAN ZECH: Good afternoon, ladies and gentlemen. Today we welcome the Nuclear Management and Resources Council, NUMARC, for a briefing concerning maintenance in the nuclear industry.

This is an information briefing, status report. NUMARC organization has been representing nuclear utilities to the NRC for about four years and in the past year, NUMARC has become the industry focal point for the discussion of many technical issues.

I firmly believe that the safe nuclear facilities are reliable nuclear facilities and reliable nuclear facilities are economic nuclear facilities. Proper maintenance programs that are vigorously executed in my view make a substantial contribution to safety, reliability and just make good economic sense.

After visiting 104 nuclear power plants in our country now, I'm convinced that maintenance is one of the major safety areas where some power reactor licensees could improve substantially and where virtually all licensees could improve to some degree.

The Commission, with the need for improved maintenance in mind, directed the NRC staff to prepare a proposed rule on maintenance which may be ready for publication or public comment later this summer.

Today's presentation by NUMARC on the current

industry activities is timely and may be useful to the Commission in our consideration of the proposed rule. I'd also like the NUMARC representatives today to talk to us perhaps briefly about the status of NUMARC's efforts to help the Commission in determining whether or not substandard components are being used in nuclear power plant safety systems and what activities NUMARC is undertaking in that regard.

Do any of my fellow Commissioners have any opening comments to make? If not, Mr. Lee, welcome and you may begin.

MR. LEE: Thank you, Mr. Chairman. I'm Byron Lee from -- president of NUMARC and I'd like to thank you and the Commissioners for giving us this opportunity to appear before you at this public meeting.

The purpose of our briefing this afternoon is to give you a complete description of the important industry initiatives in the plant maintenance area. We know that we've heard piecemeal pieces of it and we thought it was important at this point that you hear a complete story.

We've taken a lot of initiatives and there are still a lot of things underway at the present time. In addition, we'd like to give you our perspective of the NRC's maintenance rulemaking -- on that rulemaking.

First, I'd like to acknowledge four of the participants that are here with me today. On the right, C. O. Woody, Executive Vice President of Florida Power and Light.

Next to C. O. is Corbin McNeill, Executive Vice President of Philadelphia Electric. On my left, Joe Colvin, Executive Vice President of NUMARC and on the far left, Jack Brons, Executive Vice President of New York Power Authority.

Proper maintenance of nuclear power plants has been at the top of our attention list for several years now and our commitment, I assure you, is strong. The utility and industry generic maintenance programs are expanding year by year and these programs build on the experience and the success and are consistent we believe with the Commission's policy statement on maintenance.

Although we may differ with the Commission on the need for a specific rule, I want to assure you again, Mr. Chairman, that the industry is willing and ready to work with you in this area as in all the other areas to reach our common goal and that's safe nuclear plants.

The utility executives here with me this afternoon have been actively involved in the industry's maintenance initiatives and in addition, they direct the operation and maintenance of their own facilities which is a significant undertaking.

Joe Colvin will discuss the results of the industry's maintenance initiatives and will compare them with several approaches that we've taken in the past on what we think are several successful issues. The nuclear industry believes that

our efforts to improve maintenance are showing results.

While we agree that there is much left to be done -- we agree with you in that respect -- we are sincerely concerned with the potential impact on utility resources that would occur should the NRC redirect our efforts on maintenance at this point in time.

I'd like first to ask Corbin McNeill -- I mean, C. O. Woody, if he would give us a history of the NUMARC initiatives and the program. C. O.?

CHAIRMAN ZECH: Thank you very much.

MR. WOODY: Thank you, Byron. Good afternoon, Mr. Chairman and fellow Commissioners. It's a privilege for me to be here and I'm speaking for the industry -- initiatives on behalf of the NUMARC working group to give some historical perspective of the approach that's been taken and the progress that's been made. The nuclear power industry recognizes the importance of an effective maintenance program to support safe, successful operation of our commercial nuclear generating stations.

We all realize that good maintenance is good business and is not an option but a necessity if we're to continue to promote nuclear power as a viable energy option in this country. In 1984 NUMARC formed one of its original working groups composed of 24 senior utility officers and maintenance managers to bring industry focus to this issue.

[Slide.]

I have listed on a chart that I think you have before you, the main objectives of the original NUMARC working group. They were to address the issue of understanding, the current state of maintenance, to analyze the industry practices, to see if there were any needed programmatic changes, to put into place some selective maintenance indicators so that we could monitor our performance and finally perform a very important function and that was to assist INPO in the performance improvement, particularly at plants that were having recurring maintenance-performance problems.

Our working group felt that we needed to know more about the state of maintenance so in 1984, we initiated a root cause analysis of some 650 significant events from the time period of 1980 to 1984.

[Slide.]

From our data, we determined that about 51 percent of all root causes were human performance related. Of that, 38 percent of all root causes were maintenance-related. Maintenance was a dominant factor. Clearly the industry had a challenge in reducing the number of maintenance-related events.

Many of the performance problems, that is, approximately 43 percent of all human performance problems, were attributable to deficient procedures for documentation. In response to that problem, NUMARC assisted INPO in the

development of a written guideline for maintenance test and calibration procedures. It was issued in May of 1986 and INPO as a follow-up action has continued to evaluate the full implementation of that by the licensees at their evaluation each year.

[Slide.]

Our analysis also showed that we needed to improve the conduct and execution of maintenance activities and this chart will show you that 17 percent of the events were related to deficient planning and scheduling, 16 percent of the events were related to failure to follow procedures and frankly, quite a surprise to me, only 12 percent of the events at this analysis time were related to inadequate knowledge or what might be characterized as training.

We also did an analysis of the practices and methodologies used by the industry. We produced a document referred to as the matrix study in March of 1985 in which we tried to capture the many things that were in place in the industry to assist in the performance of maintenance.

We were trying through this analysis to determine if there were any programmatic voids which should be addressed. We looked at the NRC's maintenance surveillance program, at all of the SALP data for the previous 5-year period, at the performance appraisal team reports. We looked at some 250 INPO evaluations of maintenance and we compared that against the

best we knew at that time of a standard to see if we knew in the industry how to do maintenance. We concluded from that analysis that we as a general industry knew how to do maintenance but there was in fact a performance problem in that some plants were doing relatively well and as you pointed out in your opening remarks, there were some plants not doing well at all.

During this time period, there was an emerging recognition on the part of utility executives and maintenance managers that maintenance needed considerably more than it was getting. Through our interaction with CEO workshops, maintenance manager workshops and industry meetings, we were able to bring some focus to this and felt that there was a consensus within the industry to begin to take on an improvement for the overall performance of maintenance within the plants.

The working group took action to correct the generic issues. We did find a couple of weaknesses. For example, there was an absence of a strong document on post-maintenance testing so in those areas where we did find opportunity to help the industry in a programmatic way, we took action.

We also determined again that there was a broad spectrum of performance and our challenge was then on how to accomplish the needed improvement as an industry and particularly how to accelerate the improvement of the outlier

plants.

Several specific actions have been taken to accomplish the needed improvement. Generally, the INPO process is the vehicle that we've used to address them. I would like to touch on a few in my discussions since our work with INPO over a three-year period was significant in providing them hands-on input in transferring technology back to the industry.

[Slide.]

MR. WOODY: Early on, we recognized the need for better guidance and a more definitive criteria for maintenance programs. To this end, NUMARC assisted INPO in development of a guideline for conduct of maintenance at nuclear power stations. INPO and NUMARC are very proud of this document that was issued in November of 1985.

It provides a means by which a utility can assess its maintenance program against a valid criteria and it's divided into 16 chapters. Each chapter has three sections that gives the general introduction, the criteria and then the guideline for how to best accomplish that function.

The guideline document for the first time addressed much more than mechanical, electrical and I&C repair functions as plant maintenance. Outage management, procurement, technical support, training, stores and other functions are now assessed in relation to the support of an effective maintenance program for the entire plant. The first application of this

guideline came in 1986 when the working group sponsored a pilot self-assessment program for member utilities representing the ten plants participated in this program using the guideline as a basis.

[Slide.]

MR. WOODY: The results of the pilot effort clearly demonstrated the value of this self-assessment approach in identifying needed improvements and it confirmed the validity of the INPO maintenance guideline as a sound baseline document for self-assessment. In December of 1986, we performed an analysis of NRC SALP data by region for operating years 1980-1986.

The study showed that the composite of maintenance SALP performance for all plants in the U.S. was improving at a rate of two tenths of a point per five years and that for the last five years, the SALP rating had averaged better than a category of 2.

The NUMARC working group was pleased at the positive trend, but not satisfied with the rate of overall industry improvement and presented this data to INPO as a basis for conducting an industry-wide maintenance self-assessment initiative. The industry wide self-assessment began in early 1987, when INPO requested all member utilities to perform a self-assessment based on the methodology and lessons learned from the pilot.

I understand that 72 of 75 plants have now completed that self-assessment and of course, there's more to the story as we talk about the follow-up action from INPO.

CHAIRMAN ZECH: What happened with that self-assessment? Can you give us a few words on that?

MR. WOODY: Yes, each utility performed the self-assessment and laid out an action program -- in many cases, a multi-year action program -- that was forwarded to INPO and as a control means on that corrective action program, INPO assesses their progress and also the validity of their self-assessment during their routine evaluations.

In addition, as a part of this initiative in '87, INPO put in place an assistance visit concept, using maintenance managers and corporate officers from other utilities, principally those who had good maintenance programs in place, to go to the plants where through the previous evaluations it had been determined that there was an accelerated need for their improvement.

I understand that 16 of those evaluations have been done. Those utilities have identified specific corrective actions that are in the process of now being implemented.

CHAIRMAN ZECH: Thank you.

MR. WOODY: Of course, we found varying approaches and varying degrees of implementation when the self-assessments were done. However, we do believe the industry has developed

the mechanism to identify its shortcomings and they have initiated methods to improve effectiveness. In order to measure performance against valid criteria, NUMARC developed a set of maintenance indicators in late 1985.

[Slide.]

MR. WOODY: These indicators are now being used to monitor trims and broad relative positions on maintenance within our industry, both collectively and on an individual plant basis. Many plants have taken these indicators and broken them down into lower level performance indicators for use by plant maintenance departments so that they can monitor specific activities and direct attention to problem areas related to maintenance before they affect unit performance or safety.

The maintenance indicators are now being reported to INPO on a quarterly basis by each utility. INPO reports a histogram summary of industry data along with plant-specific data to each nuclear utility. This information has proven very useful to managers so they can assess their individual plant against industry averages, look at trends in their plants and apply additional resources to those areas where analysis indicates it is needed.

A word of caution though about indicators. They are not an end but a means -- in fact, a management tool. They need to be supplemented by knowledge of the many dynamic

conditions impacting the plant. Since existing lines of communications among utilities have been less than fully effective for addressing technical problems as they occurred, the working group initiated through the Electric Power Research Institute, the establishment of a Nuclear Maintenance Assist Center.

[Slide.]

MR. WOODY: this is a new concept with the single purpose of assisting utilities in improving their maintenance efforts. The Nuclear Maintenance Assist Center will provide more than solutions to technical maintenance problems. It will be a vehicle for communicating tried and proven solutions to technical maintenance problems and it will assist in helping plants allocate maintenance resources such as deciding what preventive maintenance tasks are really necessary and desirable and what tasks to automate and how and whether to use predictive or periodic maintenance.

NMAC's startup is heavily supported by EPRI, but it is to be the industry's maintenance assistance organization and it is expected that it will be funded from within the industry in the future. NMAC will draw o the best talent in the industry, both domestic and foreign and we expect that it will be self sufficient and independent by 1991.

The director for this organization is now in place. There is a steering committee in place. The initial

prioritization of the problems to take on and some of the products that will be early coming out of that group is the bolting manual and the motor operated valve service manual.

This center is basically a methods and hardware approach. It is not redundant to INPO, but fills a need. For example, in December of 1986, the AEOD case study on safety related motor operated valve performance was forwarded to NUMARC with the request that we undertake appropriate initiatives to remedy the motor operated valve performance and reliability problems.

To address this issue, action was taken by NUMARC to have INPO analyze the elements of a good motor operated valve performance at certain plants and communicate the lessons learned to the rest of the industry.

During plant evaluations and assist visits, INPO now places additional emphasis on improving motor operated valve maintenance. In addition, the first project for the new NMAC organization is to assist in improving motor operated valve performance and reliability by addressing issues in a technical repair standard. It's my understanding that this standard is targeted to be issued in October of this year.

NMAC will be using an advisory group composed of utility, valve manufacturers, MOVATS, EPRI and INPO representatives to guide this effort.

[Slide.]

MR. WOODY: In the area of maintenance evaluations, the working group assisted INPO in instituting the maintenance peer evaluation program in which maintenance managers and supervisory level personnel accompany INPO teams on plant evaluations or maintenance assist and review visits at other plants. We've made initial contacts to utilities in February of 1986 to solicit their help and support. To date, about 120 of the nuclear maintenance managers and supervisors have participated in these peer reviews.

We see several benefits of this program such as a improved evaluation team capability by the addition of experienced people, enhanced professionalism and communication, a learning opportunity for peers, exposure of peer evaluators to good practices from other plants and finally, familiarization of the peer evaluator with the INPO process and the ever-rising standard of excellence that's being promulgated.

Feedback received from the participants in the program has been very positive in reinforcing these benefits. I want to make the point that we've continued in our efforts toward improvement and applying emerging techniques and things that we've learned in this complex arena. Let me illustrate.

[Slide.]

MR. WOODY: While reviewing the various types of maintenance performed in the industry, we conducted a survey in

1986 which revealed that the most widely used form of predictive maintenance in the nuclear industry was the vibratory monitoring program. Based on information from 71 plants at that time, we found that most used some form of vibration monitoring and analysis on plant rotating equipment. Many plants also were beginning to perform lubricating oil analysis on selected equipment for quality and wear particles to determine the origins and severity of machinery wear.

[Slide.]

MR. WOODY: Other predictive techniques being used and expanded include infra red detection and thermography, motor operated valve dynamic testing and others that are on the chart that is on the screen. To promulgate these industry practices, two presentations were given at the 1987 INPO maintenance superintendents' workshop in Atlanta that directly addressed these predictive maintenance techniques and the benefits that would accrue to a plant from using them.

I've spoken about several initiative developed since the NUMARC working group appointment in June of 1984. We've worked toward raising the level of maintenance performance in our industry, using industry experience and innovation and we've directed our efforts to achieve not only economical operation, but more importantly, to increase the margin of safety in our plants. We've reviewed and analyzed areas of concern pointed out by both our regulators and our peers.

We have developed a set of industry indicators that allow us to track our progress and guide us to areas that may be deficient.

[Slide.]

MR. WOODY: Let me mention training. All of the craft and maintenance training programs of the 60 operating plants as committed to you have now been accredited. Through training, we can take appropriate action before we experience significant negative changes in performance. The indicator program helps us with that.

The INPO guidelines for the conduct of maintenance at nuclear power stations tie together all of the components of the maintenance function at a nuclear station and the self assessment process gives the utilities the opportunity to compare its maintenance program to a practical set of guidelines which show how the various parts of the program should all fit together. These guidelines provide the flexibility needed to serve this purpose since they address all functions needed for an effective program while not becoming necessarily prescriptive.

This is important considering the variation in plants, organizations and locale conditions throughout our membership.

The peer evaluation program has helped upgrade the quality of the INPO evaluations as well as facilitate the

transfer of good practices from plant to plant.

Through NMAC, we have established a central point to obtain maintenance assistance and expertise. We believe the industry initiatives that we have implemented and support have achieved gains toward improving the quality of maintenance in the nuclear industry and the methods being used.

Again, a review of the SALP data from 1980 through 1987 shows a continuing steady improvement. INPO maintenance indicators and performance indicators also show steady improvement.

By moving forward in the area of maintenance training upgrade, improved management focus, continuing vigilance through ongoing self evaluation, INPO evaluations and assistance and EPRI support, we can continue these positive trends.

Thank you for allowing me to address our industry initiatives.

CHAIRMAN ZECH: Thank you very much.

MR. LEE: Thank you, Mr. Chairman. I might indicate we have quite a bit of support here with us today from the industry. I might ask the industry people if they would raise their hands. We have a pretty good turnout. I'm sure most of them would rather be home attending to the plants to meet these large loads that everybody seems to be experiencing.

CHAIRMAN ZECH: Conducting maintenance, too.

MR. LEE: Do the maintenance; right. This last day or two, you might just want to watch everything run, keep the loads going.

We have asked Corbin McNeill and Jack Brons to talk a little bit about --

COMMISSIONER ROBERTS: Are you going to have questions at the end of the presentation?

CHAIRMAN ZECH: Go ahead.

COMMISSIONER ROBERTS: Your hand-out chart two, did I hear correctly, that was for 1984?

MR. WOODY: This was 650 significant events between the years 1980 and 1984.

COMMISSIONER ROBERTS: To compare apples and apples, if you used the same criteria on what an event is, what would this look like for the period 1984 to 1988?

MR. WOODY: We have not done that, Commissioner Roberts.

COMMISSIONER ROBERTS: What was the number?

MR. WOODY: 650.

COMMISSIONER ROBERTS: How many would fall into a significant event in the period 1984 to 1988? I think those would be interesting numbers.

MR. WOODY: We do know that the number of significant events have been decreasing and the rate, in fact, someone from INPO might be able to help here, it has been cut in about half

in the last five years, the number of significant events per operating unit.

Pat?

COMMISSIONER ROBERTS: The gross number would be smaller. I'd be interested to know if you would have the same percentage for cause.

CHAIRMAN ZECH: Would you please step up to the microphone? Please identify yourself for the Reporter.

MR. BEARD: I am Pat Beard, Vice President, Government Relations at INPO. We have not done an analysis as C.O. Woody said of the causes of all the events from 1984 through 1988. It is true that the number of events that we have classified significant have about halved. The number is still decreasing on a yearly basis.

CHAIRMAN ZECH: Thank you very much.

MR. WOODY: We will take a look at that.

COMMISSIONER CARR: I might note that the slope of that SALP line is pretty steady from 1980 through 1987. I didn't see any drastic drop from 1984 on.

CHAIRMAN ZECH: Also it started out at a pretty high level; it has a ways to go.

MR. WOODY: We certainly acknowledge that, Mr. Chairman.

CHAIRMAN ZECH: Let's proceed.

MR. McNEILL: Good afternoon, Commissioners. I am

Corbin McNeill, Executive Vice President, Nuclear, for the Philadelphia Electric Company. I've been a member of the NUMARC Technical Committee and its successor, the Issues Management Committee since 1986.

That group has had an advisory role in overseeing the various industry working groups which NUMARC has sponsored. This includes the original Maintenance Working Group which was chaired by Mr. Woody starting in 1984. That came under NUMARC purview after it had been in operation for some time.

This past year I was also appointed a member of the NUMARC Ad Hoc Advisory Panel on Maintenance to look at what we could in fact do within NUMARC to continue to coordinate the maintenance activities and the maintenance initiatives that the industry had undertaken.

The utility industry has always had a strong interest in maintenance and it is particularly true in the nuclear utilities. Earlier inclusion of surveillance tests in the technical specifications and the dedication of time during refueling outages to equipment overhaul were evidence of that fact.

Just as Mr. Woody has indicated and the later presenters will show, there has been an increased emphasis on maintenance in recent years. If you review the evolution of this industry over the last eight years, I believe you will find at least in my opinion that there is a logical sequence of

the improvement initiatives which have been undertaken and of which maintenance is only the most recent one.

This initiative has a sound basis and will be continued by the industry. It is not one which is fleeting in nature.

In the early 1980's, the industry organized itself under INPO and subsequently established standards and performance measures. It set industry-wide goals and implemented an evaluation process. In the early years, INPO review of significant operating events highlighted personnel issues as a major problem requiring more vigorous training programs. The training program improvements and accreditation therefore became the major industry efforts of the early and mid-1980's.

Since training was such a cornerstone of operational safety and of long term improvement programs, it rightly received this high priority.

As Mr. Woody has indicated, near the completion of the development of our training program upgrades, performance indicator data caused us to shift our focus to plant reliability and capacity. The result was the major maintenance issues which are being described today.

Since these areas were more technical in nature, lead responsibility was in fact shifted to NUMARC after NUMARC's formation which was then the industry's recently formed

technical organization.

The industry's response to maintenance was and is coordinated using both the resources of INPO and NUMARC. INPO has issued maintenance guidelines which Mr. Woody has described. It has revised the evaluation criteria and instituted both maintenance, self assessment and maintenance assistant review teams, commonly referred to as MART's. NUMARC has worked with the industry and EPRI in establishing the Nuclear Maintenance Assistance Center, and addressing specific maintenance issues such as motor operated valves.

The coordination of these activities has created commonality of approach to maintenance throughout the industry. This commonality of approach is one which I believe to be one of your objectives.

Our maintenance initiatives are both manpower intensive and expensive. A MART inspection itself will consume a minimum of about three weeks of executive time and on the order of 20 man weeks of industry or peer review assistance.

In addition, there is significant utility resources which at Peach Bottom have required for instance approximately 50 man weeks of effort on the part of the station itself. Much more significant is the implementation of resulting programs or strategy in maintenance. We have estimated that Peach Bottom and Limerick will spend approximately $5 million a year for four years on maintenance program upgrades for each plant and

close to $10 million a year over the same period for spare parts procurements.

Public Service Electric and Gas, of which I used to be an officer, had estimates of the same order of magnitude.

I would like to point out that with that level of expenditure and it may be similar among plants, the focus at each plant has in fact been different. Peach Bottom for instance is focusing on reliability. It has suffered from a number of trips and a high forced outage rate. Limerick, which has a very low forced outage rate, has a need to improve its planned outage performance and reduce that time.

Broad performance indicators such as those currently used by INPO and the NRC, will be used to measure the improvements and subsequently the continuing health of our programs. Other more specific indicators such as preventive maintenance status will be used for work group goal setting, diagnostic efforts or in some cases leading indicators of the trend of performance.

When dealing with people in a social or organizational setting, it is important to understand that implementation of similar programs by different organizations frequently produce differing results. Similarly, performance indicators can be defined, interpreted and managed differently by similar organizations. As a result, can have variable effectiveness as a management tool.

If too many indicators are created or they are too narrowly focused, organizations will manage the performance indicators and disregard the activities which are not measured. The end result could well be an overall decline in broad performance.

In most cases, I believe they are collectively reaffirming a longstanding management principle, that the issue really is not just the implementation of the programs but the management capability behind the implementation.

I offer that the current industry maintenance emphasis and efforts are logically placed within the evolution of the industry. The direction provided by INPO, NUMARC and the NRC are proper and significant progress is being made.

That progress is also very compatible with the resource availability and management skills of the industry. We have adequate standards and goals. The utility programs have focus and they have the advantage of individual plant prioritization, that focus and prioritization will be adversely affected by additional broad regulatory action.

The commitment of the industry will be sapped by such action resulting in my opinion in diminished industry effectiveness and maintenance. Neither of us will benefit from such a result.

Thank you very much.

CHAIRMAN ZECH: Thank you.

MR. BRONS: Thank you. I have some material that is a little bit different from what you have heard. With respect to maintenance, I think the New York Power Authority is being represented here as a part of the industry because we are typical. The Power Authority has not been either a leader or a lager in the area of maintenance. We are able to offer a full scope viewpoint because we operate a boiling water reactor and a pressurized water reactor. We have a different union at each one of them. We are able to see the full scope of issues that are present in maintenance.

In addition, we have long believed that good maintenance can and does pay off.

[Slide.]

MR. BRONS: We manage our maintenance program through the use of performance and process indicators. I stress that there is a difference between performance and process indicators, and on this particular page, you see indicators which I would classify as performance.

We'll not discuss each indicator, but point out that in the aggregate availability is one thing. When we want to use that indicator for guidance in our maintenance programs, we must break it down in component parts. And so we look at planned and forced outage time. We look at planned and forced derate time, forced LCS's.

All of those things yield information about

maintenance that's either going well or needs correction. A similar story can be told about the relationship of thermal performance to the derate numbers. Automatic scrams clearly have a maintenance tie and chemistry performance, a subject that's often forgotten in the maintenance area, is an extremely important indicator of plant quality.

[Slide.]

MR. BRONS: As we proceed down the list of indicators, I begin to gray into the area of stretching from performance indicators to process indicators, but clearly radiological performance is a good measure of our ability to do work efficiently and effectively. The results of our maintenance also are measured in terms of our effect on our environment and on our work force.

In the area of equipment operability, we measure control room annunciators and control room instruments that are out of commission because we, like you, believe the operators must have a full deck.

As we move into maintenance department performance indicators, we are clearly into the area of process indicators. I would like to take just a moment to discuss the first two listed here and to give you an example of how, even within a single company, there is some difficulty in measuring these items.

Work requests outstanding by priority. One of my

plants is represented by the IBEW, the other one by the UWUA. Because of work rules agreed to many years ago, which are not a problem in any way, shape, or form, we are required to use a work request of one priority at one plant in order to call out people on the weekend.

A lower priority work request will do the same thing at the other plant. So doing the same work at both plants will generate different numbers in the ratio of high priority to average priority work requests.

The ratio of preventive to corrective maintenance is an intellectually very appealing item. In fact, I got by Board of Directors to include it as part of the objectives of the company in measuring our performance. I become somewhat disenchanted as I recognize that there are vast differences in that aggregate number between the ratio of preventive to corrective maintenance in the mechanical area, the electrical area, and the I&C area.

It's easy to understand. Mechanical work generally requires scaffolding, removal and reattachment of lagging, all of those things which tend to distort the numbers. By the same token, most switch gear is located at ground level and designed to be racked in and out.

So the time spent on these tasks changes. Also, if I analyze those numbers by the number of maintenance work requests or the number of man hours or the number of dollars

spent, I can come up with different ratios of what we're doing there.

And in addition, we've found that there is a deep philosophical discussion worthy of taking place on what is preventative maintenance and what is corrective, particularly when you consider predictive maintenance aspects.

[Slide.]

MR. BRONS: There are other performance and process indicators that I will not dwell on. These are the ones that we consider useful. We track many others because we are required to report them, but we don't find them especially useful. There's a whole arena of indicators possible.

[Slide.]

MR. BRONS: Looking at the scope of maintenance from another view point, I've shown for 1987 our numbers that the two plants, of preventative maintenance work requests broken down by the maintenance department which encompasses mechanical and electrical maintenance and the I&C department.

Similarly, you'll see corrective maintenance work requests for the same time period and surveillance tests. I would like to stress that the numbers of work requests are about 50-50, balance of plant as you would define it, and safety-system related, and that's true in the preventive maintenance area as well.

If you look at those overall numbers, you would

conclude that we are doing vastly more preventive maintenance than corrective maintenance. If I look at it on a man hour basis, I get the opposite picture.

I would like to comment on the surveillance tests. Of the surveillance tests, about 95 percent of them are tech spec related and only five percent are related to what you would call balance of plant.

That's not a statistic I am proud of. I would like to be able to apply more resources to that area. I think that provides an opportunity which we can discuss later.

[Slide.]

MR. BRONS: Looking at the scope of maintenance yet another way, our average number is 15 man hours per work request on preventive maintenance items, 60 hours for maintenance department, corrective maintenance work requests, and 17 the I&C department.

Within the maintenance department, I would also break that down that mechanical maintenance takes much, much more time on average than electrical maintenance per work request.

The surveillance tests, eight hours per surveillance test. It is in this particular area that I think that there is a regulatory opportunity to free up some resources, which I'll discuss later.

[Slide.]

MR. BRONS: Looking at human resources applied to the

problem, a snapshot of our maintenance department at Indian Point 3 in 1977 and 1988, shows that the total staff has more than doubled. This application of human resources is true not only in -- at both plants. A similar change has taken place, but in all maintenance related departments.

Probably the most disappointing thing to me personally on this thing is you'll notice that we've gone from one maintenance engineer to nine engineers. I was one of the driving forces behind that change and my hope was to apply those resources to improved preventive maintenance programs and they have been siphoned off to a whole host of emergent issues such as they've been relatively ineffective, at least by what we intended to accomplishing that program.

COMMISSIONER ROBERTS: Pardon me, I show my ignorance. What's a PUW?

MR. BRONS: Slide seven, please.

[Slide.]

MR. BRONS: Good question, Commissioner Roberts, and I did have some notes but in order to put the viewgraphs together -- it's a utility worker with apprentice maintenance skills and they have janitorial duties.

The two most relevant notes on this page is that the maintenance department does not include I&C design engineering or procurement functions, and also the growth is masked a little bit because we took some responsibilities away.

In 1977, this department was responsible for rad waste compacting and handling.

[Slide.]

MR. BRONS: What do we do about maintenance at the power authority and how have we tried to approach it? In 1983, we were concerned that our peak attention had shifted from operation and maintenance of the plant to performance of a whole host of things, regulatory work included.

We were in the peak years of installing TMI modifications, appendix R things and so on, and frankly we felt that our focus on maintenance was slipping. As a result, we began some efforts to asses our maintenance programs.

It began as a two-pronged approach to look at balance of plant activities and separately to look at preventive maintenance. In short order, we recognized that maintenance, if it was going to be effective, was a single issue for the entire plant and so we put together a planned maintenance task force whose charter was to include preventive maintenance and other aspects of maintenance plant-wide.

The task force was composed of the plant managers at the two plants. There are maintenance and I&C superintendents and several individuals from corporate headquarters. In November of that year, they issued their report which covered the items noted and most significantly listed what we considered to be the attributes of the maintenance program we

would like to have.

An interesting aside was the classification of maintenance.

[Slide.]

MR. BRONS: As we looked at overall maintenance activities, we found, of course, that we dealt with forced corrective maintenance. We dealt with general repair, that's housekeeping and building and grounds and that kind of thing. And then we found that in both of those areas we were satisfied with what we were doing. If something broke, we reacted properly and fixed it.

But it was in the area of planned maintenance that we found that we had significant room for improvement. They defined plant maintenance to be composed of three elements. Preventive, predictive, and planned corrective maintenance. That's where we call the shots, stage the equipment for something that we recognized to be deteriorating.

[Slide.]

MR. BRONS: In 1985, we began the implementation of those maintenance programs that we had developed from our attributes listing and in 1985 INPO issued its guidelines. Shortly after those guidelines came out, we conducted an assessment of our planned maintenance programs to the INPO guidelines.

We really felt good about that. We found that we had

a very good correlation with what was in the INPO guideline and so we made some very minor adjustments to our program and continued on with what we had planned.

In '86, we formed a standing nuclear maintenance committee whose purpose was to ensure that transfer of good practices from, at least between our plants. If one had a good program in rigging control and another one on tool control, we wanted to make sure we didn't reinvent the wheel and so those guys were responsible for getting those things back and forth, as well as our continued assessment of our efforts in maintenance.

And so it is continued. We reported our efforts to INPO as a result of their call for the self-assessment and in December of last year we conducted another assessment of our progress and set objectives for '88 and '89.

What kinds of things did we do in maintenance? I've listed here some routine predictive and preventive maintenance techniques. These ideas have come from our own experience, from INPO workshops and good practices, and from just generally being professionals in the field and reading trade literature.

We do vibration analyses, both baseline and troubleshooting. I would caution you to please understand that when I say that it doesn't mean that every rotating machine in my plant has a baseline measurement on it. We start at mid-stream on this. We're working towards getting there.

We do oil analyses. There's a special story here I'd like to tell. About three years ago, we replaced a main transformer on the plant, solely based upon the chemical trending of dissolved gas in the transformer oil.

We had opened up the machine and gone inside. We could not find anything wrong. We put it back together, put it on the line. The trend continued in the parts per million range and we elected to take the machine out of service and replace it.

Later destructive disassembly of that transformer showed that it would have failed while the unit was on the line had we not replaced it on that analysis.

We do RF monitoring and the idea came from a magazine article about another utility's practice in that area and we monitored the main generator. We've also installed antennas at our four reactor coolant pumps so that without receiving high radiation exposure we can go into low radiation areas of the containment and measure the RF fields on the reactor coolant pumps.

[Slide.]

MR. BRONS: We do acoustic monitoring, and I'm not just talking about stethoscopes and transducers, but we also teach our people to stop and smell the roses and listen while they're in the plant.

[Slide.]

MR. BRONS: We do routine preventive maintenance in infrared areas, which has expanded from the switch yards and transformers to use in the plant with steam traps. We do leak testing with helium. And not all these things work out well. We tried to get more sensitive than helium and shifted to SF-6, and found that when we injected SF-6 in the condenser in the plant and it came out in the lake a half a mile later or out into Lake Ontario. It was an on-shore wind. We could sense it in the plant. So that was clearly too sensitive. So not all these ideas are good ones.

[Slide.]

We have the motor-operated valve program and live load packing and I have not written here, but we do all the old fashioned things too, like reviewing logs for temperature trends and Delta P's and motor running currents. We have done maintenance based on all those items.

We have some things that are more or less unique to the Power Authority in maintenance, not exclusive but some of them are less extensive in the industry than others.

Following an INPO report on a visit to European utilities would suggest that a good item for a work control center. We instituted that at a plant where we had the geography and we had the need.

We have video-mapped both our plants so that our design engineers, our maintenance engineers, our ALARA planners

can review the high rad areas of the plant, even take measurements from those video maps and plan jobs to help out in maintenance. We lately have found that it has a good application in emergency plan work also.

We have a patent application pending for a resistance, heat stress improvement program that we developed to replace induction heat stress improvement on BWR piping when we could not get the coils into place. We have a patent on our post-accident sample system which was designed with maintenance in mind.

We list a number of others. I think the two I would like to focus on are the Failure Analysis Associates.

[Slide.]

We read an article in either Time or Newsweek when the walkway collapsed in the Hyatt Hotel that an outfit named Failure Analysis came in and did some work. Shortly after that we had a main generator failure and we called them in. In that case they were able to tell us what caused the failure. We were so pleased with their work that in two subsequent events we have used them that have led to a design change in the case of our reactor coolant pump motors and an operational change in the case of our main turbine.

Our suggestion program produces the largest monetary awards for employees with suggestions in maintenance, not by design but because they are most cost effective.

We had an apprentice program at our J.F. plant which pre-dated the accreditation process.

[Slide.]

In this area of maintenance I think there are some regulatory opportunities. I would urge you to emphasize performance and not process. The quote I have there is from 10 CFR 50.49, "must be maintained in auditable form." The paper trail for the inspection, removal, repair and replacement of a single motor operated valve is over one inch thick. Human factors effects which required the signatures to be next to the step require us to save all those pages. We sometimes do 60 MOV'S in an outage.

Balance the regulatory need and maintenance impact: As a result of some regulations now we are sealing instruments, conduits, connectors. We are redoing splices in the plant whose quality and workmanship I can attest to but whose pedigree I could not.

We are developing a disposable mentality with sealed components that says you don't maintain them; if they fail, throw them out. It is affecting our resources and our man-rem.

I would encourage you to encourage us to shift the reliability based surveillances. I have a surveillance test that I do week after week after week, month after month without failure, but I do them because I am required to do them. In those surveillances that I address myself to balance the plant,

if the equipment proves reliable, I adjust the frequency of the surveillance to match the reliability.

If you consider rule-making, please recognize that our interests and concerns are the same as yours. We have initiatives in place. We are producing positive results. I am concerned that rule-making may increase process and stifle performance.

[Slide.]

This last slide (slide 16) has a controversial heading, which frankly didn't dawn on me until last night.

[Laughter. Slide heading is "Advice to Naval Officers.]

I refer here to my background and to good advice that I received as a young Naval officer. I believe it is particularly applicable when dealing with good people reaching for excellence, as this industry is. Always tell your people what you want done, not how to do it.

You have told us in your policy what you want done and by our actions and initiatives we had agreed in advance. We have some excellent guidelines from INPO. Together I believe they should be sufficient.

Thank you.

CHAIRMAN ZECH: Thank you very much. We'll finish with Joe Colvin, who'll talk about the results.

MR. COLVIN: Good afternoon. I will assure you that

I have no such slide at the end of my package.

CHAIRMAN ZECH: I think you are well advised. We'll have a few words about that later.

[Laughter.]

MR. COLVIN: Gentlemen, the purpose of my presentation is to provide an overview of what we were doing in maintenance and why and to summarize the results, what some of the results of those initiatives are, how they compare to other industry initiatives that we have undertaken and what the future holds for those initiatives as we proceed.

[Slide.]

First, what are we doing in maintenance and why do we have increased interest? That is slide 2.

[Slide.]

First of all, our primary interest is in the area of improving and enhancing maintenance and we have had plant events that have been attributable to maintenance. Secondly, to increase the reliability of our plants and as Mr. Woody pointed out, to reduce the operating and maintenance costs in order to maintain a nuclear viable option in our energies mix, in our nation's mix. Next slide, slide 3, please.

[Slide.]

The next three slides that we present will provide an overview of the major industry initiatives, and as Mr. Woody pointed out, these initiatives form the foundation for overall

improvements in maintenance. Both Mr. Woody spoke about a number of these. INPO has recently briefed the Commission so my purpose is only to cover the highlights.

In the INPO evaluation and assistance area, as you'll note, the chart only provides starting times from 1984 through and into 1989. Many of these initiatives have been under way for some time and where so, where that is the case, they are so indicated.

INPO's evaluation program is by far the best method we have had as an industry in determining overall performance and achieving improvements. In 1986 the focus of that effort was enhanced on maintenance to address issues such as work control, coordination of maintenance activities, post-maintenance testing, material conditions, preventive maintenance on motor operated valves, to name but a few.

Mr. Woody -- jumping to accreditation -- also mentioned the accreditation of the maintenance training programs. The initial commitment in December of 1984 was for the accreditation of programs, all training programs at the 60 sites that were currently operating. That equated to 180 programs, maintenance training programs, required for accreditation. We met that commitment. All programs have been accredited for those plants. The other plants that are in the process of either loading fuel or completing construction are also in the process of completing their accreditation

commitment. Slide 4, please.

[Slide.]

I would like to focus my comments on slide 4 and slide 5 with respect to some of the initiatives under way at EPRI. We have discussed in depth some of the initiatives of INPO. I would like to bring in a couple other aspects and elements.

EPRI established the Maintenance Equipment and Application Center in 1984 with the purpose of transferring technology, conducting workshops and seminars, evaluating equipment and demonstrating that equipment as well as direct assistance to utilities. This center is established in conjunction with the Non-Destructive Examination Center at Charlotte, North Carolina. A number of the initiatives that they have undertaken to date have been preventive maintenance models, erosion/corrosion, bolting, diagnostic training for maintenance personnel, work on protective coatings. They have also done work in MSIV mock-ups, robotics, electrical characterization and diagnostic systems. Slide 5, please.

[Slide.]

On slide 5 I note that the EPRI Component Monitoring and Diagnostic Technology Transfer Center, M&DC for short, was established recently, in the middle of 1986 to assist the industry in the development and implementation of practical monitoring and diagnostic technology. We have mentioned

several of those examples today, the vibration analysis performance monitoring, oil analysis thermography, et cetera.

This center is in the process of working with the industry to develop those programs both in safety-related applications and in balance of plant.

The last two items on slide 5 are examples of some of the more issue-specific initiatives the industry has undertaken, the example of motor operated valves and that of check valves wherein we tried to focus the resources of the industry where we can make real and significant improvements.

The initiatives on these charts are really some of the key initiatives underway to improve maintenance. That work is progressing and the results are being achieved.

These initiatives cover both the total maintenance of the plant, both safety related and balance of plant, and form the foundations for proper maintenance.

Please skip to slide 8.

[Slide.]

We have discussed at some length both in this meeting and in other forums overall performance indicators and the use of performance indicators. The industry has put in place the overall performance indicators as managed by INPO with the understanding or with the thought that good results indicate a well-managed plant and a well-managed plant overall is a plant that is more reliable and therefore has a higher margin of

safety.

I noted the Equivalent Availability Factor and the Industry Averages on Equivalent Availability Factor to discuss because these are the same and this is the same as the Equivalent Availability Factor in the INPO trifold that I am aware that you gentlemen have seen. However, this is the only indicator that was not showing improvement of the indicators specified. I think we need to look beyond that to determine whether we are or are not making progress in an issue such as the Equivalent Availability Factor.

[Slide.]

If you'd turn to slide 9, if you'll note that we have the distribution of the Equivalent Availability Factor that indicates where the plants fit within that distribution, numbers of units versus the percent EAF. The 1987 average was 61.8 percent and yet the median is 66.7 percent. If we were able to remove the six plants down at the bottom that were at a very low Equivalent Availability Factor, then we would have raised that industry average up to near 70 percent.

[Slide 10.]

If you turn to slide 10, you will see that we have plotted the median Equivalent Availability Factor for the years 1985, 1986 and 1987. It shows that there is an improving trend in the industry -- that is that the distribution of the Equivalent Availability Factor is moving to the right, as shown

on the previous slide, and that is indicating improvement. We plotted that trend line out to show where it intersects, at the 1990 goal, and we hope that that progress continues. We expect it too.

Also this EAF factor is a strong indicator of not only overall performance but also performance of maintenance. It is difficult to have good availability, good capacity with out doing maintenance properly. Please skip to slide 13 -- excuse me. I apologize. Back to slide 11.

[Slide.]

We have also indicated here the unplanned automatic scrams while critical. This is an issue where we have demonstrated significant progress in reducing unnecessary and unplanned automatic scrams. This is indicative of improvements in maintenance in the overall plant including the POP. This improvement is driven primarily by the reduction of equipment failures. The progress we have seen to date results from that progress. Recently AEOD -- I know AEOD has a draft report in preparation that was provided to the industry for review. This draft report confirms this progress made and the reasons for that progress. Now skip to slide 13, please.

[Slide.]

We also took a look at the unplanned automatic scrams while critical associated with maintenance activities. This is one of the original maintenance performance indicators

developed by the working group under Mr. Woody.

These are automatic scrams that are caused by maintenance activities, where the root cause is maintenance related. We will note on this slide the distribution between 1986 and 1987 wherein the average in 1987 has improved, is 1.4 as compared of an average of 1986 of 2.2. The important thing is really the distribution, the shift in distribution and the improvements indicated.

[Slide.]

MR. COLVIN: The forced outage rate, the median value of forced outage rate in the industry from 1980 through 1987, it is clear that we have not made the progress and improvement in forced outage rate that we would desire. We are working to reduce the forced outage rate at all utilities.

We looked at the distribution on slide 15, we looked at the average, the average forced outage rate as well as the median is driven by a few plants that are in long term shutdown, plants that are up at the upper end of that scale have a very significant impact on median and average values.

[Slide.]

MR. COLVIN: C.O. Woody has already indicated a viewgraph on improvements in SALP ratings. I only show this as the lead-in to slide 17, which is slightly different.

[Slide.]

MR. COLVIN: Slide 17 is a slide demonstrating the

percentage of plants receiving Category 1 and 2 ratings for maintenance SALP's as compared to the percentage receiving Category 3 ratings. I think the important thing to the industry to note is that the SALP 3 trend line has been downward as well as the SALP 2 line while the SALP 1 trend line is upward.

We recognize as pointed out earlier that we are not where we would like to be and there is vast room for improvement. I would note that the data is only from January through March and recognize that we understand the Commission has issued a SALP 3 rating in maintenance to an utility recently. This needs to be updated.

[Slide.]

MR. COLVIN: Slide 18. The industry has had excellent experience in results with other major industry initiatives. These results were recognized by the Commission and the staff as well as by Congress. The bases for these results were the industry initiatives, the time that the industry was given to demonstrate the results, proper oversight by the Nuclear Regulatory Commission.

Our approach to make improvements in maintenance has followed these basic practices. I would like to illustrate that with these slides.

Both maintenance and training were a fundamental INPO cornerstone program from the beginning of INPO, fitness of duty

was started as an evaluation effort in 1982 and with more emphasis beginning in 1985.

Each of the areas has specific evaluation subjects, a specific area for the evaluation and has unique performance objectives and criteria. Industry guidelines were developed in all areas with broad industry input, review and comment.

All utilities are committed to meet the intent of those guidelines. We use industry peer evaluators to assist the INPO evaluation teams in the evaluation and assistance efforts in maintenance and training. It was determined that was not necessary in the area of fitness for duty.

[Slide.]

MR. COLVIN: Slide 19. All utilities are conducting or have conducted a self assessment of their program against the industry guidelines and reported the results to INPO. The "no" in fitness for duty here is not to indicate that we did not conduct a self assessment against the guidelines in fitness for duty, in fact, that was conducted. The results of that self assessment were not reported to INPO.

INPO reviews the self assessment results to determine need for additional assistance to the utility and also for possible generic lessons learned. This is applicable in both maintenance and training.

The INPO evaluation team follows up on utility identified corrective actions in all three areas.

[Slide.]

MR. COLVIN: Slide 20. The INPO assistance teams visit selected utilities. INPO has conducted several hundred assistance visits in a broad range of areas to utilities in the area of maintenance, training and fitness for duty over the past several years.

Training has an accreditation process. It is accredited or certified. Whereas maintenance and fitness for duty are not. There are NRC rules, regulations that are applicable to maintenance and training. We recognize the Commission's intent to proceed to issue rules within the fitness for duty area but they are not currently issued.

NRC inspections are being conducted to assess utility programs in all areas. NRC has overview of the industry initiatives including participation with selected INPO evaluation teams and assistance teams.

[Slide.]

MR. COLVIN: Slide 21. NRC has authority to address plants not performing at desired levels and we believe the NRC is exercising that authority. We have industry initiatives that are achieving results.

[Slide.]

MR. COLVIN: In summary, I'd like to project what the future holds. We believe that through the industry initiatives performance is being improved and will continue to be improved.

This results in a higher margin of safety for our plants, increased capacity factors and reduced costs. We are not where the industry desires to be in maintenance but we are making significant progress.

This is not an overnight achievement. It takes time to implement effective corrective actions. We think that some of the early signs of these will be mixed but we will make improvements. This requires and has an industry-wide commitment and also requires a regulatory commitment, both are essential for the nuclear option.

Thank you.

CHAIRMAN ZECH: Thank you very much.

MR. LEE: Thank you. I hope that gives you a much more complete presentation, understanding of the operation, all four of these gentlemen have been actively involved in the industry initiatives as well as being actively involved in their plant operations on a day to day basis.

Our members, I hope you will get the feeling are strongly motivated to preserve certainly their plant investments through the excellence maintenance program.

We recognize that maintenance is essential for the safety and reliability needed to retain nuclear power as a viable option. I can assure you that we are dedicated to fulfilling that responsibility.

The past six or eight years have been busy times for

the U.S. nuclear industry. We have undertaken several major industry initiatives and we have responded to many new regulations and requirements over this period. These major efforts have had an impact on our operation of our plants and the associated personnel. We have made great strides toward improving the level of safety and the reliability of our plants.

Improvement programs must be given time to show results. This is especially true or it should be allowable when the trends of performance are in the right direction. We recognize that the results have not been uniform. We have said that several times and we agree with you on that point. The industry is now concentrating its efforts in the areas where effort is needed most.

The Japanese experience seems to be one that is pointed to as being very successful. Good maintenance programs are in place there.

During the NRC maintenance workshop in July, Mr. Omato from Tokyo Electric reported that it took them about six years from their lowest level of capacity factor, between 75 and 77, to get to a 70 percent capacity factor in 1982. It took them another three years to get to their present level of 75 percent plus.

We believe that our initiatives have us moving in a similar course. We need stability in the regulatory process.

We need to avoid duplication of effort and we think the combination of the NRC maintenance policy issued earlier this year and the commitment of the industry to the INPO guidelines for the conduct of maintenance along with all the other initiatives that we have talked about today provides the adequate guidance for keeping the industry moving upward on that performance curve.

Because maintenance covers so many facets of a station's operation, it certainly is an area where there is more than one way to reach a common goal. We believe it is wise to allow the utilities to develop implementation plans that fit their location conditions and for the industry to learn from each other as we have done so well in other areas.

To do that, the NRC must set the tone, the desired direction and the objectives or expectations as we used to call them. We think you have done that in the Commission policy statement on maintenance and now we believe that you need to monitor the results in some defined and consistent manner and to focus your attention on the areas where we are not meeting your expectations.

We think that the maintenance inspection programs and some other efforts that you have underway that have been started recently give you that ability and are headed in the proper direction.

You need to set in a sense the climate for

achievement which will encourage the utility management and employees to meet our common objectives.

Senator Breaux's nuclear regulations subcommittee issued a report at the end of last year that accompanied his legislative proposal and the report concluded that policy statements can prove to be an effective means of addressing issues of regulatory concern, especially where there is a high degree of plant specific consideration, or where there is considerable expertise on the particular issue within the regulated community. We think the maintenance area is certainly an area that meets that definition. The subcommittee report cautioned that the policy statement approach is fine as long as sufficient basis exists for taking necessary enforcement action.

They recognize that this approach permits more timely response to the Commission's concern. Although they apparently supported the promulgation of a regulation in the area of maintenance, that support appears to be based on the premise that the rules presently do not exist in the maintenance area that allow or provide adequate enforcement capability. There are several rules. There are many requirements that govern maintenance in the form of technical specifications, in Appendix B, ALARA, NRC generic letters, and other industry individual licensing commitments.

As Joe had indicated, you have taken aggressive

action. There seems to be agreement that writing a rule for maintenance is difficult. A prescriptive rule would take an extremely long time to develop and we believe it would reduce the incentive for the industry to continue its self improvement initiatives. It certainly would have high costs in terms of manpower required to respond before any real results could be seen.

On the other hand, a general rule appears to be no better than the present maintenance policy when that policy is combined with the industry's guidelines, except to possibly cause confusion by providing two interpretations of what is desired.

I would like to conclude by saying that we appreciate the opportunity to appear before you, provide you our perspectives, the status of the industry initiatives which we think are aggressive, broad, all encompassing, and we think are showing significant trends in the right direction.

We ask you to carefully consider, which we know you will, our concerns during your deliberations. Again, as I said before, we will continue to cooperate in any way we can to assist in improving maintenance programs at our plants.

With that, we are concluded. I would be happy to make a few comments about the fraudulent material.

CHAIRMAN ZECH: Please do.

MR. LEE: Again, this is an area where industry has a

large effort underway at the present time and we're working very closely with the NRC staff on trying to first evaluate the scope of the problem and then secondly to try and evaluate the safety significance of any findings that we have.

And our third step will be then to look at the long term program as to how do we avoid getting into these kinds of situations in the future. How can we assure ourselves that the material we are specifying and buying and paying for is the material that we need and want at our plants.

We started our efforts on the pipe flange or the WJM psi effort a month and a half ago or so and we've established a broad extensive industry program to attack that problem. The first thing we did was to develop a testing method for in-on plant, in the plant, on-site, in place and situ testing, so that we got a comparable testing from all plants, so that we had numbers that we felt we could compare and can look at.

We held two major training programs, one on the west coast and one on the east coast, to train our members, people on the testing methodology at those plants. We've run detailed laboratory testing on in-stock program materials that were available.

And we've done some detailed engineering analyses with several consultants to look at the impact, the potential impact of flanges and other material that were supplied by those companies. I would say that the results to date, we've

looked at, and the material, the pipeline is full of information coming in. Over 2,000 field tests and a 130 lab tests, and I think we can say very -- with what we've looked at that the materials are no substandard with the exception of a handful of what appear to be nonconforming blind flanges and even when you do an engineering analysis of those handful of blind flanges, it appears that that material is suitable for the intended service.

We have spent, on this program, in the first five or six weeks, an estimate, from a little survey that we did, of 100 man years of effort in trying to get the information, understand where it is, and try to evaluate it. So it is no small effort on the part of the industry.

In the area of electrical components, we are working again with the NRC, trying to get the scope, understanding of the magnitude of that problem. And really there are three -- I guess three separate areas that are all related to the same problem.

I should say back on the flange area, we think that the safety significance is not there at this point in time. We are worried, of course, about the documentation and that aspect of the program. That is an open issue and one that we'll look at in the long run.

On the electrical component side there really are several areas that we need to look at. One was -- one of the

first ones was the information notice on planned maintenance systems, equipment that was suspect, determined that there might be some problems there, and concluded that it's not a widespread problem.

What we have done is we have set up an advisory committee, ad hoc advisory committee, initially to help us evaluate, scope out the problems here again. These are people who are familiar with the engineering design procurement process.

We have seven major companies that are on that advisory group. They cover all geographic areas of the country so we think we have a fairly good sample of purchase experience. And we can really indicate that only at the present time, this company has only been in service for three years, so that it's not a long history area.

But in looking at that program again we concluded that this is not a widespread generic issue. The lists that were attached to the information notice was really a list of companies that were -- had been contacted or had requested to be on the bidding list, and in some cases may be on the bidding list, but only a few companies actually procured any materials from PMS, and those companies are in the process of evaluating the materials that they bought and the safety significance of that and we will take a broader look at that.

In terms of the second area are the five California

companies and again there we are trying to get feedback from all of the utilities on how many, how much material was purchased from each of them, to determine if it's in safety related areas initially, and again the preliminary assessments there are that very little of the material bought from that company has actually been used in safety related systems.

Many of the purchases, in fact, that again were listed on the inspection report are for non-nuclear plants. The fossil plants at these companies, and in several cases, for other purposes. We are also working on the list of 50 plus companies that were alleged to be doing the same thing as the California companies.

What we have done there is to ask again those seven companies to send to us their Q lists, their bidders list, of the companies that they purchase safety related electrical equipment because we were not -- we were trying to maintain that list confidentially at this point in time.

We've evaluated those lists and to date there is only one of those companies that is on any of the bidders lists of our seven companies and it does not appear that that was safety related equipment that was purchased or it was used in safety related work at this point in time.

I think that our overall program that we're going to be getting into is to establish the NUMARC Board -- at our Board meeting on June 30th, approved the establishment of a

working group and Bill Cavanaugh, the President of Surrey, has agreed to Chair that group. We will be getting that group together at the end of the month.

We need to get more complete understanding of the scope of the problem. We are filling out that working group at the present time and as I said earlier, our objective is really to review our existing programs and find out where the failings are in those programs, if any. To determine where we can improve them in the future, again, as I said, to assure ourselves that we get the quality materials that we've asked for and paid for.

CHAIRMAN ZECH: Thank you very much. As you know, the NRC is actively pursuing that fraudulent problem, too. We have a series of bulletins and an information notice that we put out. We're working on taking other actions at the present time. We appreciate very much what NUMARC is doing, has a leadership role in this area.

We certainly don't want any defective material in our plants. You don't want that and we don't want it. We won't stand for it as far as our regulations are concerned, as you well know. But we do appreciate the effort that is going on.

We have investigations going on as well as our own staff reviews, as you know, and we encourage you to continue that aggressive action in that regard.

MR. McNEILL: Mr. Chairman, if I might make a

comment. From a utility executive standpoint, I believe that it would be very worthwhile for you to understand that I believe that there's a strong consensus among the utilities that this approach of working through NUMARC to resolve these issues has been very successful from our standpoint.

It has provided a unique way to interpret the desires of the NRC in a common manner so that they're not being done individually by utility. It has saved us a great deal of effort and it provides a database from which broad interpretations can be drawn from the commonality of approach that is employed across the board. And I would encourage both NUMARC as an organization representing the utilities and the NRC in future cases like this to continue that type of working relationship because I believe it does help the individual utilities in filling the role that many of us have envisioned for NUMARC in its formation, since its formation.

CHAIRMAN ZECH: Well, we appreciate that very much. Since you made that comment, of course, our effort is not only to inform NUMARC, but in NUMARC's role to get the word out to the utilities so that they can be aware of the problem as well as NRC getting the word out.

And what you're saying I guess I guess is that you believe that not only putting out our notices and bulletins and our regulatory -- taking those regulatory actions, that working through NUMARC, as far as you're concerned, is effective and it

is perhaps getting to the heart of the problem which is protecting public health and safety which is our responsibility as well as yours.

You're telling us that that is working reasonably well. Is that what you're saying?

MR. McNEILL: It's a very efficient and effective way both to meet that objective on the part of the individual utilities.

CHAIRMAN ZECH: Thank you very much. Appreciate that. Let's have comments from my fellow Commissioners.

COMMISSIONER CARR: I have a couple of questions for Jack Brons. On your surveillances that you cited were really a waste of time to keep doing them, have you requested that we just knock them off?

MR. BRONS: Yes, sir. We have taken up some individual ones and one that comes to mind is the turban stop valve testing, resurgence were in steam generators with phosphate control which we never had, and we found that the effort to extend the interval on doing that testing, not to delete it, was extraordinary. We worked on that for a couple of years. My most honest and direct answer to you is that those few cases that we have tried to change that interval has proved to be a very difficult experience.

COMMISSIONER CARR: Well, let me encourage you to keep trying because I think we ought to quit doing things we

shouldn't be doing if they're not producing any value and I think that's generally the feeling of the Commission and the staff. I don't think anybody wants to -- if we have the documentation and support that it's unnecessary, we shouldn't be doing it.

MR. McNEILL: I think the tech spec improvement program certainly has a high degree of focus on allowing more flexibility or at least --

COMMISSIONER CARR: If you can get it finished.

MR. McNEILL: Yes, sir.

COMMISSIONER CARR: Talk to me a little bit more about RF monitoring. I don't understand the procedure.

MR. BRONS: Rotating electrical equipment produces a radio frequency signature and the variations in that signature, indifferent, just like an audio signal, in various frequency bands can be indicative of corona occurrences or ground leakage.

COMMISSIONER CARR: Is that a continuous monitoring or is that just --

MR. BRONS: No. It's a -- on the main generator, it's a continuous monitor logged on a recorder and reviewed in time against generator loading and so on. On the reactor coolant pumps, we must make a periodic containment entry and go in and assess it.

COMMISSIONER CARR: Okay. The other question I got

is on your one inch of documentation on MOV's. Is that both balance of plant and safety related?

MR. BRONS: It's -- we only maintain that level of documentation on the safety related ones. We prepare a -- for ones that are kept for our own records, we keep a record which is substantially less. We use the same procedures. It would be very similar --

COMMISSIONER CARR: One standard of maintenance, two standards of documentation.

MR. BRONS: Yes, sir.

COMMISSIONER CARR: Okay. That's all I got.

CHAIRMAN ZECH: Thank you. Mr. Roberts?

COMMISSIONER ROBERTS: I have a quick question. When we were briefed about the staff -- here's a staff requirement, staff is to obtain industry's commitment for early transmittal of its proposed standard technical specification. When is that going to happen?

MR. BRONS: Tom Tipton from NUMARC --

CHAIRMAN ZECH: Would you identify yourself for the Reporter, please?

MR. TIPTON: Tom Tipton of NUMARC. That's April 1st, 1989, all four topicals from all four owners groups.

COMMISSIONER ROBERTS: Thank you.

MR. LEE: There are several steps in between that.

COMMISSIONER ROBERTS: I understand.

CHAIRMAN ZECH: Thank you very much. Commissioner Rogers?

COMMISSIONER ROGERS: Yes. I guess Mr. Woody first talked about performance indicators and listed the various ones that NUMARC has established to look at maintenance. Have -- there's always the question that comes up of to what extent is a performance indicator a retrospective look that doesn't tell you very much about the future and to what extent does it predict the future?

And have you done anything to look at performance indicators and any of those performance indicators and compared them with significant events attributed to maintenance at any plants in the past? In other words, you've got the information now, can you look back and see whether any of those performance indicators, when applied to significant events that are attributable to maintenance at any of the plants, would have predicted a problem or whether they would just have simply not shown anything.

My understanding is that it is very difficult to get a performance indicator on maintenance that's predictive and I think it's worth looking to see to what extent any of these things tell us about what we can expect in the future rather than what was good about the past. It's really very important for us to know about.

MR. WOODY: An overall validation of the nine

maintenance indicators that are being tracked has not been done on an industry-wide basis and as you point out, the proper use of indicators is a very complex issue, the hierarchy of indicators and the analysis, the cause and effect, if you will -- in our own utility we are pursuing that vigorously and we have cases where taking process and control charts, they do produce predictable things that you can act on but generally the indicators that we have shown you here today are what I would call out-put indicators and they're really recording facts and do not give you much opportunity to take early actions.

They're not leading edge or predictive indicators -- the management aspect of the tool. For example, if a plant sees its position on occupational exposure or industrial accident rate being outside of the median and let me give you a point in case with one of the industry indicators being fuel performance.

In my own case I found upon looking at the industry data that my target for 1988 was no better than the industry was already achieving. So it certainly gave me reason to rethink whether or not my target was aggressive enough. There was a better way. So for that purpose, they do work in order to help utilities set higher goals and achieve targets where they might not be performing to the level that we now can perform to.

MR. LEE: I might add, Commissioner Rogers, I think in trying to look at broad, general indicators for the future is very difficult in any field whether it's business, the stock market or what have you. I think some of the methods and approaches that Jack Brons was talking about are in a sense predictive. I would say the vibration analysis, the radio frequency -- those kinds of things are certainly predictive of events to come.

COMMISSIONER ROGERS: Yes, right, but you know, if you're trying to look at a -- they're not performance indicators. They really are --

MR. LEE: No, that's right -- broad performance indicators -- very difficult to predict for the future.

COMMISSIONER ROGERS: And one of the problems we have in this whole business is in fact implementing the good advice which you quoted at the end of your remarks. How do you know when somebody has in fact done what you've asked them to do? What are the measures? Even if you don't tell them how to do it, what are the measures that in fact something has happened and been achieved that you want to achieve.

In this particular arena, we're talking about an effective program that prevents something from happening and what are the measures that would give us some assurance that in fact a good maintenance program has created a situation that we feel safe about.

I don't expect you to give me an answer because I think this is something we're all quite concerned about but I would simply say that you can't just give a general statement about it's nice to now have a proscriptive approach but we need some measures of performance or achievement in this area and they are hard to come by and I think we should all recognize that that's an important element in regulation, some kind of a measure of success and when we talk about maintenance, it's a particularly thorny area to get into.

MR. BRONS: Yes, sir, Commissioner Rogers. The indicators that I talked about as process indicators are in fact useful to an individual utility or to an individual plant on a trended basis. The difficulty that we have and that I -- certainly is one that I was trying to express is that comparing plant to plant on those indicators is not necessarily helpful.

COMMISSIONER ROGERS: Yes, right.

MR. WOODY: Let me suggest one other comment. The nine quality indicators that the industry is using that have been briefly expressed today are a general overall indication of improved performance. Then, within that -- when you break it down and stratify, if you find a plant for example in trouble with forced outage rate, you then need to go ask why a lot of times to find out, is it a short-term thing? What is the real cause to correct that and that is the proper use of indicators in our view.

COMMISSIONER ROGERS: Well, it is a difficult problem but I think that the whole purpose of maintenance is to prevent something from happening and we want to have some way of feeling comfortable about that short of from my point of view anyway, short of a very proscriptive approach and procedural approach. There's the dilemma. How do you do that? How do you measure it?

Mr. Colvin, you showed us some graphs but you skipped over a couple in the packet that I think were quite interesting and the Equivalent Availability Factor, three-year distribution and the unplanned automatic SCRAMS while critical one-year distribution. Now they're not quite from the same period but presumably they're roughly the same collection of plants. One is 76 units. The other is 86 units. I notice that in the Equivalent Availability Factor, there is a superior group up there between the 80 and 90 percent availability. Twelve plants are up there.

If I look at the unplanned automatic SCRAMS while critical, I see that there's a number eleven down there around zero. Are they the same plants?

MR. COLVIN: In some cases, Mr. Commissioner, in some cases in fact they are the same plants but in a number of cases they are not. To have zero SCRAMS in a unit per year is very difficult task to achieve and so the fact that you have one scram or two SCRAMS in a year does not necessarily mean that

you have an unacceptable program or poor performance overall.

INPO does look at the distribution and as was pointed out by Mr. Woody, each year the reports are issued to the individual utility with not only the distribution on an industry-wide basis but the distribution of where that particular plant sits on there and can be used in that process to determine --

COMMISSIONER ROGERS: All I'm saying is that if they are more or less the same set of plants that are in both categories, they're telling you that there's a good place to look for practices that really produce results. Whether that's sustained over a longer period of time than one or three years is another question, of course.

MR. COLVIN: Mr. Commissioner, I was going to make one other comment on performance indicators. I think you're aware that INPO began that process in 1982, late 1982, to look at how do we measure overall industry performance and that was the idea or thought that was the genesis of the development of those indicators and that process came to fruition in 1984 with the development of the overall industry goals for 1990 by about the 1986 time frame.

With the efforts by the international community to establish the World Association of Nuclear Operators that -- and that initiative as well as for consistency of data between the International Atomic Energy Agency and the U.S. nuclear

industry, there's an effort currently underway by INPO to look and review performance -- look at performance indicators, to review those and to determine what performance indicators should be established for 1990 and beyond and how should those goals be applied and that's an initiative I'm sure that INPO taking the lead for the industry will brief the Commission on at some future date.

COMMISSIONER ROGERS: Just one more point, Mr. Colvin. You also gave us a list of what were cornerstone activities of INPO in the beginning and so on and so forth and what is accredited and certified and what is not and I wonder if you could comment on the possibility or the concept of accrediting and certifying a maintenance program?

MR. COLVIN: Yes, sir. I'd be pleased to comment on that. I think that to this date, we've taken the approach that there are several reasons for accrediting a training program that were different from a maintenance program. I think that the basic approach that we've utilized in all the initiatives, the improvement in training and I think the improvement we're achieving in maintenance really results from the process that we take in getting to the point and making these -- undertaking these initiatives.

If you go through the process that I outlined that is, we've established the industry guidelines, the standards for that particular program, the bases for that program, the

conduct of a self-assessment, the reports to INPO, the follow-up on that corrective action, the INPO look at that, that's the process by which I'm talking about. The final accreditation of the training programs by an accrediting board is quite different but the real improvement is achieved by going through that process.

In addition, training itself is fairly standard whether it be training -- the approach to training either from a university or training in a utility program for mechanical, electrical, I&C or whether it be for reactor operators. The process through which we put training is -- lends itself to an accreditation of the process and of the program.

To date we have not reviewed in detail whether we should consider an accreditation or certification of maintenance program. I believe that is certainly something that we would undertake to review.

COMMISSIONER ROGERS: Well, certainly you're setting up centers to study maintenance and to produce maintenance manuals on various topics and in fact, maintenance training programs that look very good.

I've visited the center in Charlotte and was quite impressed with the quality of what they were doing and it didn't seem to me that the approach that was being taken there was very different from the kinds of training programs that we're conducting or that are being conducted in other areas and

I would think that that's an approach that's probably worthy of some real study, the notion of accrediting -- certainly accrediting maintenance training programs if not all maintenance programs.

COMMISSIONER CARR: This obviously doesn't need to be said, but I'll say it anyway. The performance indicator program is databased and therefore, it's got to be on past performance, otherwise you don't have any data. So, trying to use it to predict, as has been said, it's only a tool to tell you, you ought to go look at something that doesn't look right.

That's where you're going to improve future performance, is by getting that tipoff early enough that you lead the problem rather than lag it.

CHAIRMAN ZECH: Let me just make a couple comments. First of all, Mr. Rogers has already talked a little bit about your comment about naval officers could tell what you want done, not how to do it. We all think that's a pretty good principle in general. There's also another saying that I recall, not the exact words, but it says, if you don't get results, do something.

If we're not satisfied with the results here and we don't think it's happening, we're going to do something -- not all bad either in my view. What we want to do is to do what's right -- do the right thing. I think that is important to keep that in mind. We recognize, certainly I do, that improvements

have been made in the maintenance program in the utilities since I've been on the Commission.

I remember talking about it in a meeting in, I think, 1984, and C.O. Woody was here and I must say, I'm more encouraged by the presentation I heard today than I was in 1984. We have indeed made progress. I'll tell you, in my view, the progress is across the table. I do think that the utilities have now recognized that maintenance is something that you've got to get serious about.

I didn't have that impression in 1984. I did not, but I do today. I do recognize that you are doing something about and perhaps you are doing something about it. That is important. At least that's my impression today and I think it's encouraging.

A word on surveillance -- I agree that if we're doing something wrong in surveillance. If we're requiring too many surveillances, we want to know about it. Don't give up. Commissioner Carr has picked up on that and I agree with that. That's your responsibility though. Don't just complain about it. Make sure you get our attention.

Another thing I said before too; I think we did too much surveillance and testing at power. I know the staff is looking at this. You can contribute to that effort too. If you believe that we are; I certainly do. That's one of things that impressed me when I first starting looking at these

commercial power plants -- all the people fidgeting things and testing and surveillance and it's all perhaps very important to do, but we do an awful lot at power and we give ourselves problems because of personnel errors.

It is being looked at. I challenge the utilities to continue to look at that very program. It's in your best interest, I think, to stop those inadvertant scrams and actuations as we've discussed here briefly today. If you see improvements that can be done by reducing some of the surveillance and testing that's done, especially at power, I think that's your obligation to bring that forward. I'm glad at least that we mentioned very briefly today, chemistry, because I think personally that chemistry is also a part of maintenance and it can be indicative of maintenance.

It was at least mentioned and I hope that you'll continue to think about that part of it. Balance-of-plant was mentioned too. I think there's a growing recognition on the part of perhaps the Commission as well as the utilities that balance-of-plant does, indeed, play a key role in safety of operations. I'm pleased that at least that was mentioned today and I think that's important to keep in mind as we think about maintenance. Maintenance cuts across the whole line of all of your entire plant.

Performance indicators for maintenance; I won't go into that. We've talked about it enough. I guess the only

thing I would say is, that when INPO was here not long ago and talked to the Commission, it was at least my impression that they were a little bit discouraged about trying to come up with any kind of performance indicators for maintenance. I must say from what I've heard today, I'm encouraged by the fact that you are at least working on a number of different types of performance indicators for maintenance.

I recognize that it's complicated. It's a very complex issue. We're talking about corrective maintenance, predictive maintenance, preventive maintenance and it can be a rather difficult subject to sort out to try to get some kind of performance indicator for. It's worth doing. It's important, I think. I'm pleased to see that you're still working on trying to come up with some meaningful performance indicators for maintenance.

Maintenance does, indeed, play an important role in safety of operations. I think Corbin McNeill said that maintenance is the cornerstone of safety. I think that's what you said. I agree with that; it is. Maintenance truly is. It's the cornerstone of safety from our standpoint, from the regulatory safety standpoint.

At least in my experience in looking at your plants, it seems to me that if you're paying attention to maintenance, you are operating your plant better. You're not actuating the safety systems when they shouldn't be actuated. You're not

having inadvertent scrams and you are not putting challenges to your people either that you shouldn't be doing.

Maintenance plays an important role in our part of regulatory safety. In my judgment, it also plays an important role in your part of the safety of operations of your plant. Maintenance can reflect and certainly is in my judgment, a key factor in a well operated plants.

Your better operating plants in my view, usually do have good maintenance programs. Those plants that seem to have problems and don't operate as well as others; if you look at their maintenance, it might show you a parallel. At least that's my judgement. It may not fit together every time, but maintenance does has a relationship in my judgment, to good operation.

Let me just conclude by saying that we recognize that there have been improvements in the past few years in all the measures that you can show and look at and indicate in nuclear power plant operations. The scrams have gone down; the actuations have gone down. Personnel exposures have gone down. Generated rad waste has gone down. Maintenance is being attended to and improved. Even availability, as you pointed out today, Mr. Colvin, does show that it's improving, although a little slower than some of the other indicators.

In general, the indicators are all in the right direction. That's encouraging, but in my view, there's still

room for improvement. Although there is overall improvement, there is room for more improvement. I think the encouraging part is to see that it is coming.

As far as maintenance is concerned, we appreciate very much your views on maintenance. We have heard from our staff, your presentations to them too. We believe that maintenance, again, is such an important area that we do want to see results. We want to see a program that impacts on improved safety of operations. It's been slow in coming, in my judgement -- very slow.

It's not just the past few years we're talking about; this program has been in effect for 30 years or so, you know. Apparently, even though we're late in the day now, we are focusing on maintenance. Whether we go to rule or not, the inclination here is that we will. Whether that's done or not, has not been decided yet. I am encouraged by what I've heard today and I'm encouraged by your committment to maintenance.

It's not only important to safety, by in my judgment, it's truly in your best interests for operations of your utilities. It just makes good common sense, as well as important to safety.

We thank you very much for an excellent presentation. If there are no other comments from my fellow Commissioners, we stand adjourned. Thank you very much.

[Whereupon, at 3:55, the meeting of the Commission

was adjourned.]

CERTIFICATE OF TRANSCRIBER

This is to certify that the attached events of a meeting of the U.S. Nuclear Regulatory Commission entitled:

TITLE OF MEETING: ANNUAL BRIEFING BY NUMARC ON PLANT MAINTENANCE

PLACE OF MEETING: Washington, D.C.

DATE OF MEETING: WEDNESDAY, AUGUST 3, 1988

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.

Suzanne Young

Ann Riley & Associates, Ltd.

C. O. WOODY

FLORIDA POWER & LIGHT CO.

NRC COMMISSION BRIEFING

ON MAINTENANCE

FOUR MAIN OBJECTIVES OF NUMARC WORKING GROUP 4 ON MAINTENANCE

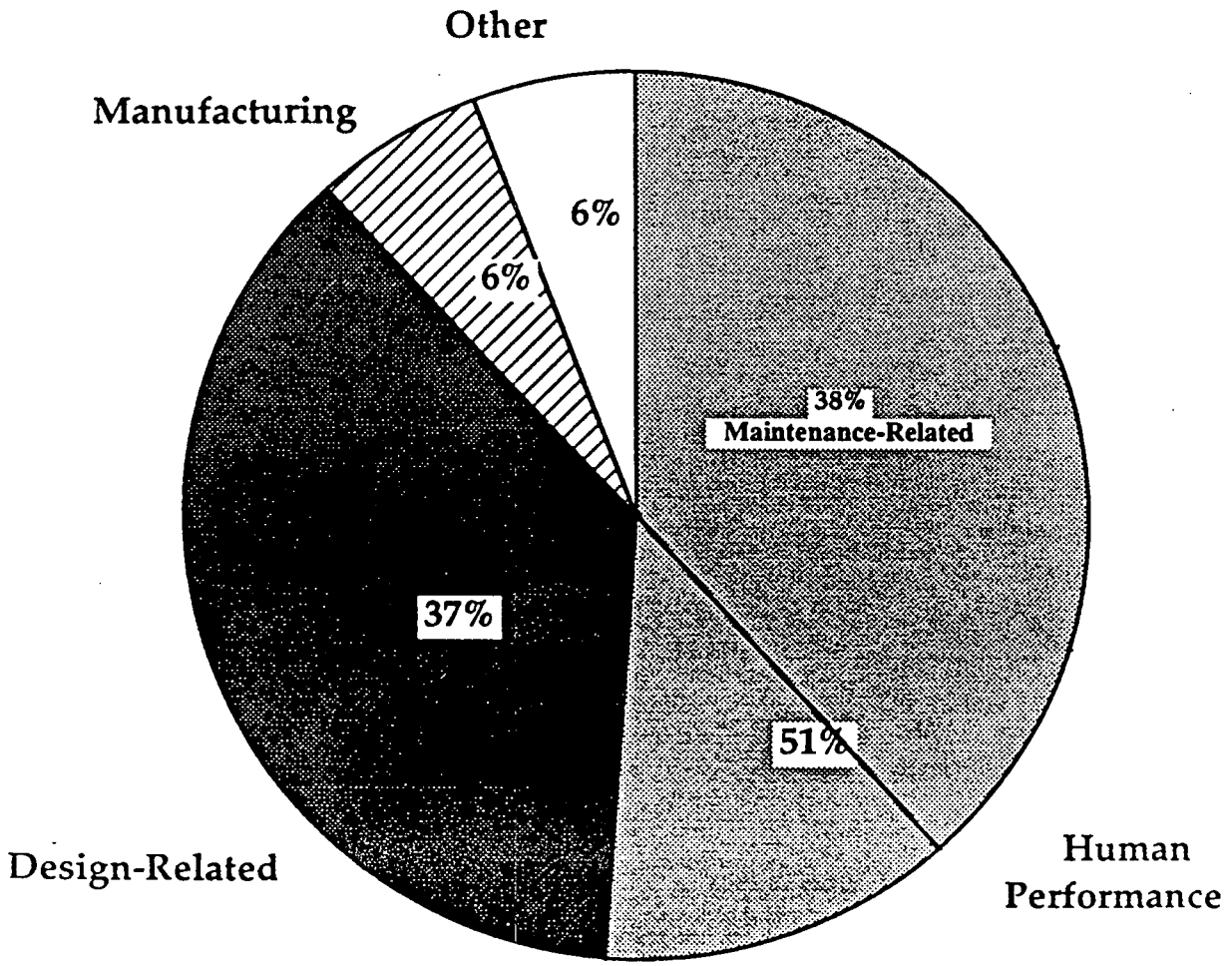
1. TO ASSIST INDUSTRY IN UNDERSTANDING THE BROAD MAINTENANCE ISSUES

2. TO FOCUS INDUSTRY INITIATIVES ON IMPROVEMENTS

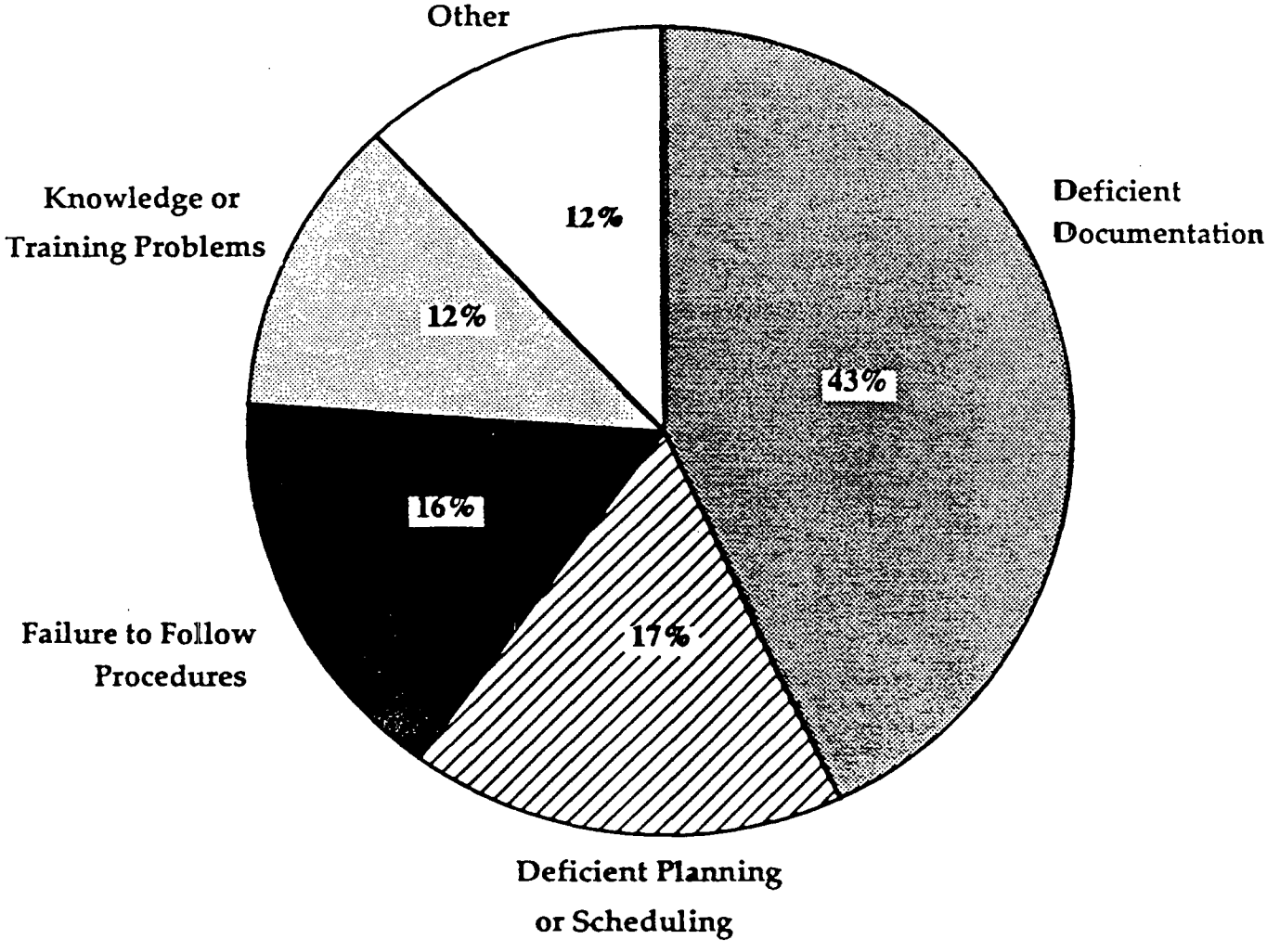
3. TO INTERACT WITH THE NRC, PARTICULARLY ON DEVELOPMENT OF THE MAINTENANCE AND SURVEILLANCE PLAN PROGRAM (MSPP)

4. AND TO SERVE AS THE INDUSTRY POINT OF CONTACT FOR GROUPS SUCH AS STANDARDS COMMITTEES, EPRI, INPO AND NRC.

Distribution of Event Root Causes by Cause Category



Distribution of Maintenance-Related Problems by Human Performance Category



GUIDELINES FOR THE CONDUCT OF MAINTENANCE AT NUCLEAR POWER STATIONS

INPO - 85-038

X. MATERIAL RECEIPT, INSPECTION, HANDLING, STORAGE, RETRIEVAL, AND ISSUANCE

XI. CONTROL AND CALIBRATION OF MEASURING TEST EQUIPMENT

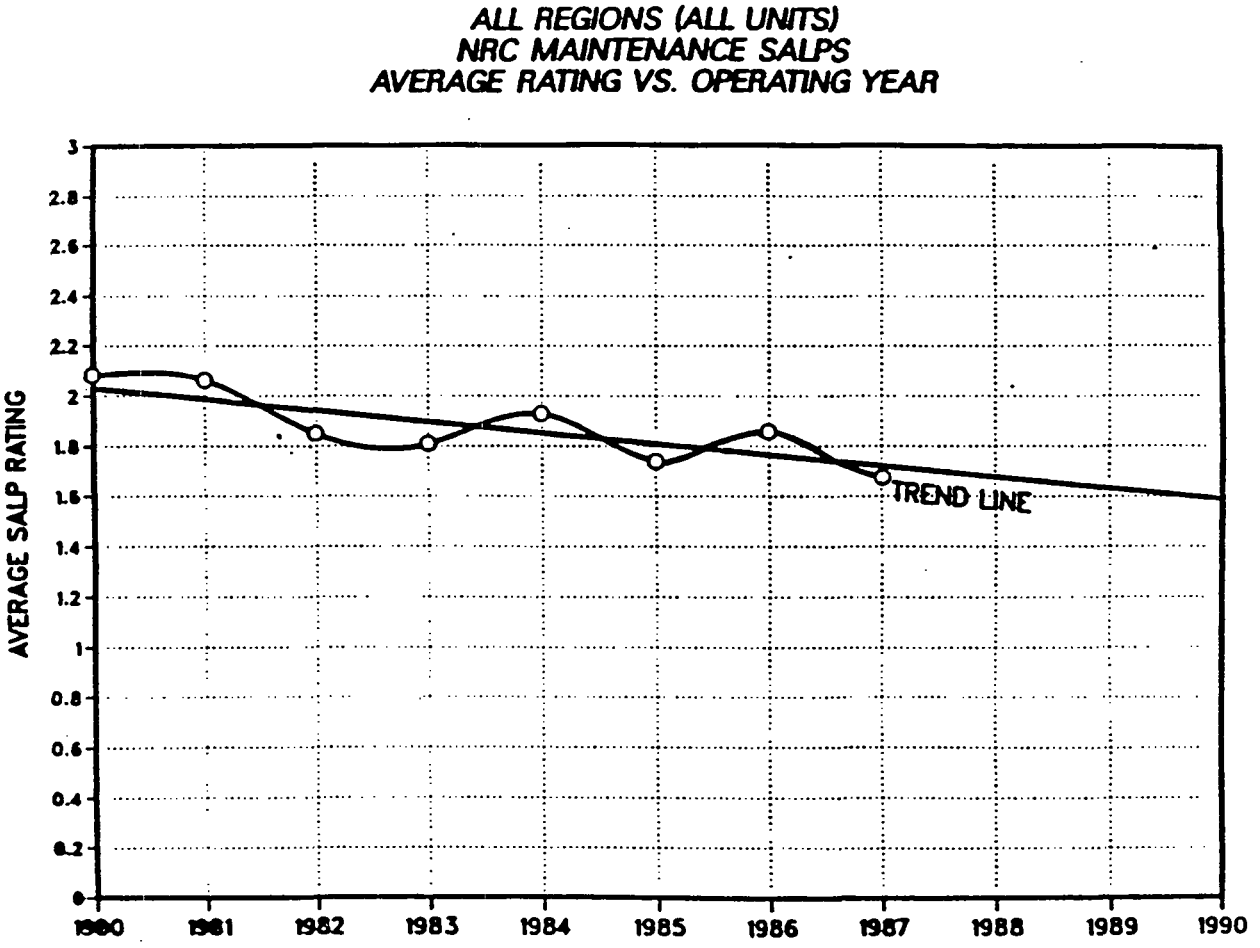
XII. MAINTENANCE TOOLS AND EQUIPMENT CONTROL

XIII. STATION MATERIAL CONDITION INSPECTION

XIV. MANAGEMENT INVOLVEMENT

XV. MAINTENANCE HISTORY

XVI. ANALYSIS OF MAINTENANCE PROBLEMS


ALL REGIONS (ALL UNITS)
NRC MAINTENANCE SALPS
AVERAGE RATING VS. OPERATING YEAR
AVERAGE SALP RATING
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
TREND LINE

INDUSTRY-WIDE NUCLEAR POWER PLANT MAINTENANCE PERFORMANCE INDICATORS

- CORRECTIVE MAINTENANCE BACKLOG GREATER THAN 3 MONTHS OLD
- RATIO OF HIGHEST PRIORITY MWRs TO TOTAL MWRs COMPLETED
- PREVENTIVE MAINTENANCE ITEMS OVERDUE
- RATIO OF PREVENTIVE TO TOTAL MAINTENANCE
- MAINTENANCE OVERTIME WORKED
- MAINTENANCE RADIATION EXPOSURE (BWR)
- MAINTENANCE RADIATION EXPOSURE (PWR)
- LOST-TIME ACCIDENT RATE FOR PERSONNEL INVOLVED IN MAINTENANCE
- UNPLANNED AUTO. SCRAMS WHILE CRITICAL ASSOC. WITH MAINTENANCE ACTIVITIES

NUCLEAR MAINTENANCE ASSISTANCE CENTER
NMAC

OBJECTIVE -

- TO ASSIST UTILITIES IN IMPROVING THE MAINTENANCE ACTIVITIES ALREADY IN PLACE AT NUCLEAR POWER PLANTS

DEVELOPMENT STRATEGY -

- EPRI PLAYING DOMINANT ROLE IN ESTABLISHMENT THROUGH FUNDING AND MANAGEMENT
- NMAC TO BE A SELF SUFFICIENT ORGANIZATION BY 1991 THROUGH DIRECT UTILITY SUPPORT

NUCLEAR MAINTENANCE ASSISTANCE CENTER
NMAC (CONT'D.)

ACTIVITIES -

- O INDUSTRY INITIATIVE TO IMPROVE MOTOR-OPERATED VALVE (MOV) PERFORMANCE AND RELIABILITY BY DEVELOPING A TECHNICAL REPAIR STANDARD
- O PLANNED DEVELOPMENT OF A MOV APPLICATION/DESIGN REVIEW GUIDE TO AID TECHNICIANS AND ENGINEERS IN MOV SPECIFICATIONS, INITIAL SETUP AND TESTING

BENEFITS OF INPO MAINTENANCE PEER EVALUATION PROGRAM

- IMPROVEMENT EVALUATION TEAM CAPABILITY BY THE ADDITION OF EXPERIENCED PEOPLE FROM SIMILAR PLANTS
- ENHANCED PROFESSIONALISM AND COMMUNICATION WITHIN THE NUCLEAR INDUSTRY MAINTENANCE COMMUNITY
- A LEARNING OPPORTUNITY FOR PEERS BY OBSERVING MAINTENANCE ACTIVITIES AT ANOTHER UTILITY
- ADDITIONAL SKILLS THAT THE PEER EVALUATOR CAN USE TO IMPROVE MAINTENANCE AT HIS OWN PLANT, AND
- FAMILIARIZATION OF THE PEER EVALUATOR WITH INPO AND ITS PROGRAMS

SUMMARY OF INDUSTRY INITIATIVES SUPPORTED BY THE NUMARC WORKING GROUP ON MAINTENANCE

- INDUSTRY-WIDE PERFORMANCE INDICATORS
- INPO "GUIDELINES FOR THE CONDUCT OF MAINTENANCE AT NUCLEAR POWER STATIONS" 85-038
- MAINTENANCE SELF-ASSESSMENT INITIATIVE
- INPO MAINTENANCE PEER EVALUATION PROGRAM
- NUCLEAR MAINTENANCE ASSISTANCE CENTER (NMAC)
- REVIEW OF NRC SALP DATA FOR TRENDING MAINTENANCE
- INTERACTION WITH THE NRC ON MAINTENANCE ISSUES

PREDICTIVE MAINTENANCE TECHNIQUES

- VIBRATION MONITORING/ANALYSIS
- LUBRICATING OIL ANALYSIS AND MONITORING
- CONDENSER AIR IN-LEAKAGE MONITORING
- ELECTRICAL INSULATION CHECKS
- HEAT EXCHANGER AND EQUIPMENT PERFORMANCE MONITORING
- INFRARED DETECTION
- MOTOR-OPERATED VALVE DYNAMIC TESTING

JACK BRONS

NEW YORK POWER AUTHORITY

MAINTENANCE ISSUES BRIEFING

INDIAN POINT THREE
965 MWE PWR

JAMES A. FITZPATRICK
810 MWE BWR

PERFORMANCE AND PROCESS INDICATORS

AVAILABILITY

- PLANNED AND FORCED OUTAGE TIME
- PLANNED AND FORCED DERATE TIME
- FORCED LCO'S

THERMAL PERFORMANCE BTU/KWH

- PLANT-SPECIFIC NUMBERS

UNPLANNED AUTOMATIC SCRAMS

- KEYED TO INDUSTRY BEST QUARTILE PERFORMANCE

CHEMISTRY PERFORMANCE

- LESS THAN PLANT-SPECIFIC OWNERS GROUP GUIDELINES

PERFORMANCE AND PROCESS INDICATORS (CON'T.)

RADIOLOGICAL PERFORMANCE

- DECONTAMINATED AREA
- RADWASTE GENERATED/SHIPPED
- ENVIRONMENTAL RELEASES
- MAN REM

EQUIPMENT OPERABILITY

- CONTROL ROOM ANNUNCIATORS
- CONTROL ROOM INSTRUMENTS

MAINTENANCE DEPARTMENT PERFORMANCE

- WORK REQUESTS OUTSTANDING BY PRIORITY AND TIME
- RATIO OF PREVENTIVE TO CORRECTIVE MAINTENANCE
- WAREHOUSE STOCK PM PROGRAMS

PERFORMANCE AND PROCESS INDICATORS(CON'T.)

- VENDOR MANUAL UPDATE PROGRAM PROGRESS
- PM ITEMS OVERDUE
- MAINTENANCE OVERTIME WORKED

ENGINEERING PERFORMANCE

- BACKLOG OF ENGINEERING REQUESTS
- NUMBER OF FIELD ISSUED ENGINEERING CHANGES
- NUMBER OF DATED TEMPORARY MODIFICATIONS
- IMPLEMENTATION OF PREDICTIVE MAINTENANCE PROGRAMS

SCOPE OF MAINTENANCE

	IP3	JAF
1987 PREVENTIVE MAINTENANCE WORK REQUESTS		
o MAINTENANCE DEPARTMENT	940	713
o I&C DEPARTMENT	1634	1124
1987 CORRECTIVE MAINTENANCE WORK REQUESTS		
o MAINTENANCE DEPARTMENT	791	349
o I&C DEPARTMENT	1296	1002
1987 SURVEILLANCE TESTS	2175	1905

SCOPE OF MAINTENANCE

- PREVENTIVE MAINTENANCE

  15 MANHOURS/WORK REQUEST

- CORRECTIVE MAINTENANCE

MAINTENANCE DEPARTMENT	60 MANHOURS/WORK REQUEST
I&C DEPARTMENT	17 MANHOURS/WORK REQUEST

- SURVEILLANCE TEST

  8 MANHOURS/SURVEILLANCE TEST

1P3 MAINTENANCE DEPARTMENT

1977		1988	
1	SUPERINTENDENT	1	SUPERINTENDENT
1	ASSIST SUPER.	1	MAINTENANCE GENERAL SUPERVISOR
1	MAINTENANCE ENG.	9	ENGINEERS
		2	PLANNERS
1	PLANT FOREMAN	1	PLANT FOREMAN
4	FIRST LINE MAINT. FOREMEN	6	MAINTENANCE SUPERVISORS
24	MECHANICS	50	MECHANICS
6	PUW'S	12	PUW'S
1	CLERK	2	CLERKS
39	TOTAL STAFF	85	TOTAL STAFF

NOTES:

A. THE MAINTENANCE DEPARTMENT DOES NOT INCLUDE ANY I&C, DESIGN ENGINEERING OR PROCUREMENT FUNCTIONS. ALL OF THESE MAINTENANCE ACTIVITIES HAVE UNDERGONE SIMILAR GROWTH.

B. "MECHANICS" INCLUDE ELECTRICIANS, WELDERS, MACHINISTS, ETC.

C. "PUW" IS A UTILITY WORKER EMBRACING APPRENTICE MAINTENANCE TASKS AND JANITORIAL DUTIES.

D. IN 1977, THIS GROUP WAS RESPONSIBLE FOR RADWASTE COMPACTION AND HANDLING. RADWASTE RESPONSIBILITIES ARE NOW IN A DIFFERENT DEPARTMENT.

MAINTENANCE PROGRAM ASSESSMENT - NYPA

1983 EFFORTS BEGAN TO ASSESS MAINTENANCE PROGRAMS

- BALANCE OF PLANT ACTIVITIES
- PREVENTIVE MAINTENANCE

1984 (APRIL) PLANNED MAINTENANCE TASK FORCE FORMED

1984 (NOVEMBER) PLANNED MAINTENANCE TASK FORCE REPORT ISSUED

- CLASSIFICATION OF MAINTENANCE
- ATTRIBUTES OF MAINTENANCE PROGRAMS
- SUPPORT REQUIREMENTS
- MAINTENANCE POLICY

CLASSIFICATION OF MAINTENANCE ACTIVITIES

- FORCED CORRECTIVE
- GENERAL REPAIR
- PLANNED
  - PREVENTIVE
  - PREDICTIVE
  - CORRECTIVE

1985	IMPLEMENTATION OF PLANNED MAINTENANCE PROGRAMS BEGAN
1985 (OCTOBER)	INPO GUIDELINES ISSUES
1986 (JANUARY)	ASSESSMENT OF PLANNED MAINTENANCE PROGRAMS
1986 (APRIL)	NYPA NUCLEAR MAINTENANCE COMMITTEE FORMED
1987 (MAY)	INPO SPONSORED INDUSTRY SELF-ASSESSMENT
1987 (DECEMBER)	ASSESSMENT OF PLANNED MAINTENANCE PROGRAMS

ROUTINE PREDICTIVE/PREVENTIVE MAINTENANCE TECHNIQUES

- VIBRATION ANALYSIS
  - BASELINE AND TROUBLESHOOTING
- OIL ANALYSES
  - TRANSFORMERS AND ROTATING EQUIPMENT
- RF MONITORING
  - MAIN GENERATOR
  - REACTOR COOLANT PUMPS
- ACOUSTIC MONITORING

ROUTINE PREDICTIVE/PREVENTIVE MAINTENANCE TECHNIQUES (CON'T.)

- INFRA RED THERMOGRAPHY
  - SWITCH YARD AND TRANSFORMERS
  - STEAM TRAPS
- HELIUM LEAK TESTING
  - CONDENSERS AND STEAM GENERATORS
  - ATTEMPTED USE OF SF 6
- MOVATS
- LIVE LOAD PACKING

NYPA UNIQUE MAINTENANCE INITIATIVES

- WORK CONTROL CENTER
  - FOLLOWS INPO REPORT ON VISIT TO EUROPEAN UTILITIES
- VIDEO MAPPING
  - ALARA PLANNING
  - DESIGN ENGINEERING APPLICATIONS
  - EMERGENCY PLAN APPLICATION
- DEVELOPMENT OF RHSI - PATENT APPLICATION
- POST-ACCIDENT SAMPLE SYSTEM - PATENTED

NYPA UNIQUE MAINTENANCE INITIATIVES (CON'T.)

- LABOR BROKER CONCEPT
  - HAS EVOLVED TO MIXED CREW CAPABILITY
- FAILURE ANALYSIS ASSOCIATES
  - MAIN GENERATOR FAILURE
  - RCP MOTOR FAILURE - DESIGN CHANGE
  - TURBINE BLADE FAILURE - OPERATIONAL CHANGE
- SUGGESTION PROGRAM
  - LARGEST AWARDS FOR MAINTENANCE SUGGESTIONS
- APPRENTICE PROGRAM AT JAF
  - PREDATES ACCREDITATION

REGULATORY OPPORTUNITIES

- EMPHASIZE PERFORMANCE NOT PROCESS
  "MUST BE MAINTAINED IN AUDITABLE FORM"
- BALANCE REGULATORY NEED AND MAINTENANCE IMPACT
- ENCOURAGE RELIABILITY BASED SURVEILLANCES

ADVICE TO NAVAL OFFICERS

ALWAYS TELL YOUR PEOPLE WHAT YOU WANT DONE

NOT

HOW TO DO IT

JOE F. COLVIN

NUCLEAR MANAGEMENT

AND RESOURCES COUNCIL

NRC COMMISSION BRIEFING ON MAINTENANCE

MAINTENANCE

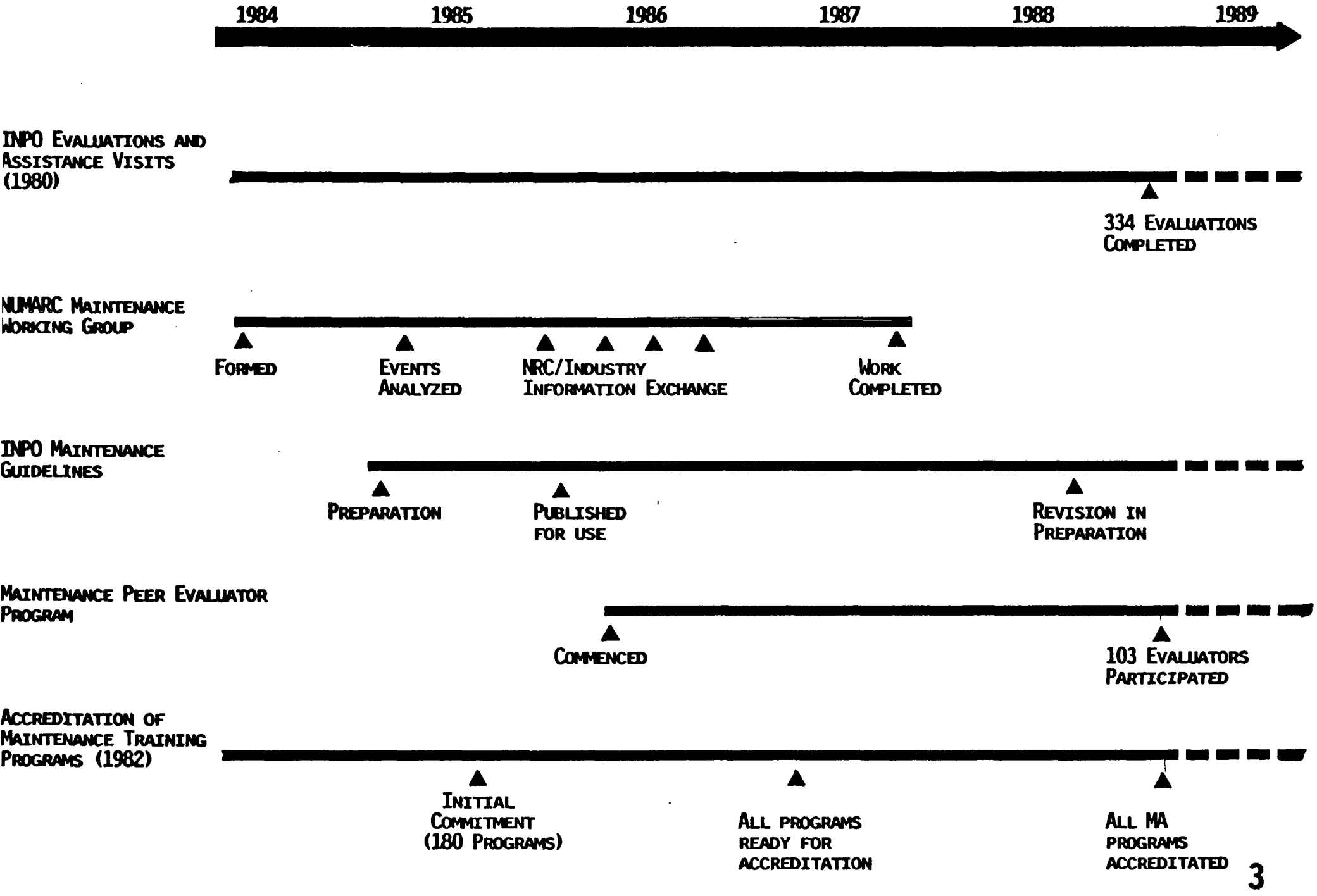
- WHAT WE ARE DOING IN MAINTENANCE AND WHY
- WHAT THE RESULTS OF THESE INITIATIVES ARE
- HOW THESE INITIATIVES COMPARE TO OTHER INDUSTRY INITIATIVES
- WHAT THE FUTURE HOLDS

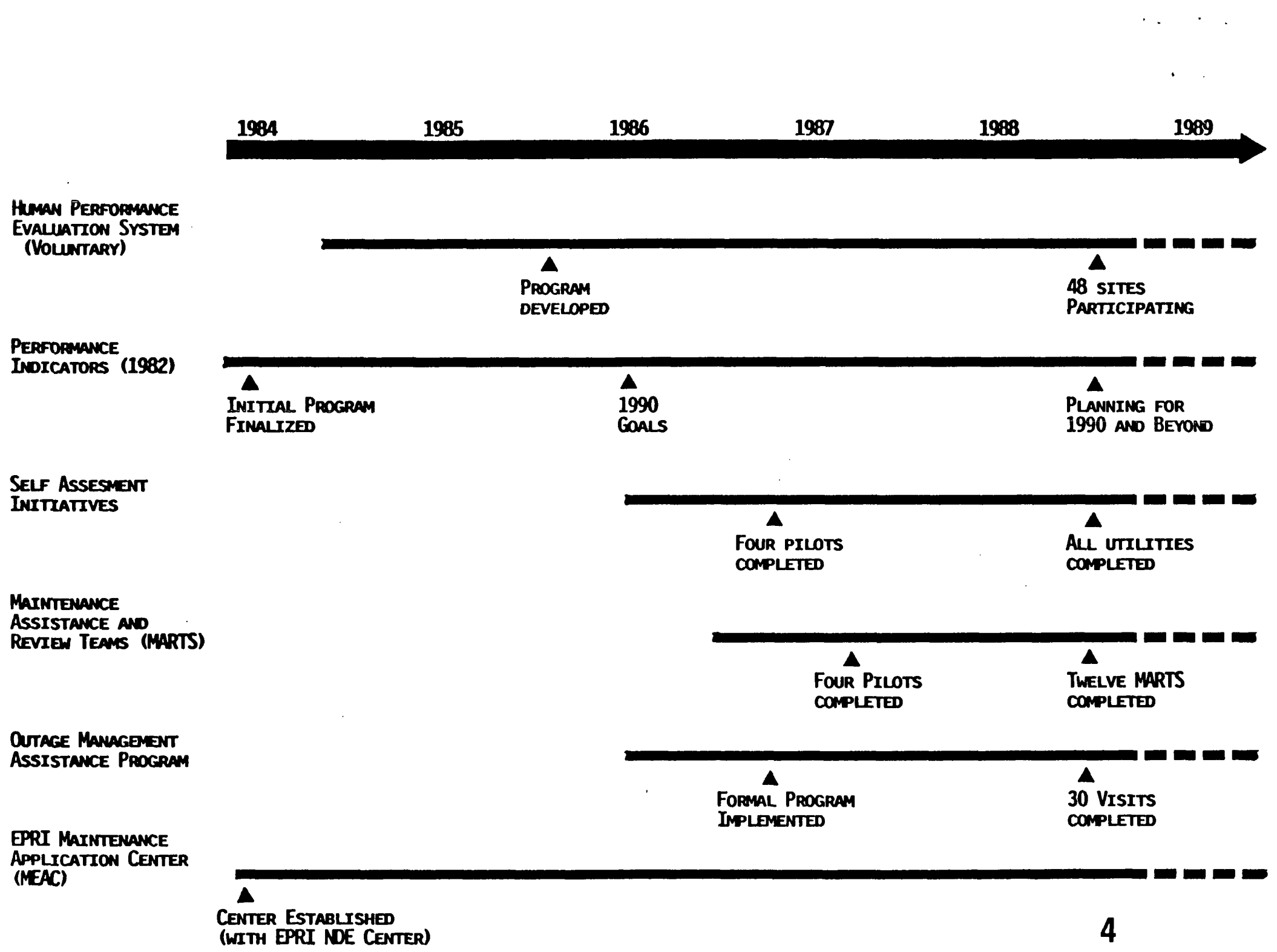
WHAT ARE WE DOING IN MAINTENANCE?
WHY THE INCREASED INTEREST?

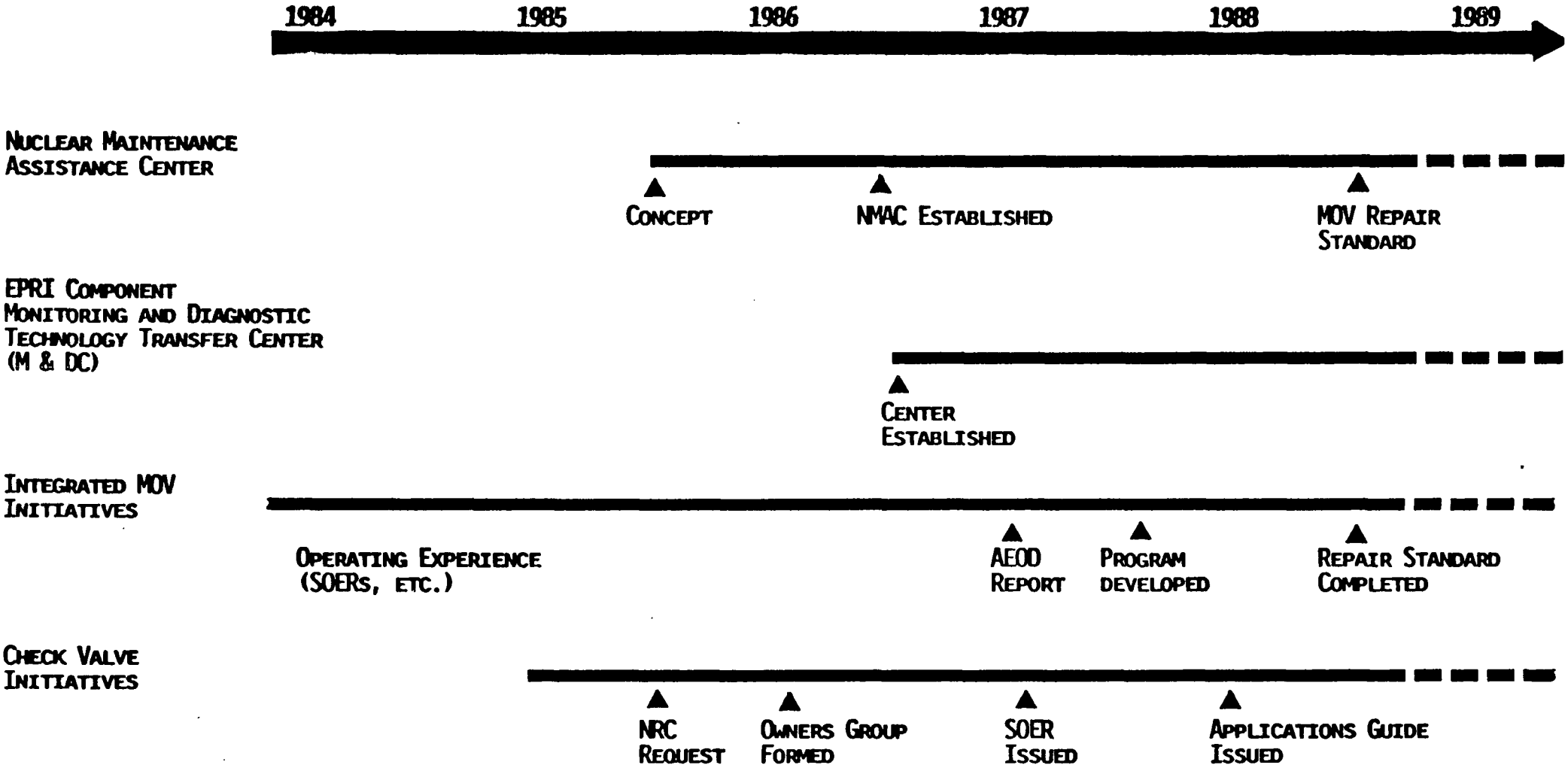
PLANT EVENTS ATTRIBUTABLE TO MAINTENANCE
SAFETY

PUSH TOWARDS INCREASED CAPACITY FACTORS
RELIABILITY

PRESSURE TO REDUCE O&M COSTS
ECONOMY


1984
1985
1986
1987
1988
1989
INPO Evaluations and Assistance Visits (1980)
334 Evaluations Completed
NUMARC Maintenance Working Group
Formed
Events Analyzed
NRC/Industry Information Exchange
Work Completed
INPO Maintenance Guidelines
Preparation
Published for Use
Revision in Preparation
Maintenance Peer Evaluator Program
Commenced
103 Evaluators Participated
Accreditation of Maintenance Training Programs (1982)
Initial Commitment (180 Programs)
All programs ready for accreditation
All MA programs accreditated


1984
1985
1986
1987
1988
1989
HUMAN PERFORMANCE EVALUATION SYSTEM (VOLUNTARY)
PROGRAM DEVELOPED
48 SITES PARTICIPATING
PERFORMANCE INDICATORS (1982)
INITIAL PROGRAM FINALIZED
1990 GOALS
PLANNING FOR 1990 AND BEYOND
SELF ASSESMENT INITIATIVES
FOUR PILOTS COMPLETED
ALL UTILITIES COMPLETED
MAINTENANCE ASSISTANCE AND REVIEW TEAMS (MARTS)
FOUR PILOTS COMPLETED
TWELVE MARTS COMPLETED
OUTAGE MANAGEMENT ASSISTANCE PROGRAM
FORMAL PROGRAM IMPLEMENTED
30 VISITS COMPLETED
EPRI MAINTENANCE APPLICATION CENTER (MEAC)
CENTER ESTABLISHED (WITH EPRI NDE CENTER)


1984
1985
1986
1987
1988
1989
Nuclear Maintenance Assistance Center
Concept
NMAC Established
MOV Repair Standard
EPRI Component Monitoring and Diagnostic Technology Transfer Center (M & DC)
Center Established
Integrated MOV Initiatives
Operating Experience (SOERs, etc.)
AEOD Report
Program developed
Repair Standard Completed
Check Valve Initiatives
NRC Request
Owners Group Formed
SOER Issued
Applications Guide Issued

EXCERPTS FROM INPO MAINTENANCE GUIDELINES

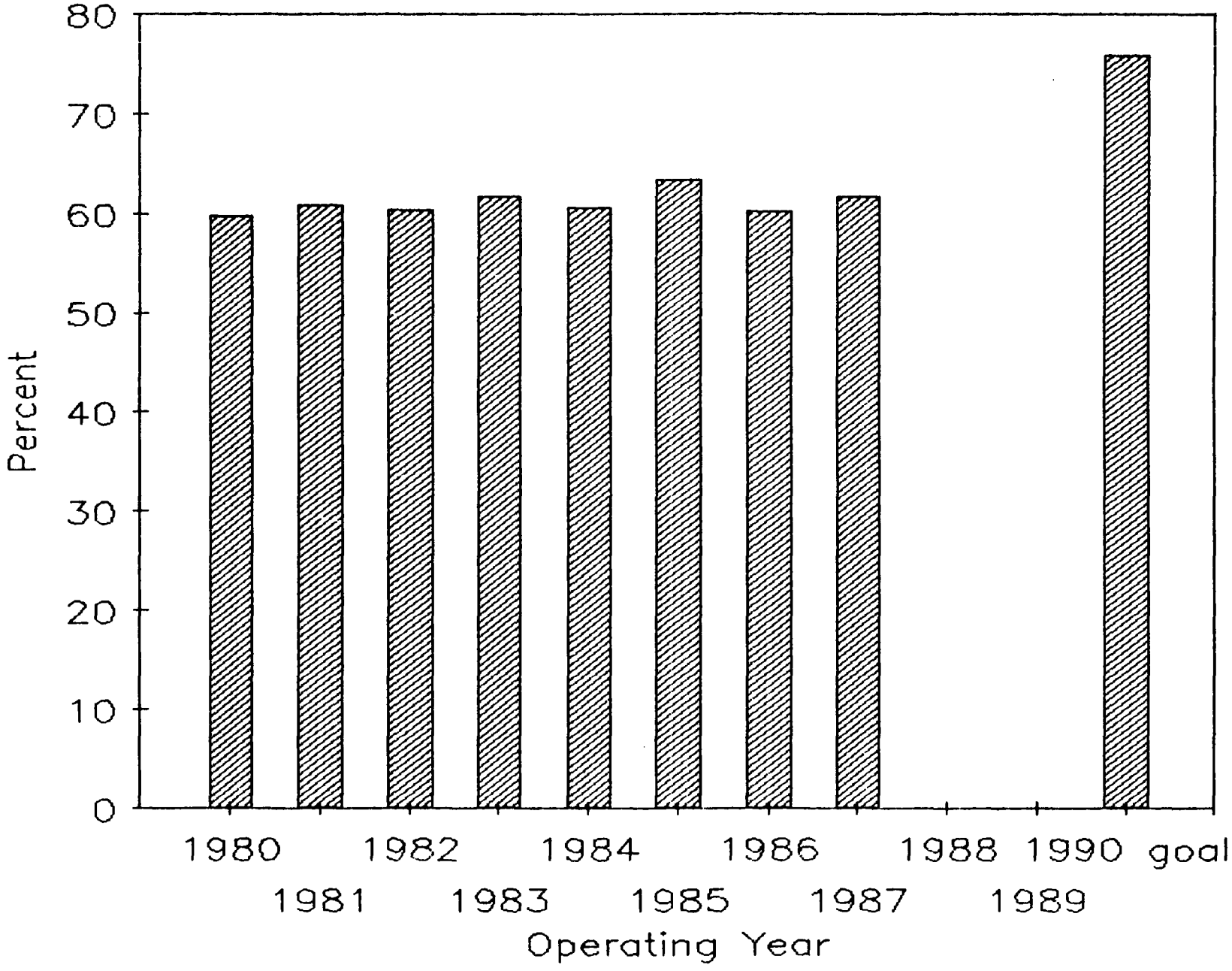
CONTROL OF MAINTENANCE ACTIVITIES

- Work Control Procedure
- Maintenance Requests
- Supervision of Maintenance Activities
- Review of Completed Maintenance Requests
- Temporary Repairs
- Control of Non-Station Utility and Contractor Personnel

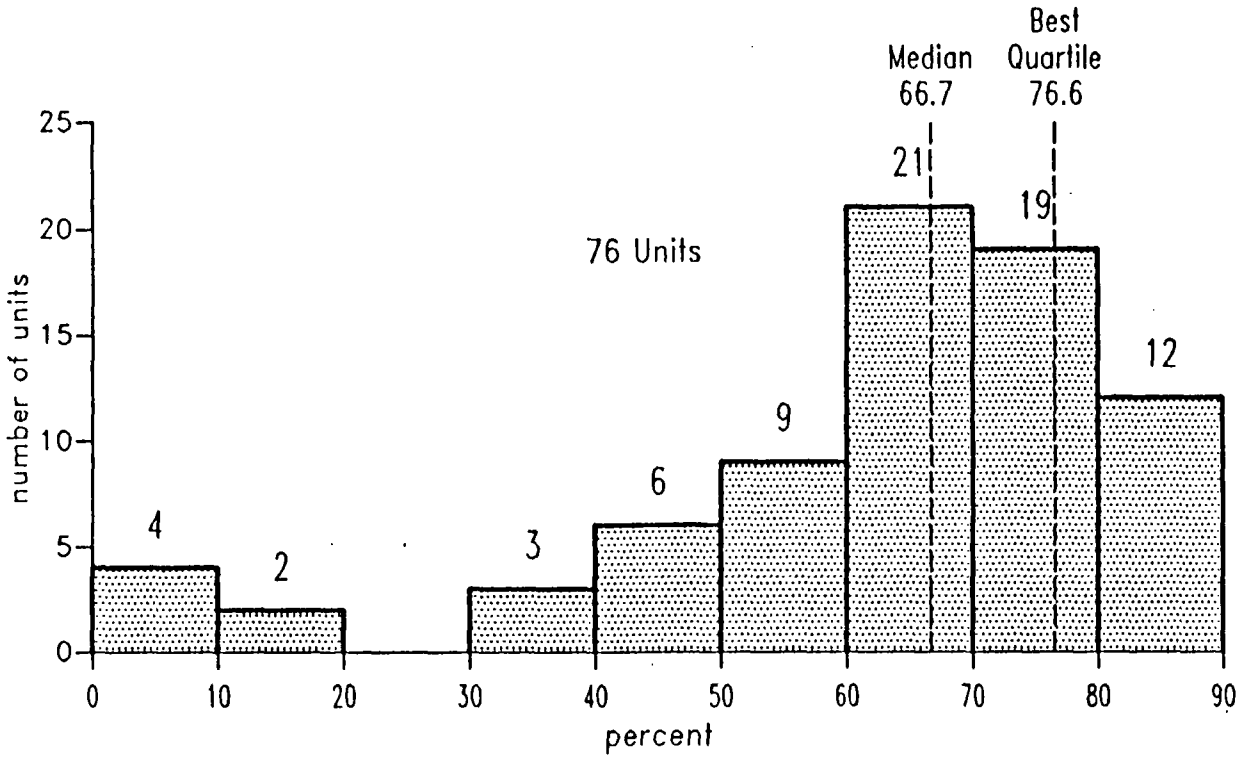
INPO
"TOP EQUIPMENT PROBLEM LIST"

- Station Batteries
- Diesel Generators
- Main Feedwater Flow Control
- Relief Valves
- Main Steam Turbines
- Reactor Coolant Pumps
- Air Systems
- Motor-Operated Valves
- Standby Turbine Driven Pumps
- Heat Exchanger Tubes
- Piping
- Check Valves
- A.C. Inverters

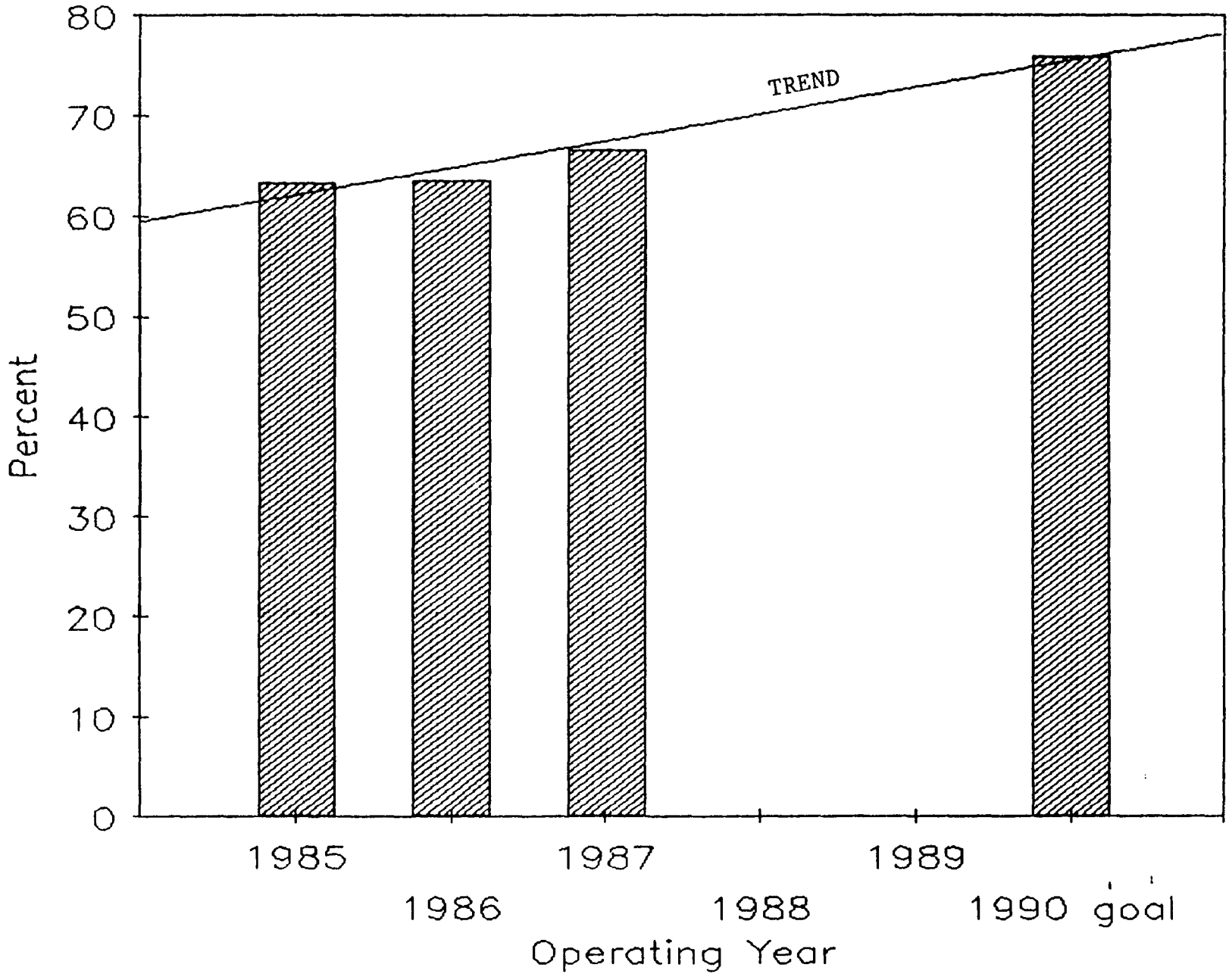
Equivalent Availability Factor
Industry Average



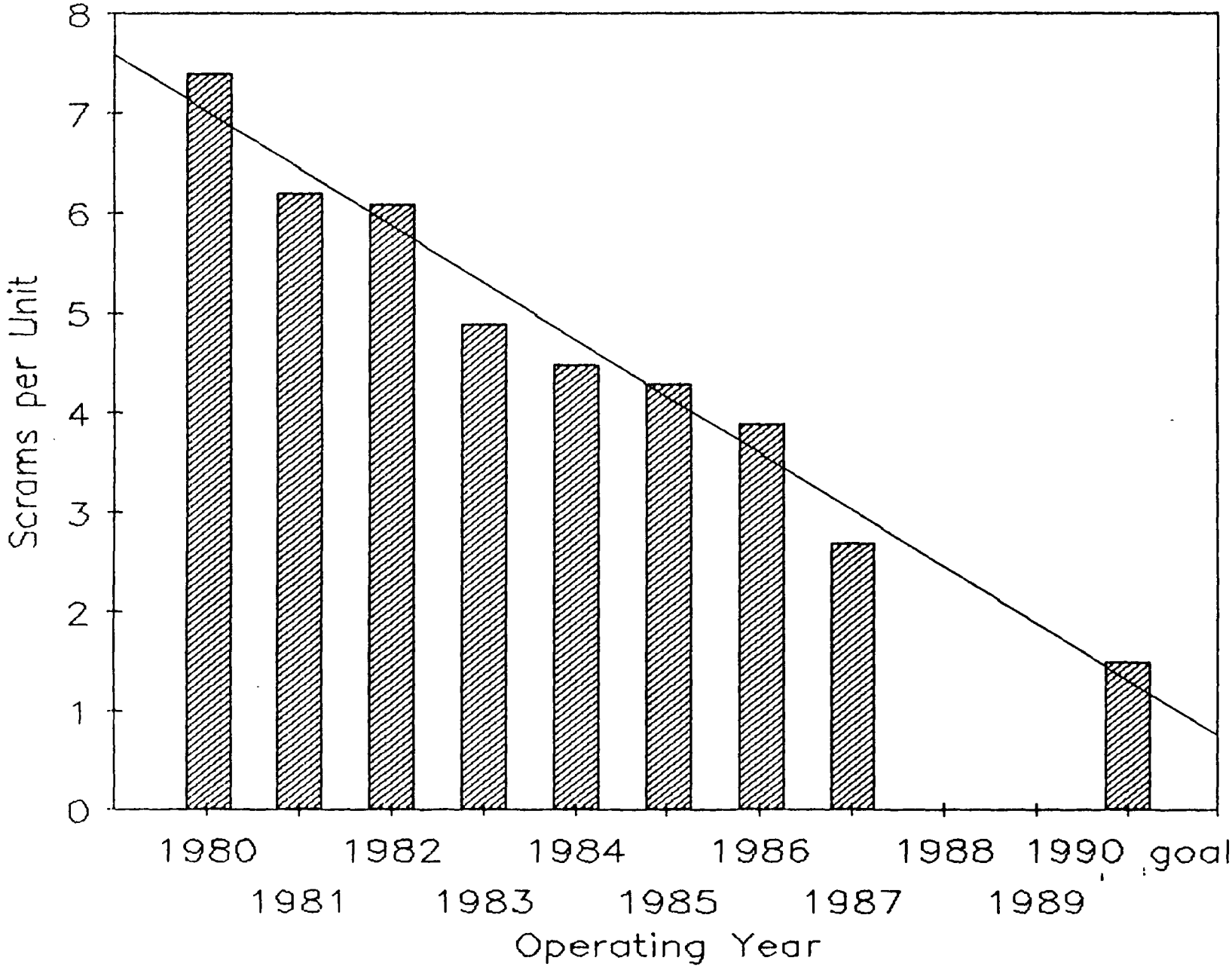
Equivalent Availability Factor
Three Year Distribution
(1/85 - 12/87)



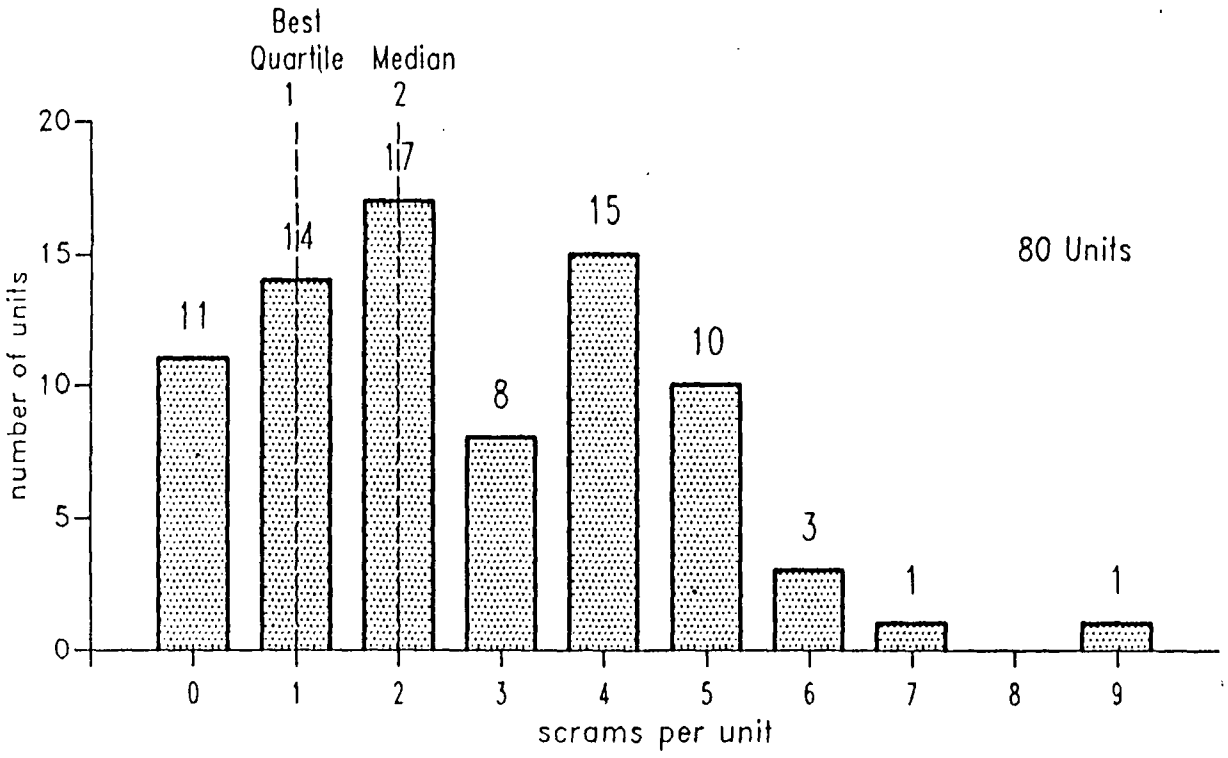
Median Equivalent Availability Factor for 1985, 1986 and 1987



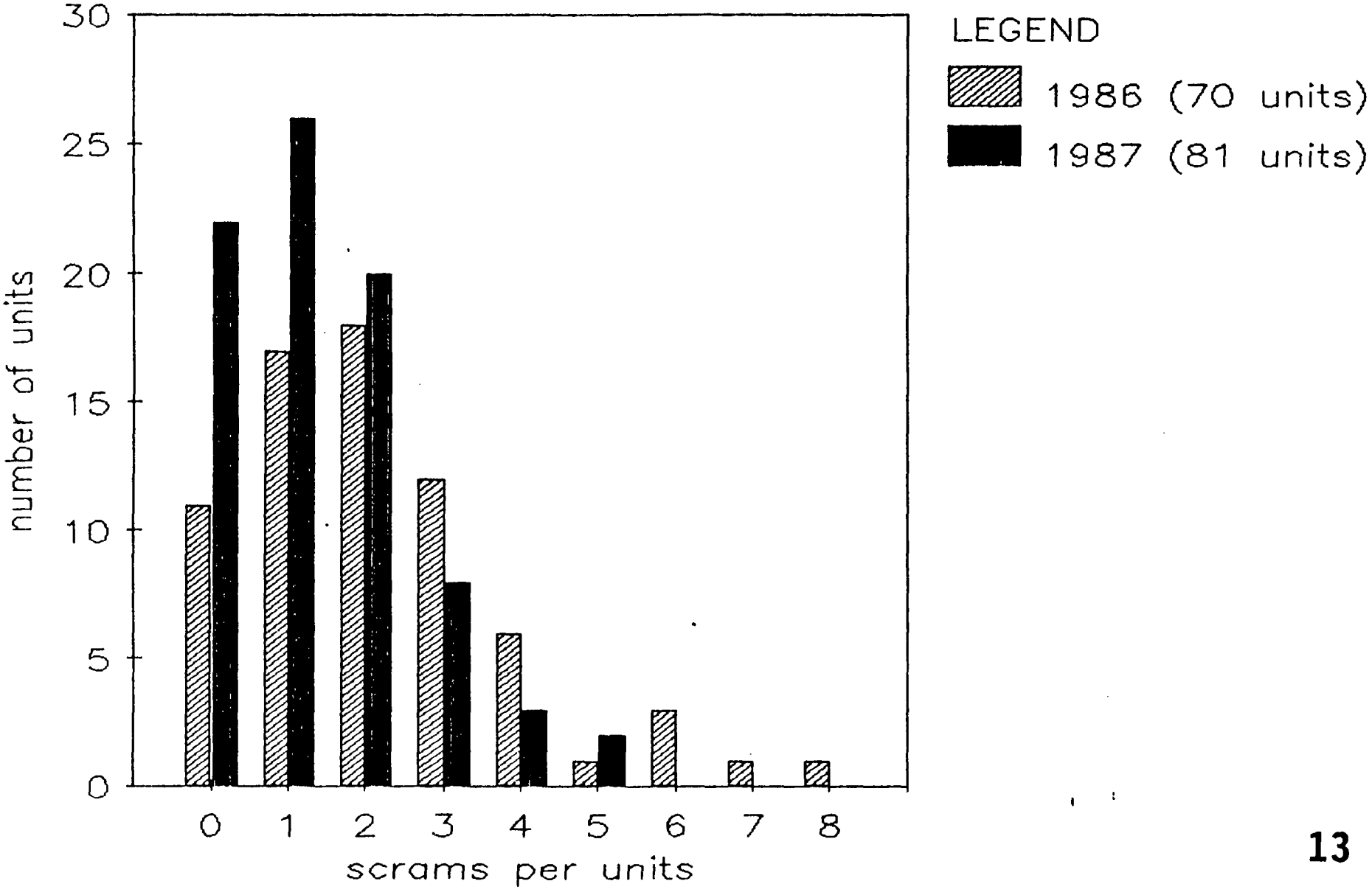
Unplanned Automatic Scrams While Critical
Industry Average



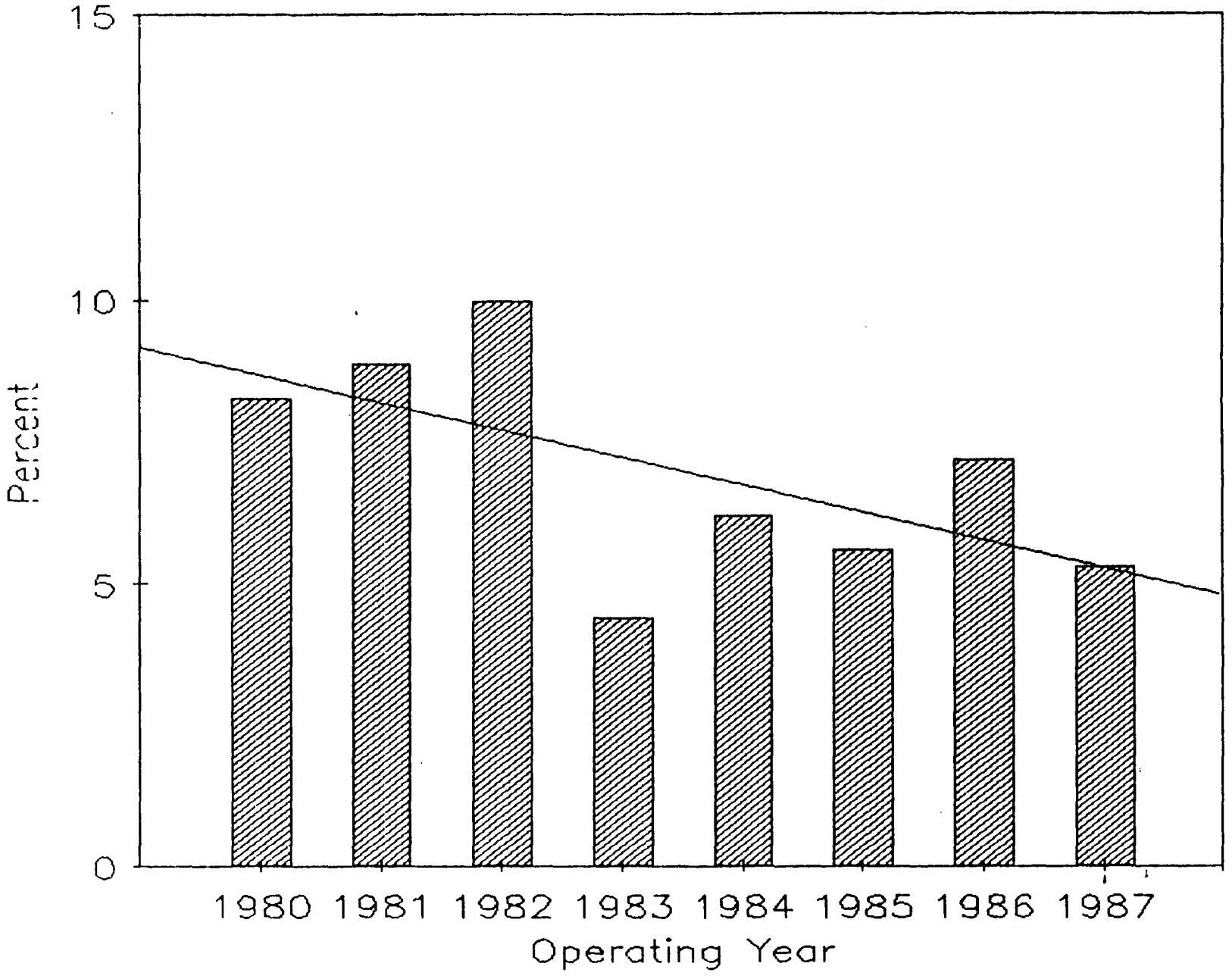
Unplanned Automatic Scrams While Critical
One Year Distribution
(1/87 - 12/87)



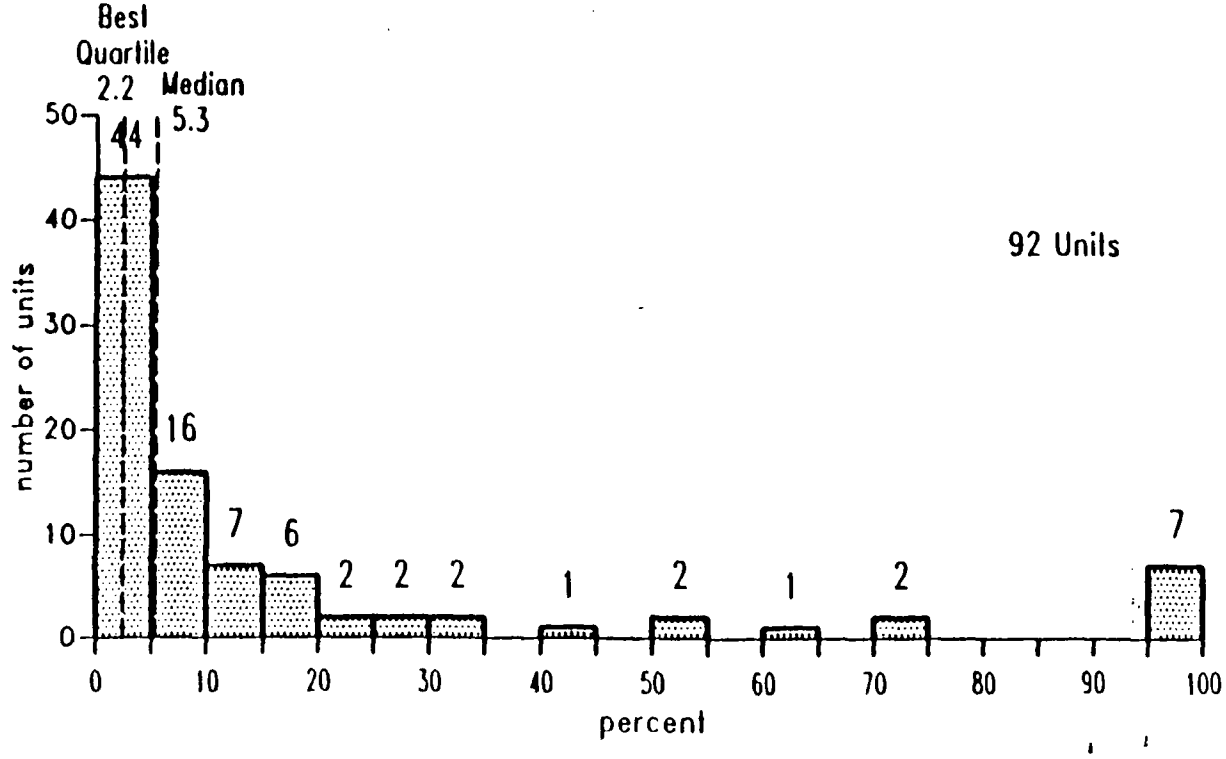
Unplanned Automatic Scrams While Critical Associated with Maintenance Activities 1986 vs. 1987



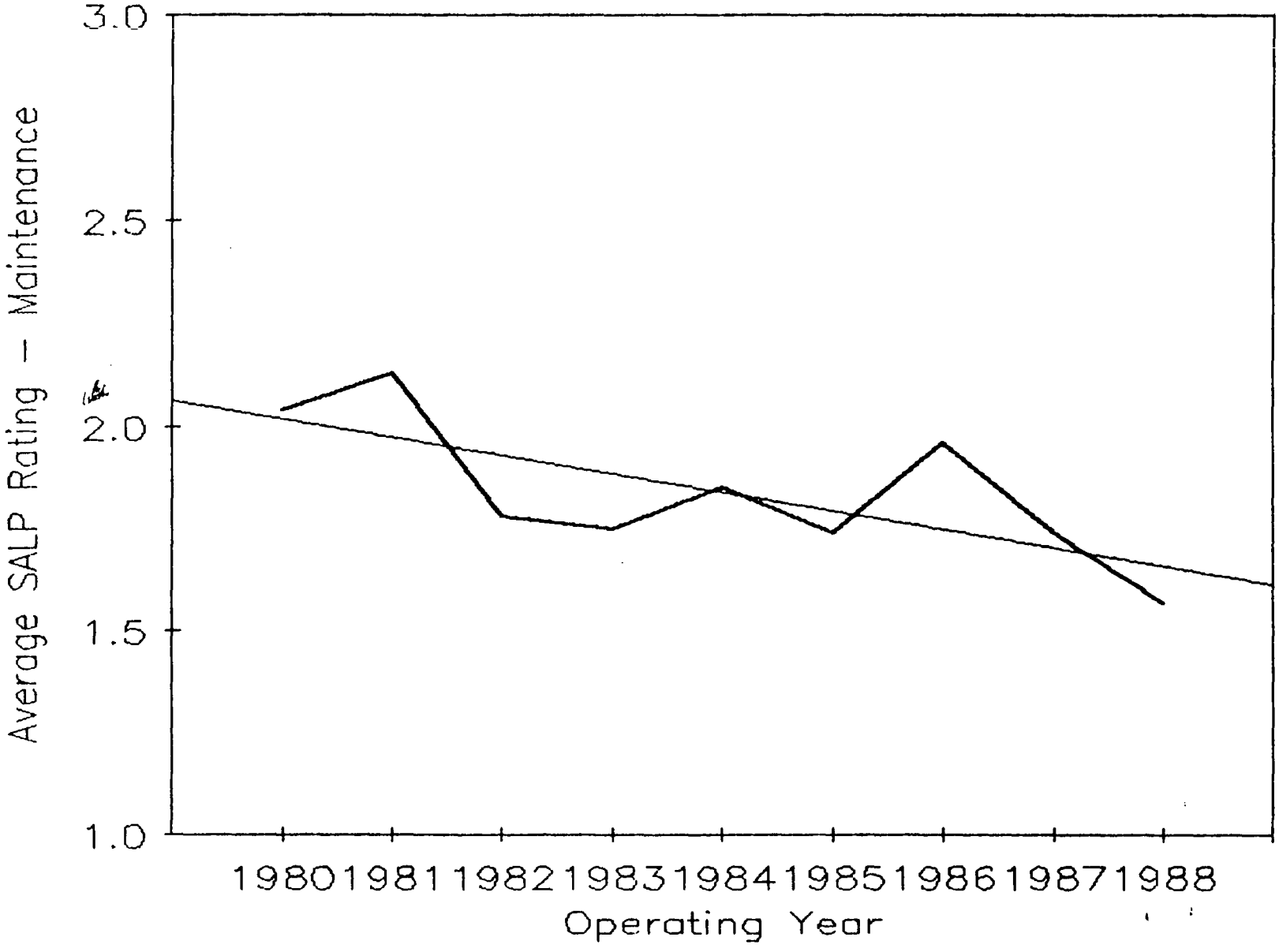
Forced Outage Rates
Industry Median Values



Forced Outage Rate
One Year Distribution
(1/87 - 12/87)

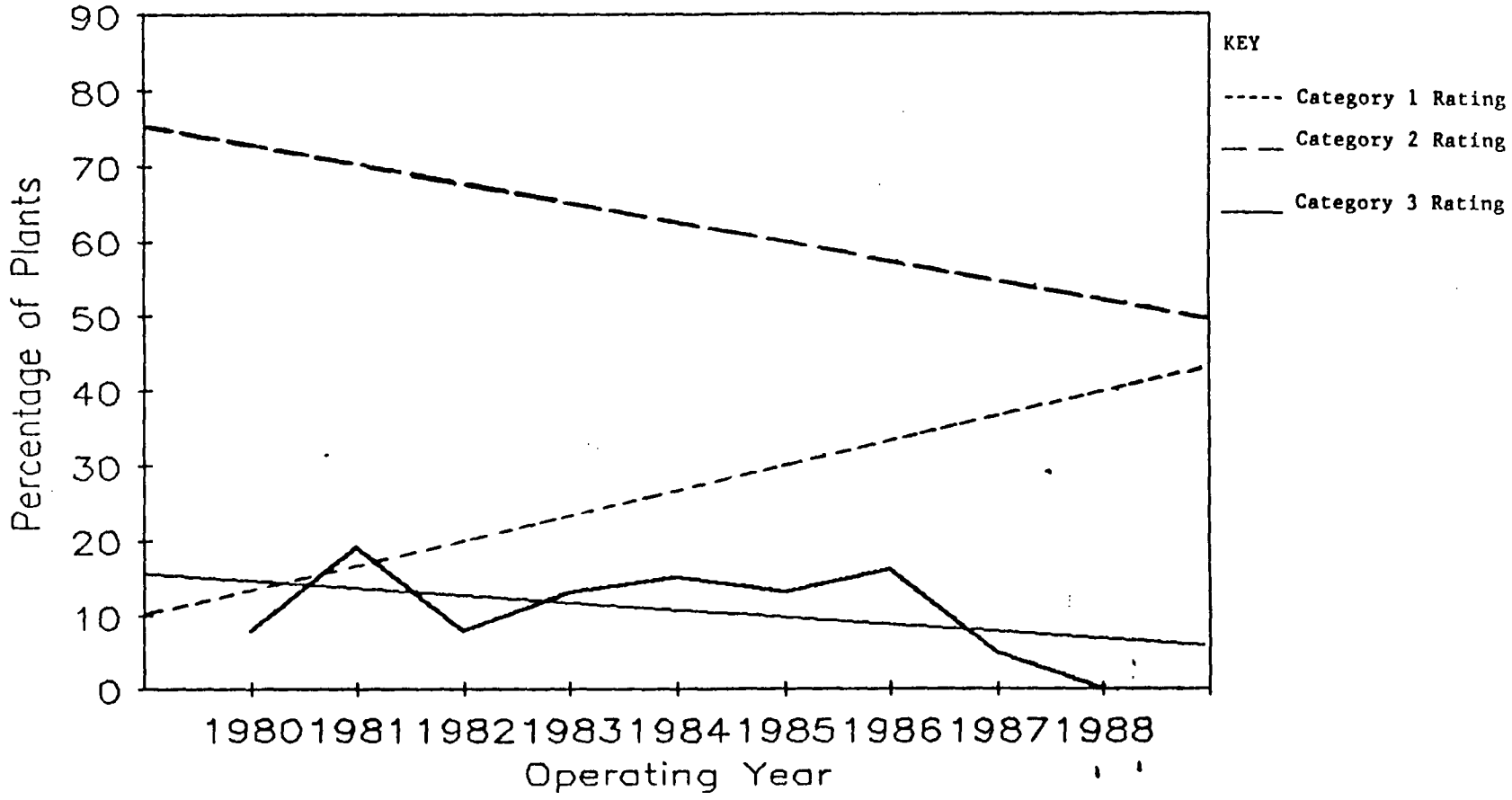


Average Ratings (all Regions/all units) for NRC Maintenance SALPS



1988 data incomplete (Jan – March)

Percentage of Plants Receiving Categories 1 and 2 Ratings for Maintenance SALPS as Compared to Percentage Receiving Category 3 Ratings (all Regions)



1988 data incomplete (Jan – March)

COMPARISON OF APPROACH

	MAINTENANCE	TRAINING	FITNESS FOR DUTY
FUNDAMENTAL INPO CORNERSTONE PROGRAM (SINCE 1979)	YES	YES	NO
SPECIFIC EVALUATION SUBJECT AREA WITH UNIQUE PERFORMANCE OBJECTIVES & CRITERIA	YES	YES	YES
INDUSTRY GUIDELINES ESTABLISH PROGRAM ELEMENTS. DEVELOPED WITH BROAD INDUSTRY INPUT AND NRC REVIEW AND COMMENT.	YES	YES	YES
ALL UTILITIES COMMITTED TO MEET INTENT OF GUIDELINES.	YES	YES	YES
INDUSTRY PEER EVALUATORS ASSIST INPO EVALUATION TEAMS DURING EVALUATION AND ASSIST VISITS.	YES	YES	NO

COMPARISON OF APPROACH

	MAINTENANCE	TRAINING	FITNESS FOR DUTY
ALL UTILITIES CONDUCT SELF-ASSESSMENT OF PROGRAM AGAINST INDUSTRY GUIDELINES AND REPORT RESULTS TO INPO	YES	YES	NO
INPO REVIEW SELF-ASSESSMENT TO DETERMINE NEED FOR ADDITIONAL ASSISTANCE TO UTILITY AND POSSIBLE GENERIC LESSONS LEARNED. FOLLOW ON WORK WITH UTILITY TO IMPROVE PROGRAM.	YES	YES	N/A
INPO EVALUATION TEAM FOLLOW-UP ON UTILITY CORRECTIVE ACTIONS TO IDENTIFIED DEFICIENCIES	YES	YES	YES

COMPARISON OF APPROACH

	MAINTENANCE	TRAINING	FITNESS FOR DUTY
INPO ASSISTANCE TEAM VISITS TO SELECTED UTILITIES.	YES	YES	YES
ACCREDITATION/CERTIFICATION OF PROGRAM	NO	YES	NO
NRC RULES/REGULATIONS APPLICABLE	YES	YES	NO
NRC POLICY STATEMENT RECOGNIZING INDUSTRY INITIATIVES	YES	YES	YES
NRC INSPECTIONS TO ASSESS UTILITY PROGRAMS	YES	YES	YES
NRC OVERVIEW OF INDUSTRY INITIATIVES, INCLUDING PARTICIPATION WITH SELECTED INPO EVALUATION AND ASSISTANCE TEAMS	YES	YES	YES

COMPARISON OF APPROACH

	MAINTENANCE	TRAINING	FITNESS FOR DUTY
NRC AUTHORITY EXISTS TO ADDRESS PLANTS NOT PERFORMING UP TO DESIRED LEVEL	YES	YES	YES
INDUSTRY INITIATIVES ACHIEVING RESULTS	YES	YES	YES

WHAT DOES THE FUTURE HOLD?

PERFORMANCE WILL BE IMPROVED

- Safety Enhancement
- Higher Capacity Factors
- Lower Maintenance Costs

NOT AN OVERNIGHT ACHIEVEMENT - 3 to 5 YEARS

EARLY SIGNS WILL BE MIXED

REQUIRES AN INDUSTRY-WIDE COMMITMENT

REQUIRES A REGULATORY COMMITMENT

ESSENTIAL FOR THE NUCLEAR OPTION