UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BRIEFING ON STATUS OF PERFORMANCE INDICATORS PROGRAM

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Public Meeting

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One White Flint North

Rockville, Maryland 20555

Thursday, April 29, 1988

The Commission met, pursuant to Notice, at 10:00 a.m., the Honorable Lando W. Zech, Jr., [Chairman of the Commission], presiding.

COMMISSIONERS PRESENT:

LANDO W. ZECH, JR., Chairman of the Commission

THOMAS M. ROBERTS, Commissioner

FREDERICK M. BERNTHAL, Commissioner

KENNETH M. ROGERS, Commissioner

NRC STAFF AND PRESENTERS SEATED AT COMMISSION TABLE:

S. Chilk	W. Parler
V. Stello	E. Jordan
C. Johnson	J. Rosenthal
R. Singh	

P R O C E E D I N G S

[10:00 a.m.]

CHAIRMAN ZECH: Good morning, ladies and gentlemen. Commissioner Carr will not be with us this morning and Commissioner Bernthal will be joining us shortly.

This is an historic occasion to be here at our new building. It's many years in coming, and I think the whole agency and certainly the Headquarters people are to be congratulated on the way they've accommodated to the new building. We have some growing pains still that are being worked out, as you know, but I appreciate everybody's forbearance and I think our new facility will certainly allow us to work together a little better perhaps. Rather than being in 10 or 11 buildings in town, we've got 60 percent of us roughly in this one building now. It's a big step in the right direction and I sincerely appreciate the way everybody has been patient through the kinks we've had and are still having.

But in general, I think the accommodations are good and I want particularly to give my respects to the Headquarters staff for the way they have kept smiling through the growing pains of getting settled in a new building.

This morning we are here to talk about performance indicators, and the NRC performance indicator program is one tool for senior NRC management to monitor the trends and overall performance of each of the licensed power reactors in

our country.

The staff recently provided the Commission a paper recommending certain modifications and additions to the Performance Indicator Program. The purpose of today's meeting is for the staff to brief the Commission concerning the current status of the Performance Indicator Program and the staff's plans for modifying the current set of performance indicators.

Today's meeting should help us to better understand the staff's recommendations. This is an information briefing and the meeting is intended to prepare the Commission to make some decisions on this program at some time in the near future. I understand that copies are available for those of you that are here, in the back of the room. Do any of my fellow Commissioners have any opening comments to make before we begin?

[No response.]

If not, Mr. Stello, would you proceed, please?

MR. STELLO: Thank you, Mr. Chairman. I agree completely, it is really a pleasure to be here and have our first meeting at One White Flint North, and for us and the staff, we see the benefits of consolidation in a real way rather than the usual 45-minute trip to come downtown. It's really nice to be able to get up from your desk and come down to a meeting and be able to do so quickly. And I think as we get used to our new quarters we're going to find that it really

does improve the efficiency of this agency in a real way and let us do our jobs better.

CHAIRMAN ZECH: Let me just make one comment, too, on that before we get into the meeting. To encourage senior managers, now that we are in one building, to take advantage of this fact and get out of your offices and see your building and see the other people that we've had such a difficult time really communicating with, even in this one metropolitan area. I'm going to try to do that, I have tried to do that and I intend to continue to get out and see the various people, all the people, every single one of them in this building.

So I commend the office managers to get out from behind your desks and go see your people, I think you're going to find that we have some absolutely wonderful people in this organization that we haven't had a chance to get to know very well. Let's take advantage of it.

Go ahead, Mr. Stello.

MR. STELLO: Let me get on to introducing the subject of performance indicators. As you know, we have been, over the past few years now, trying to understand what information we can get out of it, and some weeks ago we presented to the Commission for the first time the benefits of collecting this information that now is starting to show the very purpose that the agency exists, and that's to be sure that the current reactors are safe. The information we've collected from this

has started to show that the trends are clearly there. Overall, reactors are in fact safer and we can now do this in a quantitative sense in showing that the trends are such that we are being able to make that point.

I think one has to be careful, however, that one does not take performance indicators on any one plant or look at these in such a way that they become a definitive way to classify quickly the plants, and that's an admonishment that I think we all have to keep in mind and we do keep that in mind all the time. And the others that tend to want to use information that we collect in this fashion need to remember whenever they use it that it's just a tool to assist us in assessing the overall safety, and there are many, many other sources of information that need to be included.

What we're going to do today is to identify a couple of new areas that look like perhaps they are fruitful for us to get further into, and with the Commission studying the matter and deciding that is fruitful, we would propose to go forward and do that.

We are not here to suggest to the Commission that we have studied and learned enough about this subject to say that we can conclusively tell you here are the right collection of performance indicators and we know this without question or reservation. We're just clearly not there and it will be sometime, years, before we feel really comfortable with that

idea.

With that introduction, I'll ask Mr. Jordan to go through the briefing for us and get started. Mr. Chairman, if you'll excuse me I have another appointment I could not get out of that coincided with this meeting because of the need for changing it because of the hearing. So with that, I'll ask Mr. Jordan to start and I'll leave.

CHAIRMAN ZECH: Yes, I understand you have a conflict, Vic. Thank you very much. Mr. Jordan, you may proceed.

MR. JORDAN: Thank you. I'd like to ask Robbie Singh to move up here as well to assist us. First, I'd like to introduce the people who will be participating directly. Carl Johnson from the Office of Research, Reliability and Human Factors, is here on my right and will be giving a discussion on the support that Research has provided in developing performance indicators.

Robbie Singh is the Section Chief responsible for the Performance Indicator Program and has been implementing the program and working with the further development. Jack Rosenthal is the Branch Chief from the Reactor Operations Analysis Branch who has been supervising those developmental efforts. Tom Novak, Director of Safety Programs, is behind me; and Denny Ross from the Office of Research is here to respond where a research question is offered; and Arlene McKenna from

NRR is present so that she may respond.

I would like to refer back to the last briefing that we gave June 9, 1987, where we received some direction from the Commission. We feel we are proceeding towards implementation of indicators that we were in the process of developing at that time and continuing development of other indicators. As Mr. Stello indicated, we are proceeding very cautiously, and I think there are two reasons for caution. One is to assure that we maintain continuity with indicators that we have in order to use them fully and to maintain stability of the definitions. And then secondly, so that new indicators, as we develop them, are validated, confirmed to be valuable before we fully implement them.

Could I have the first slide, please.

[Slide.]

CHAIRMAN ZECH: Let me ask the people in the audience, can you see the slide? Good. Okay. Let's see if we can see it here.

MR. JORDAN: It may be easier to look at your handout, sir.

COMMISSIONER ROBERTS: Is there any difference between the handouts dated April 21st and those dated April 28th?

MR. JORDAN: Yes, sir. The difference is we changed some of the slides so that they would project and be visible

for people here.

CHAIRMAN ZECH: All right, let's proceed.

MR. JORDAN: The program status -- at this time, we are continuing development. We have support from the Task Group which is composed of personnel from the Office of Research, from the Office of NRR and from the regions. This is an advisory group that meets periodically and gives us insights on the development process. It's been a very, very valuable cooperative effort.

The implementation is the responsibility of the Office of AEOD, and development -- we receive a great deal of support from the Office of Research and work very closely with them.

[Slide.]

The products that we're presently putting out are the quarterly reports, and these are all prepared and issued to management; after about two weeks they are sent to the Public Document Room, and that data then becomes input to the senior management for the semi-annual performance review programs. The next one is scheduled for June.

We feel that in the implementation we have improved the graphic display, and I will show you that briefly. We've made the packages more user-friendly and the users are quite pleased with them. That is, the managers from the program offices in the regions.

[Slide.]

On the development side, and that's principally what we're here to talk about, the areas are risk-faced PI's, and this is the system availability/safety system trends. Programmatic indicators are ranging from management to maintenance and we're looking at a number of specific areas in the maintenance area that we will describe to you.

Program improvements -- we're trying to continue to improve the presentation and the packaging, the usefulness of it for the managers. And an area that I'd like to bring to your attention is an expanded program; that is, we're participating with selected utilities in getting plant-specific data, data that they are already collecting, and observing their trending, and that's helping us with validation of trial indicators. So that's a very valuable part of our program.

And then there is other related research that ties back into performance indicators indirectly -- the modeling of management is one example.

[Slide.]

I would briefly touch on the resources that we apply to the Performance Indicator Program. We have budgeted and are spending about four FTE staff in this office, and Research is budgeted and I understand spending about .5 and .75 respectively for the two areas that they're supporting us in. The contractor support, we are actually spending more in AEOD

than budgeted. We have reprogrammed about $310,000 in order to accelerate the maintenance performance indicator development.

COMMISSIONER ROBERTS: Then you have to ask the obvious question: where did that come from? What was cut?

MR. JORDAN: We cut some of our other data programs and shifted the emphasis to these maintenance indicators. So that was my decision, and I believe it's in the best interest of the office and the agency.

COMMISSIONER ROBERTS: Good. That was not a criticism; I'm just curious.

MR. JORDAN: Yes, sir.

In order to accelerate the maintenance program itself, we have some two years of data that were collected by one of the regional offices for 20 plants, and so we're having a contractor analyze that data to help support, extracting from that more maintenance PI information.

COMMISSIONER BERNTHAL: Let me see if -- I was distracted here for a minute, but I understand that -- let me put it this way. Do I understand that the maintenance performance indicators are based on your tagging the other performance indicators, this cause tagging that we talked about, or -- ?

MR. JORDAN: The cause code is one way of getting at maintenance and we will talk in some detail about that, but that's not a leading indicator, it's really a trailing. So

we're looking further at indicators that may be leading in terms of maintenance backlog, those kinds of data. Today you may see the backlog building but the plant is still running okay, and in a year and a half or in some later timeframe, because of this building maintenance backlog, the lack of maintenance, then you would see a deterioration in the way the plant is running. We'd like to have that leading indicator assisting us.

COMMISSIONER BERNTHAL: So you're trying to develop certain indicators. Well, let's take that example, though. In the absence of a regulation, a requirement of some kind or even a Reg Guide at this point, how do you know that there is any uniformity at all -- in fact, we already know there is no uniformity --

COMMISSIONER ROBERTS: You know that answer on the front end; there is none.

MR. JORDAN: There is trend information on an individual plant that is useful and I don't believe that data will be comparable -- certain of those data will not be comparable between plants; it would be simply trending that particular plant, and you do not have requirements for utilities to maintain data in that fashion.

And if you recall from our previous presentation to you, we had proposed internally the maintenance backlog, and the industry comments back on that and interactions with

industry were that it was subject to manipulation, it was not comparable and so it didn't fit some of our selection bases. And so we deferred selection. INPO has some indicators similar to that which they are tracking and we're reviewing those with them, as well as data that we've collected from selected plants in those specific plants. So we have not given up.

COMMISSIONER BERNTHAL: Well, it seems to me that in principle that sort of thing is useful, but I've got to say that if you expect it really to be useful, comparing the utility with itself based on however it may choose, evolving with time to categorize outstanding maintenance items, which box to put them in -- you know, they tend to have different categories as we all know -- without some sort of regulatory requirement and now you're talking about getting into a maintenance rule which certainly would happen, if it ever does, long after I'm gone from this place, it seems to me that that is the only way that you're going to get some uniformity. There would have to be a uniformity of requirement there which not only would ensure that a single utility maintains a consistent system, but that across utilities then there is the basis for comparison in maintenance performance.

Right now, we don't have any of that, and I think while the idea isn't a bad one, I'm skeptical that the data can't be cooked very easily.

MR. JORDAN: And that's why we have to be very

careful in selecting, and if we put new requirements on, assuring that the new requirement has a beneficial effect and not an adverse effect. So it's a very real concern.

Slide No. 6, please.

[Slide.]

I was just going to briefly touch on the data presentation that we presently have. We feel that the presentation is very important. We, as you know, started out with simple tabular data and it was impossible to use for 100 plants. We have now condensed it down to two pages per plant that we issue quarterly. This is one box out of six that would be on the lefthand page in a package. And so from that one panel -- for instance, this is Safety System Actuations, you can see the actual number of actuations for that particular parameter. You can see the critical hours of the plant, so if the operational time has some apparent effect during a period or for instance there is a long shutdown, you can see that very easily.

The dark bar is a four-quarter moving average for this particular parameter, and then the light bar down low is the older plant average. So on that one chart you can easily compare this particular plant with that parameter with itself and with the other plants and see the actual data. So I think the staff did an outstanding job in assembling in one picture a very large amount of data.

Could I have Slide No. 7, please.

[Slide.]

I confess that what I call the finger charts, this slide and the next one, have been my favorites but I'm beginning to look more at the more detailed chart. These are easier to skim through, and especially when there is a lot of coherence between the charts. For six indicators, this is the trend chart which shows a trend from the previous four quarters to the last two quarters. So this is, in terms of standard deviations, the actual delta change that has occurred in each of those parameters. So from this -- and this is not a real plant -- from this sample, this would show a plant that is improving in every characteristic, and it would be easy to pass that one up in terms of trends for concern.

Could I have Slide No. 8, please.

[Slide.]

This chart is a similar presentation but it's comparing this particular plant with the mean of all other plants of that same generation, so these are the older plant means that we're comparing to. So this particular plant, although improving, would be seen to be below average performance. And in our normal sense, this would not be a basis for having the performance indicators cause us a concern that would need further attention. However, in the management reviews, the results of inspections, the SALP scores and

interactions with NRR would be a basis for perhaps considering further issues with this particular plant. The performance indicators -- it's below average but improving measurably.

At this point I'd like to turn to Jack Rosenthal and ask him to pick up on describing the maintenance performance indicator development and where we stand.

MR. ROSENTHAL: We had the opportunity, some of us, to meet with your tech assistants yesterday and I am to discuss maintenance and cause codes, and we think that maintenance should come first because of our understanding of your interest. So I'd really like to go on to Slide No. 17 in your packet, and then given time, I'll come back to cause factors.

CHAIRMAN ZECH: Fine, go right ahead.

[Slide.]

MR. ROSENTHAL: Let me start out by saying that the staff is mindful of the guidance that the Commissioners have prepared over the year with respect to developing maintenance programmatic indicators. For example, Commissioner Rogers' guidance of 1/21. And we're working very hard to be responsive.

The program has been a top-down program where the first thing you did was to implement events that take place in a plant. The next thing you'd like to do is say well, what's causing those events; how effective are the programs that you have in place at maintaining the readiness of the plant? And I

think we're ready to go on effectiveness.

With measures of the effectiveness of programs in place, it seems to me that the next place you go is into attempting to measure the program itself. If you can succeed in that, then you can even look at inputs to that program. And at least in my mind, this is more than a question of scholasticism on drawing these distinctions. Effective maintenance should result in things like a low forced outage rate due to equipment failures, and that's in the program already. That will be a measure of balance of plant.

And you'd like to know something about the operability of standby systems, of safety systems; are they ready to do their intended purpose. And our, what we've termed, safety system unavailability but we think a better term now might be safety system function trends, where you look at those trains of equipment that you know are important, provide good measures of how effective the program is and measures the overall goal of that maintenance program. Are you achieving results.

Now, I can distinguish between that and attempting to measure the program. When I measure the program I look at things like overdue preventive maintenance or a maintenance backlog or a ratio of corrective to preventive maintenance, and depending on the hardware mix of the specific plant, the optimal ratio will be different.

On the input side of the coin you could look at corporate goals, plant management direction, you can look at money that's being spent on the program. The program over the last two years has gone this top-down approach. Could I have the next slide, please, Slide No. 18.

[Slide.]

We were very interested in maintenance rework because of its -- just from an engineering stand -- its face validity. You go in, you maintain a piece of equipment. Especially for safety systems which you perceive as being very reliable, at the next quarterly surveillance or the next time it's demanded to work you surely expect it to be operable. And so if you find evidence of cases where you have to rework an item -- it's a steam-driven aux feedwater pump, and then you go in at the next surveillance and if you have to work on it again, that's an indication of inadequate maintenance.

We attempted, using our automated systems, information that's reported to us, to come up with a measure of maintenance rework. We were unsuccessful. In our systems as we concurrently access and manipulate them, it just isn't there to support that item.

We tried a surrogate, and that is to say well, let's look at the trend level. They go in and work on --

CHAIRMAN ZECH: Excuse me, we're going to turn the air conditioning on and see what happens. It does make a

little noise but it's getting a little warm, so please bear with us until we experiment a little bit. If it's difficult to hear with the air conditioning on I hope somebody in the back row or the front row will raise your hand and we'll do our best to accommodate to our new facility.

Please proceed.

MR. ROSENTHAL: It was attempted to look at times that individual systems worked. Now ideally in the rework, you would say okay, some bearing had to be replaced and then you'd go back and say, my gosh, three months later you had to replace that same bearing. Well, what was wrong with your maintenance program that you didn't do it right the first time?

CHAIRMAN ZECH: Excuse me, let me interrupt you for a second. Before we go any further, let me ask Mr. Springer, Mr. Chilk, let's see what we can do to quiet this down a little bit.

MR. CHILK: Have already asked, Mr. Chairman.

CHAIRMAN ZECH: It's -- I think most people can hear but it is distracting, and it seems to me that the engineers we're dealing with perhaps can do a little better than that. I feel sure they can but please follow through.

COMMISSIONER BERNTHAL: Don't pay their bill if you haven't yet.

[Laughter.]

CHAIRMAN ZECH: Let's just keep it going if it's not

too distracting. If it is, please raise your hand and we'll turn it off again.

COMMISSIONER ROBERTS: I'd rather be distracted than hot.

CHAIRMAN ZECH: We'll make a big judgment if we have to, but please proceed.

MR. ROSENTHAL: The concept there is that one time you may have gone in and worked on a pump; another time you may have gone in and worked on a valve within a train. But somehow, you surely expect that when you re-declare a train operable, that it's all running. So if you have to go back in and look at that train or you find it deficient at the next surveillance or the next demand, it's an indication of inadequate maintenance. It's not as good as the maintenance rework which would get down on the pump or the valve level.

That shows more potential for us to be able to extract it from our automated systems, and we're now attempting to do that.

We looked at items out of service -- that's just a gross count of what is out of service at that plant, and you can trend it at that plant. And of course it will be different at every plant.

We tried NPRDS and it's not working out. The next place to go would be some direct plant, once a month type count of what's out of service.

That's what we did, and we're running out of data that is currently reported to us that would allow us to come up with maintenance indicators.

CHAIRMAN ZECH: But you are going to come up with a maintenance indicator.

MR. ROSENTHAL: One way or the other, yes, sir.

CHAIRMAN ZECH: You know, as I recall, it was the sense of the Commission that we wanted one and we asked you to give us one and you haven't so far, but I'm pleased to hear that you're still working on it and you're going to come up with one.

I appreciate, and I know my colleagues do, how difficult it is to come up with a really good maintenance indicator. You've shown us that and pointed out the wide range of things you may look at to determine a good maintenance indicator. But for that very reason I think it shows me and I think it should show most of us the value of a maintenance indicator. So we want one. Keep working on it.

MR. JORDAN: Yes, sir.

MR. ROSENTHAL: Let's move to the backup slide which repeats some of the information on this slide.

[Slide.]

This is my best shot at where I think we'll come out on maintenance indicators.

COMMISSIONER BERNTHAL: Which slide is this now?

MR. ROSENTHAL: It's a backup slide. And I specifically don't have them in any special order. Equipment out of service --

COMMISSIONER BERNTHAL: Am I blind or is that out of focus? I guess my eyes are going.

CHAIRMAN ZECH: It's jumping around a little bit.

MR. ROSENTHAL: Why don't I read down the list. Equipment out of service; maintenance work request backlog; safety system rework -- we're still interested in that; an overdue surveillance rate; control room alarms and instruments; preventive maintenance overdue; preventive to total maintenance; high priority total work orders -- high priority work order requests to total work orders; the ratio of preventive to corrective maintenance; mean time to return to service. Our best shot now. Now, how are we going to get there?

Somehow we have to validate trial indicators against data in plants, and that's been hard to get. But we've managed now to get data on a voluntary basis from a representative sample set of plants, and that allows us to perform a validation exercise. And we've developed, with the cooperation of several utilities some of which have excellent recordkeeping, a cooperative program where they have agreed to provide us data -- it will be selected plants, just a few -- where we can do in-depth studies of what's going on at those

plants. And it's been painful to work out these agreements, but that's in place. That now provides the basis to go forward.

In parallel with that, we have an expanded indicator program at a few plants. Slide No. 19, please.

[Slide.]

We are working with the regions and with NRR and attempting to get data at a few plants that would be more detailed --

COMMISSIONER ROBERTS: Excuse me, how many is a few?

MR. ROSENTHAL: Four.

COMMISSIONER ROBERTS: Thank you.

MR. JORDAN: This is generally data that those plants were collecting for their own purposes.

COMMISSIONER ROBERTS: How did you select the four?

MR. JORDAN: These were plants that were in a restart program and so they are under special agency scrutiny and realized it and are developing their own indicators, as it were.

MR. ROSENTHAL: We visited those plants, proposed what information we'd like to get, found out what information they already collected and are customizing the programs to minimize the burden on them. And so we end up with this data that they would be collecting anyway and they're sharing it with us.

COMMISSIONER BERNTHAL: How many of these categories that you've listed in the backup slide -- how many of those has INPO focused on? In other words, has the industry itself taken any steps to voluntarily gather and collate that kind of information?

MR. ROSENTHAL: INPO has 11 or 12 major indicators and then they have supplemental information. They have a corrective maintenance backlog greater than three months old. Ratio highest priority -- maintenance work requests to total maintenance work requests completed. Three, preventive maintenance items overdue; four, ratio of preventive to total maintenance; maintenance overtime; and maintenance radiation exposure.

COMMISSIONER BERNTHAL: And the industry, pretty much every plant is committed to gathering that kind of information?

MR. JORDAN: Yes.

MR. ROSENTHAL: Yes. And we could well adopt some or all of those indicators.

COMMISSIONER BERNTHAL: Why don't we just get them from INPO on a voluntary basis, of course.

MR. JORDAN: We have, of course, been communicating with INPO. We have now recently received three years back data for the four common indicators that we have, and so we're reviewing their data and our data for verification. We would like to somewhat independently select an indicator, decide that

it in fact has validity, and where there is a sufficiently common definition, then accommodate with INPO and then adopt what --

COMMISSIONER BERNTHAL: Well, do you think INPO's indicators somehow are deficient or that they have not picked the best ones? Why --

MR. JORDAN: We know that they've put a great deal of resource into it and they have, we think, a very fine program that is benefiting industry, but our purpose is regulatory and theirs is not focused at regulatory. So we want to make sure that the indicators we select are, in fact, associated with our regulatory tools; that they are for plant safety performance.

COMMISSIONER BERNTHAL: Well I agree, but what you're saying then is you have not yet reached a judgment, or it sounds like you have reached a judgment that the indicators that they have are not adequate or sufficient for our purposes.

The only reason I'm pressing you on this is because the key word here is voluntary, unless and until there is a regulatory requirement. And if it's the same set of data and it's being sent to both places it just seems to me that we could maybe cut through some junk here.

MR. JORDAN: That's correct. And our intent would be that if we adopt a common indicator, that we would access the INPO data. But we're not simply going to embrace the INPO program because their data become our data; I don't think that

would be an appropriate way to handle it.

COMMISSIONER BERNTHAL: But their data are the utilities' data, and the utilities' data are our data. Unless we have a regulatory requirement, and we don't.

MR. JORDAN: Right. And for the indicators that we have adopted thus far, there is a regulatory nexus connected to them. We obtain that data already and there is on problem. But where we are getting data that the utilities are not required by regulatory requirement to collect, then I think we have to be very certain that that is the data we want and that we're willing to, if necessary, issue a regulation to obtain it.

We can very nicely study data that's being collected for another purpose, but once we decide that it is to be one of the performance indicators, then I believe we should be willing to make that regulatory judgment. And we have to be certain in those cases.

CHAIRMAN ZECH: Let's proceed.

MR. ROSENTHAL: I am essentially finished with that. Slide No. 10, please.

[Slide.]

We disaggregate information typically --

CHAIRMAN ZECH: You weren't finished. You meant you were finished on that subject?

MR. JORDAN: Yes, we were finished on the maintenance

indicators.

CHAIRMAN ZECH: Okay, and now we're going to a new subject, fine.

COMMISSIONER BERNTHAL: Let me see if I can get a clear answer here on one point, though. It appears that you are convinced that the maintenance indicators that INPO already gathers and collates from the industry which are being supplied voluntarily now by the industry and which are the same data that at least in those categories we would get voluntarily from the industry, our not being in a position to require it at this point, you're convinced that there are other things that we need to ask for that are not currently included in that body of data? Or you haven't reached a judgment on that.

MR. JORDAN: I would say it differently. We believe that some of those might be excellent candidates for us to use but we believe there are others that will be of greater benefit to us for our regulatory purposes.

COMMISSIONER BERNTHAL: For our purposes. Can you give me one or two examples of things that aren't there now, aren't going to be done, are not being done by INPO, perhaps are not even being collated routinely by the industry that you really feel are good candidates for what we would need to look at?

MR. ROSENTHAL: I'd like to -- rework. Rework has an enormous amount of face validity.

COMMISSIONER BERNTHAL: Rework means you do the job once and it isn't done right?

MR. ROSENTHAL: You do it once; you think from your PRA's that you have 01 trains, which means you've got to have 001 components. That means that if you work on that and you fix it, fine. It broke, you fix it. You surely expect next time you demand it or next time you surveil it, at whatever the surveillance interval is, that it will be operable. And if you have a plant that has to go in -- and we have the example with RCIC or steam-driven aux feedwater which we know are important -- where they go in and surveillance interval by surveillance interval go in and fiddle with it and fiddle with it and fiddle with it.

COMMISSIONER BERNTHAL: Right. Sort of like my car. But rework is one. Give me another example.

MR. SINGH: Another example is the number and duration of items out of service.

COMMISSIONER BERNTHAL: And INPO does not collect those data right now.

MR. SINGH: No.

COMMISSIONER BERNTHAL: Okay, thank you.

CHAIRMAN ZECH: Proceed, please.

MR. ROSENTHAL: Cause codes, Slide No. 10.

[Slide.]

The NRC has in the past and continues to disaggregate

LER data, and we find it useful. Again and again, whether it's a commissioner site visit or input to NRR in a program or looking at PI data, you have relatively little data, it is seemingly disparate events, there are two trips and one safety system failure -- you say what does it all mean. And there's this need for sewing a common thread between those events. We think that associating those events with broad programmatic areas provides some useful information, and that's why we want to do it.

We believe that by disaggregating information that's reported to us into these broad programmatic areas, we can identify areas of weakness. Surely it's softer than how many trips did you get or what was your forced outage rate, but we think it would be useful.

And we think we can monitor the effectiveness of corrective actions, and I'm very interested in the case where the corrective action and the cause don't match, where you see a hardware deficiency and it's fixed by additional training of the operator or a procedural change, and it's not one, but when you see many lining up then there's reason to question.

We think that disaggregating the causes will be predictive. Right now about half the LER's we receive end up in the current PI program as some data point, and about half don't. There's been work over the years to say that little problems that you may find, the event that wasn't safety-

significant but reveals a programmatic deficiency will come back to haunt you in some bigger event. So by using all the information that's available to us, we think we can get a leg up in terms of deficiencies in programs.

You have to use this stuff in conjunction with everything else you have; you can't make any judgments unto themselves. And in fact the maintenance indicators you'd use in conjunction with all the other information. It gives us an independent view of programmatic effectiveness.

I want to talk a little bit about quality control.

COMMISSIONER ROGERS: Before you leave that subject, the specificity of some of these categories is really very different from one to the other, and your Category 4, design, installation, fabrication -- that is such a broad category. Do you really feel that has value? It's so enormously broad, what do you do when you see something there? It involves a number of different kinds of activities.

MR. ROSENTHAL: You have established plants that are 10, 15, 20 years old, and we still read about problems in these areas. But you expect in a mature plant to have relatively few of this nature. After all, they were built, they were tested, they'll run. You aggregate into this category, you ideally will have very few things falling in there. And when you do, it causes you to then go look at the details of what went on. So it's simply a trigger --

COMMISSIONER ROGERS: You expect that to be rather infrequent then.

MR. ROSENTHAL: Hopefully. And then -- but you don't use that category alone. All you do is you say okay, that's a trigger. Now because that stuff is important, I've got to understand each event.

COMMISSIONER ROGERS: It's just that the way you ultimately want to display this -- and you will be saying something about that in these pie charts -- that's going to be buried, it's going to be hard to see any activity in that and changes in it.

MR. JORDAN: That's why we would be simply looking for a plant with an unusually large wedge in that area, and then backing up, for instance, to the corrective action. If they have a large wedge there in corrective action it's very frequently design modification or equipment replacement. One can learn more from that.

COMMISSIONER ROGERS: From what I'm hearing it sounds to me like you're going to see -- that's going to be almost a little straight line in that pie chart --

MR. JORDAN: That's what we anticipate.

COMMISSIONER ROGERS: -- of zero area, almost always.

MR. JORDAN: It's an important element. If we look at the logic chart in terms of what contributes to risk, if the plant has a number of design issues, then this might be a way

of getting an early indication of it.

MR. ROSENTHAL: My branch reviews 3500 LER's a year and I think last year, 1987, we have roughly about 100 that we would put into that category. But we tend to classify those as significant.

Let me get to the QA and then I'll get back to your other question. One, you have to read those LER's by knowledgeable engineers; you can't rely on boxes checked. Two, and this is true for the entire PI program, we collect data and we send that data out to the regions and we send it out to NRR, and it's a two-way cycle that we go through and then we publish the data.

So that LER then in which we've associated, let's say, a maintenance deficiency can have the imprint of the regions who know far better what's going on at that specific plant. So that's one way of upping the QA.

The next thing is that we have envisioned that Synet will ultimately come into being, and that will allow us to correlate other regional products such as inspection reports with LER's, and that also will increase the quality.

And then the last thing is, of course, you'll have to be mindful that you don't ascribe to this more than is justifiable.

COMMISSIONER BERNTHAL: I want to make a comment as well. Commissioner Rogers picked up on an important point I

think. I noticed that there also are -- there is a diversity to be sure, but at least what appears to be two or three rather different and important categories, as you well know I guess, in these cause codes, and the one that interests me the most, frankly, or the several that interest me most are the ones that clearly relate to management. We've talked about management in many respects around here, the difficulty of getting any kind of management performance indicator. I've seen individual utilities, frankly, attempt to do that with some greater and lesser degrees of success. We aren't very good at it, period, around here, probably never will be, if anybody is very good at doing predictive management assessment. There's no evidence yet that we are.

But there just may be something in this; things like licensed operator error, other personnel error, administrative control problem. And you might even go out to Clinton because I know that's one plant -- you've probably already done this -- where they have attempted at the initiative of the plant manager there to set up a kind of management system like that.

I'm not suggesting another great new realm that we delve into here, but if simply by the cause code approach, which I think in principle can work fairly well, you can get that done, that kind of information, that would be good.

MR. ROSENTHAL: The admin control is particularly of interest to us in the kind of events we see. I have to say

something about a random equipment failure and maintenance problems. Often you see people ascribe equipment failure as the cause of 50 percent of the problems, and we want to distinguish between what we call random equipment failure and a maintenance problem.

A lightning strike I'll say is random. An alpha particle ripping through a chip and causing you to drop a bit I'll call a random failure. But a clogged fuel strain on a diesel line in my mind is a maintenance deficiency and not a random failure. A rotating bearing that blows -- you ought to find it before it catastrophically fails. And so we'll ascribe those to maintenance rather than to equipment failure, and we're going to be very critical in assessing what's going on there.

MR. JORDAN: That's the reason that the definitions that we lay out for these are very important and that we have trained reviewers who do it in a consistent way continually thereafter.

CHAIRMAN ZECH: Let's proceed.

[Slide.]

MR. ROSENTHAL: Slide No. 12 shows corrective actions and we intend to monitor those, and I'd like, if there are no questions, to move on to Slide No. 13, please.

[Slide.]

In Volume II of our report now we list each event

that has taken place and give a one-line description of that event. Let's say it's a safety system failure -- well, what system was it, when did it fail, how did you find out, was it an LER, a 50.72; and for people on, let's say, my level, I find that Volume II more interesting than some of the top level graphics.

We've had people from the region say you know, I knew about each of those events but I never realized that there were six events in the last eight months all involving, let's say, RCIC. That was a specific case. And putting it on a piece of paper and you can read each event -- RCIC, RCIC, RCIC -- then you start getting a pattern. And that Volume II will have the corrective action. We're not proposing a graphic display at this time. And you'll look and you want to see how many times are they going for procedures, and how many times is the cause described as operator personnel. So that's the backup for the graphics, and it gives us an audit ability of the system which I think is very important.

Anyone reading that, be it a licensee or somebody in the region, can see how the top level graphics were developed from the individual events. It's all out in the open. That's the way I think we ought to go. Next slide, please.

COMMISSIONER ROGERS: Excuse me, just on that, you're going to have some kind -- you've got a review process. This cause now, where does that come from? Is that the one that the

licensee -- or is that the one that's at the end of your process?

MR. ROSENTHAL: We have done a lot so I randomly picked an LER and I read it for myself, and this is a real LER and I said could you really say what's going on here. Okay? And if you read that LER -- it's a real one -- it really is --

COMMISSIONER ROGERS: But you're developing a data base here. These sheets will be a data base for the future.

MR. ROSENTHAL: Right.

COMMISSIONER ROGERS: Now, what is the status of that cause analysis? Where did that come from? In the future as you accumulate this.

MR. ROSENTHAL: From an engineer reading that LER from a QA cycle that involves the region and NRR prior to publication, and ultimately enhanced by advance data. So that's the --

COMMISSIONER ROGERS: That's the terminal assessment then of this cause; it's not a preliminary, it's not one that just comes from the licensee --

MR. JORDAN: No, that's right.

COMMISSIONER ROGERS: -- when the LER is filed. It's a review after that. And it could be different from what the licensee --

MR. ROSENTHAL: It will often be different.

MR. JORDAN: And presently, we have cause codes in

the Oak Ridge data system and so we're issuing new instructions on what the causes are and what the rules are ascribing the causes.

COMMISSIONER ROGERS: Okay, fine.

[Slide.]

MR. ROSENTHAL: We can prepare bar charts that are not fancy but that are consistent with the other information in the program. Now, you couldn't use pie charts -- Slide No. 15, please.

[Slide.]

-- without Slide No. 14, because if you're talking about relatively few data -- you know, if you have a lot of data then the pie charts look wonderful. But if you have relatively little data you'll see swings in the pie chart that really don't have anything backing it up. So you have to use the package as a whole. I like the pie charts because it shows a real good graphic snapshot about what's the relative mix of this plant, and how is it changing. Slide No. 16, please.

[Slide.]

And you could also look at the plant and compare it to some sort of industry average.

Now, the relative proportions here are going to be different than you're used to seeing from, let's say, EPRI type splitting where you get half equipment and half personnel because of our driving that maintenance versus random equipment

failure. So it would be different from, let's say, the EPRI program.

And with so much information, it sums to 100 percent, so what you're looking for here is does that plant profile look significantly different than the industry average profile? It's something to light you off and then I go look and read that Volume II stuff and that's when the real work starts.

With that, I'd like to turn the presentation over to Carl Johnson.

MR. JOHNSON: Thank you, Jack. Slide No. 20, please.

[Slide.]

As you recall, the logic model we used for performance indicators is based on risk considerations. For example, safe plant operation implies a low frequency of transients and a high availability of safety systems, and a high availability of safety systems in turn implies a high availability of individual trains and a low potential for common cause failures due, for example, to programmatic problems of maintenance, training and so forth.

The existing indicator for unavailability of safety systems is safety system failures as reported in licensee event reports. During the past year, we've developed an improved indicator for safety system availability based on research done by Brookhaven and SAIC, and in ongoing discussions in the staff in the few days since we just sent you this paper we've made

two changes in this indicator for unavailability. One is we changed the name to safety system function trends in order to emphasize that the value of this indicator is for trending unavailability, not in the absolute value itself. And secondly, instead of aggregating the data to an overall indicator at a plant level, we believe it is more accurate to aggregate the data to individual system levels for some important safety systems and look at the trends of the important safety systems.

CHAIRMAN ZECH: Is the goal here for predictive purposes, predictive validity and looking into the future? Is that what you're trying to do here?

MR. JOHNSON: This is an outcome indicator; this is what has the plant been doing in the recent past, and looking at trends so that we can use the trends to say if that trend continues, is it getting better or worse?

CHAIRMAN ZECH: Okay, fine.

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

[Slide.]

I'd like to discuss the basis for this indicator, what it means, the input data and possible sources for this data, and our plans for future development.

The existing indicator for safety system unavailability is the safety system failures reported in LER's. This uses input data at the system level; in other words,

complete loss of safety system function -- these are events that don't happen very often so they're difficult to trend.

The new indicator uses input data at the train level, aggregates it to an estimate of system availability so that we can see the trends a lot faster.

In order to evaluate the practicality of this indicator we collected data from a BWR and a two-unit PWR and analyzed them to see is it practical. We're also in the process of evaluating some data from another two-unit PWR. And to evaluate how well the indicator responds to changes in plant performance, we used computer simulation. This is illustrated on the next chart.

[Slide.]

Because this indicator uses train level data, this new indicator responds a lot faster than the existing indicator and thus it's more predictive of what's happening. This is a computer simulation of -- the trend line going up is a computer simulation of unavailability of a typical two-train system where the train failure rate is inputted into the computer as having doubled at time equals zero. And you can see that within four to six quarters you have a distinct trend of degrading availability of this system.

With the existing indicator we go for two or three years before we get the first data point; namely, a safety system failure, and of course it would be longer before you

could distinguish a trend.

CHAIRMAN ZECH: Do you have any real data -- this is computer data.

MR. JOHNSON: Yes, we have real data from these three units that I mentioned, but they were done to try out the practicality of using this indicator. Do we find some things when we try to take real data and use it; is there something strange there that we didn't understand.

CHAIRMAN ZECH: Does the real data correlate to your computer simulation?

MR. JOHNSON: Yes, in that it does work and does the same thing, but we were not able to take real data and say -- let's take data from a plant that we believe is going to have an accident and then say could we prove it. So we broke it into two pieces saying use the real data to test out the practicality of using this kind of an indicator, and use the computer simulation to say what could it show us.

CHAIRMAN ZECH: Here's what I mean. Did you use real data or could you use real data that you've had on plants we know we've had problems with in the past few years, take that data and trend it like you did and put it in your computer simulation. Would the problems we've had in the past on certain plants -- real data -- would that correlate and would it have shown trends that would be significant?

MR. JOHNSON: We did this initially when we started

the job to try out with Davis-Besse, looking at unavailability of feedwater, and over the several-year period between when it first started commercial operation and when the loss of feedwater accident occurred sometime ago, there were several occasions when that unavailability of the auxiliary feedwater system would have raised a flag in people's minds about the performance of that plant.

CHAIRMAN ZECH: Did you put it on a chart like this?

MR. JOHNSON: We did not put it on a chart like this to see what we do.

CHAIRMAN ZECH: Why don't you do that? What would it look like?

MR. JOHNSON: I don't know, sir.

CHAIRMAN ZECH: Why don't we do it?

MR. JOHNSON: All right, we'll do it.

CHAIRMAN ZECH: Okay.

MR. JOHNSON: The next chart, please.

[Slide.]

The next chart shows the criteria we use to select the safety systems that we want to monitor. We selected seven important safety systems for monitoring trends in unavailability; six of these account for approximately 90 percent of the increase in core melt likelihood due to taking an individual train out of service. Then we also added a containment function, containment spray. So the scope of this

indicator is the important safety systems that prevent core melt and an important containment system.

[Slide.]

This slide shows what this indicator means. The new indicator monitors trends in unavailability, and this is then directly related to trends in safety performance. Also, this indicator directly relates to maintenance effectiveness, both overall maintenance and preventive maintenance, in the following way. We define maintenance as the aggregate of functions aimed at preserving, restoring safety, reliability and availability. So therefore, a degrading trend in availability of some important safety systems is one indicator of ineffective maintenance.

Also, we can analyze the same input data in a different way and estimate the mean time between failure of these same important safety systems. Now, a preventive maintenance program is intended to prevent failures, so a trend in mean time between failures of these safety systems is indicative of a trend in preventive maintenance effectiveness.

Now usually these two parameters will trend the same way. A degrading availability and degrading time between failures will either be improving or degrading together. But if these trends diverge, that tells you some different information; additional supplemental information. For example, if the availability is degrading but the mean time between

failures is remaining the same, then that could indicate an increase in trains out of service for maintenance, a change in the balance of preventive maintenance in the program, perhaps not helping safety.

This indicator then, safety system failure function trends, provides information on trends in safety system availability and maintenance effectiveness.

Next slide, please.

[Slide.]

The input data are simple. For each of these seven selected safety systems, we need two pieces of data. One is the number of train failures that occurred in each of the trains of these seven safety systems during the quarter and the other is the hours that each of these trains was taken out of service for maintenance, or whatever reason.

We also considered a third category of data, but did not recommend it. This third category would include event type information on each of the train failures, particularly the time of the train failure and the causes. This would make the trends more predictive, because if you knew the causes, causes tend to persist, so you could have more confidence that the trend would persist or if you thought the cause had been corrected, you could adjust your prediction of the trend.

However, this would increase the burden of reporting and we felt instead of asking everybody to report that

information, rather we would go collect that information on an "as needed" basis. The Regions, if there were some cause for concern about a trend, then in that case we could find out this additional information, rather than asking everybody to provide that kind of information.

MR. JORDAN: I think this is a case where the cause codes will be complementary, that is you are looking at a different set of data but if the utility has a problem with one particular activity, you should be able to see it through the cause codes attached to all the LERs.

MR. JOHNSON: In addition to this information on train failures and hours out of service, we do need some one time data on the design of the plant, namely, how many trains are in each of these systems and how many trains are required to perform the system function. Also we need the surveillance interval.

These data on train failures and hours out of service are not now reported to NRC and the next chart shows two options for obtaining this data.

[Slide.]

These two options are rulemaking and voluntary data collection. The staff is assessing rulemaking for obtaining these data and reviewing a similar indicator being developed by INPO and discussions with INPO are continuing.

[Slide.]

In summary, we have developed a risk based indicator that will monitor trends in unavailability and these trends are directly related to trends in plant safety performance and plant maintenance effectiveness.

Our plans for future development of risk based performance indicators are to improve the indicator for frequency of transients and to improve the treatment for evaluating common cause events.

These methods are being developed in 1988 and 1989 and the results will further improve our capability to monitor trends in plant safety performance.

MR. JORDAN: In summary, we are continuing with the development of performance indicators. We have two that we would like to implement on a trial basis. We are proceeding with developing the rulemaking in parallel with our further coordination with INPO, one of those is a success path and we will come back to the Commission with a recommendation of which path.

With the cause codes, we would like to proceed with trial implementation there. That data is already in our possession. We are instructing our personnel who extract this information in a new procedure upon your approval, and then the trial implementation would consist of providing that data to the Office Directors for their trial use in the evaluations that are done semi-annually.

We would not as yet publish it as performance indicators that are in final form and adopted for full implementation.

I believe the staff is proceeding consciously but we feel we are responsive to the Commission's direction. We feel the maintenance area is one in which we have a very good understanding of maintenance effectiveness. We can give you views about plants and their maintenance effectiveness, but we do not yet have good leader indicators that would give you indications about the programs, the candidates, and we are working hard on those candidates and we will continue to do so.

CHAIRMAN ZECH: All right.

MR. JORDAN: We do have some coordination with IAEA, Robbie Singh has participated in some development efforts with them. He was involved in OSAR which uses some of their indicators. We are well appraised of their activities and continue to have that full understanding and coordination.

CHAIRMAN ZECH: All right.

MR. JORDAN: We do have a program that is fully implemented. The data has been found to be useful by senior management. We feel that the industry performance trend data which was a by-product has been extremely valuable. We were very pleased that was a by-product. We plan to continue the development of the performance indicators and the two directions we have described.

CHAIRMAN ZECH: All right, are you concluded?

MR. JORDAN: Yes, sir.

CHAIRMAN ZECH: Thank you very much. Questions from my fellow Commissioners? Commissioner Roberts?

COMMISSIONER ROBERTS: No.

CHAIRMAN ZECH: Commissioner Bernthal?

COMMISSIONER BERNTHAL: No.

CHAIRMAN ZECH: Commissioner Rogers?

COMMISSIONER ROGERS: I think this whole question of validation is key to this. Everything that I heard sounds really very good but it is a question in my mind of really what ultimate use it has for predicting the possibility of problems arising and I think the computer model, of course, will give you a little comfort that you are sort of on the right track in some way, but I would really urge you to spend a significant effort to try to validate these approaches.

I think there is a lot at stake in doing that, to convince the volunteers that it would be useful to them to see what these outcomes are, so they will supply the data to us that is necessary to run this program on a voluntary basis and also give us some confidence that we are not just doing something that sounds very good, but really when all is said and done isn't that useful. I think if you can go back and validate any of these indicators and also particularly the safety system function trends, that looks very, very exciting

to me. It is a marvelous idea.

I would sure like to see some real data that says if we had generated this trend, we would have had an indicator early on, on something that we missed. That also brings to mind some of the latest things that we have heard about, that INPO turned up that we weren't aware of, how about that situation? Can we look at any data there in the light of these safety system function trends or any of your other performance indicators that you are suggesting we haven't been looking at, that would have indicated a problem?

MR. JORDAN: Yes, sir, I understand. We will look in that direction. The validation is very difficult. We have actually, I think, made some change in the process of validation. We were doing statistical correlations among the indicators and then making that correlation to SALP.

Commissioner Bernthal at our last meeting identified that we may have some greatly correlated indicators that may not be really measuring safety. We feel that the logic model is our preferred method, that we establish it does have face validity, it does fit into a safety model and then actually do the trial program, the real data is the best way to assess it.

As you say, look at performance as it has evolved at a particular plant and see if we can understand the data.

COMMISSIONER ROGERS: It looks to me like a very professional and well constructed approach to these problems.

I really want to compliment you. I am very impressed with what I have heard. Again, let's go that next step of convincing us all that it is real.

MR. JORDAN: We have had excellent support from the Offices and the Regions. That is why the program is working well.

COMMISSIONER BERNTHAL: I want to second what Commissioner Rogers has said. I think it is a tribute to you, Ed, that you have developed a philosophy for one thing, you are being very systematic in the way you are approaching it. I would hope you are also cautious and go step-wise as you move along in this entire area, because you have talked about a lot of things, a lot of different indicators, a lot of ways to gather, perhaps require eventually, reporting of information. That could easily get out of hand.

I think you want to proceed deliberately and make sure that what we are doing here doesn't fail to serve the regulatory needs of the agency and safety in the industry.

I was curious about one point. I think this is the one Ken was alluding to. What about the Hatch case? We have been at this performance indicator thing now for a little while at least. How come we didn't seem to pick up what INPO did?

MR. JORDAN: We did look at the performance indicators for the last quarter and Hatch would not, from the performance indicators, have been brought to our attention nor

would we bring it to any other management's attention.

COMMISSIONER BERNTHAL: Is there anything that is in your proposed bag of tricks so to speak that would have caused Hatch to appear on the scope?

MR. JORDAN: We don't know yet. We will examine that data to see if any of those in fact would have.

COMMISSIONER BERNTHAL: I have one item that I would like the general counsel to comment upon. I understand the Memorandum of Agreement with INPO that had been proposed, that OGC had some comments on that or some concerns about it. Are you prepared to speak to that, Bill?

MR. PARLER: I'm prepared to speak to the fact that there were some concerns with the Memorandum, beyond those concerns, which certainly could be accommodated from OGC's standpoint but perhaps not from the staff's standpoint. The staff can speak to that. It was my understanding a policy question was raised as to whether there was a need for an additional Memorandum.

We already have a Memorandum of Understanding with INPO after a Court decision, where we had to have such a Memorandum of Understanding to comply with the Court decision as published in our materials in the Federal Register as part of the policy.

The first question I have is why isn't that good enough. The basic issue that is involved in anything such as

this is this; this agency is the regulatory agency that is responsible for the public health and safety of the American people. INPO provides a very useful role which this agency in performing its regulatory commission can use to complement its responsibility. Now, if one starts in official agreements carving up our regulatory responsibility, that is when this general counsel starts having legal problems. That is the basic issue. Beyond that, I guess we can discuss it later on.

COMMISSIONER BERNTHAL: Thank you. I appreciate it.

CHAIRMAN ZECH: Let me just say, Mr. Jordan, I think you in particular with your leadership in this program have done an excellent job. I would like to compliment your own people, too, both the AEOD staff and the research staff as well as others who have contributed, the Regions, too, all those who have helped. I think you have made significant progress.

I would like to make several comments. First of all, you know, the whole purpose of this program is to see if we can't predict problems. We are trying to look into the future. That is very difficult, as we all know. One of the ways to look into the future is to look into the past, get some trend data that will perhaps indicate declining performance in time enough for us to take actions to prevent more serious incidents. That is what we are trying to do.

The whole performance indicator program, I think it is important to keep that in mind, the purpose of the program

is to try to help us do our job better by preventing incidents. I think you are getting there. This is a very difficult initiative and it needs maturing and it needs all the kind of thinking that you and your fine staff are putting into it.

I am very encouraged by what I have heard. Keep your eye on the ball. We are trying to design a program, not to just gather a lot of data for data purposes. We are trying to do something extremely difficult. We are trying to design a program where we really can extrapolate, the line gets dotted with uncertainty but if we can design a good program with a certain degree of confidence by quantifying as much as we can, perhaps we can have justification for a prediction of perhaps trouble ahead, and then we can do something about it to prevent that trouble from occurring. That is what we are trying to do.

What I am saying is in all the design you are doing, keep track of the forest as well as the trees.

Let me give you one example of what I heard this morning in your safety system function trends, which I think is excellent. It is an excellent logical process. If I understand it properly, previously you had one system that you put existing performance indicators into for safety system failures and all that in one indicator, if I understand it right.

MR. JORDAN: Correct.

CHAIRMAN ZECH: Now what you have done is taken

several more, maybe six or seven different indicators, focused on specific systems that would perhaps result in a safety system failure. Is that correct?

MR. JORDAN: That is correct.

CHAIRMAN ZECH: You have gone from one to many. That is fine in a way, I suppose. I think what you are telling me, the reason you did that is because when you just had one, you kind of had a flat line, it didn't really show you very much. On your new system, you will perhaps get more signals. That is fine.

MR. JORDAN: We should get earlier signals.

CHAIRMAN ZECH: Earlier signals and perhaps more.

All I would say is remember what we are trying to do and perhaps that system you are designing you could use not all seven systems, six or seven, but perhaps you could combine them and still come up with what you are trying to do. What we are really trying to do is make a system that senior management can use and if you need to get down in that level, that is what we will do. If you don't need to get down there and if you, with your very professional people can figure out, keeping the forest and the trees in mind, a way to make those trends come together, so that you can with a fair degree of confidence and logic put them together, so you don't have to look at seven of them, but you are looking at one or maybe two, it might be something for you to think about.

We do need a maintenance indicator. I know it is hard. We need one.

Just a word on the subjective versus objective things. As we have discussed before, you are trying to quantify it, you are trying to make as much objective data we can get our hands around, and that is exactly what you should be doing. As we develop the program and as it matures, it is my experience we will have more confidence in moving from the objective to the subjective. For example, management. We don't know how to quantify management. If we think of this program enough and you get a number of different categories, for example, that you could talk about management and quantify it, for example, turnover rate, operator exams, supervision of even industrial accidents, various things that you can kind of relate to management, have half a dozen of those that your staff might work on, and then result in one perhaps or two categories of management assessment.

In other words, we don't want to just say management is a concern without really knowing what we are talking about. My view is that as you develop this and as your people think about it, perhaps you can show from the regulatory/safety standpoint, which is our mission, that there are certain things that would add up to something we ought to be concerned about for management. It is a very difficult task. Maybe almost too difficult.

Predictive, validity and ability to be confident of the data you have and use real data to proceed to come up with a system. That is extremely important.

Let me just say a little bit about the incidents we have had in the past that we were concerned about. If you can take those significant incidents we have had in the past few years, fortunately, we haven't had any recently, but we have had over the past few years, Davis-Besse, Rancho-Seco, the TVA situation, the Pilgrim problem, Peach Bottom, if you could go into those, now we know we had problems, do what I've heard termed in the past, retrogressive analysis or retrospective analysis, what it really means is analysis by looking back and taking real data from those plants. Now we know what happened, now you can go back and see if at the time we measured all that data, would we have been able to predict something. You can learn something from that. That is real data.

If you can look back and trend that perhaps, then it might help you design performance indicators, are there common performance indicators of those plants that would have triggered our attention perhaps.

MR. JORDAN: Those did lead us to the existing set of indicators, so we did look at that early data.

CHAIRMAN ZECH: That is excellent. Very good. That gives us a fair degree of confidence that we are not just designing something without real significant data.

Those are the comments I wanted to make. I think you are right on track. It is a very important initiative. We are not going to finish it soon but I feel good about it. You are making progress in a very difficult area that perhaps will help us do our job of safety and public health and safety. That is what we are trying to do, keep the plants operating safely and knowing more. We have all this data as you have discovered, Ed, and your people, and now we are trying to bring it together and use it more intelligently and do the very difficult task of perhaps looking into the future and seeing where we can make a very reasoned and at least fairly confident judgment.

I am very pleased with what I have heard and I commend you and your people for the efforts you have made to date. Keep up the good work. We hope to hear from you again in the future when you have developed the program.

MR. JORDAN: We will bring you more on maintenance.

CHAIRMAN ZECH: Good. Anything else from my fellow Commissioners?

[No response.]

CHAIRMAN ZECH: If not, thank you very much for an excellent briefing. We stand adjourned.

[Whereupon, at 11:32 a.m., the briefing was concluded.]

REPORTER'S CERTIFICATE

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

TITLE OF MEETING: Performance Indicators

PLACE OF MEETING: Washington, D.C.

DATE OF MEETING: 4-28-88

were held as herein appears, and that this is the original transcript thereof for the file of the Commission taken stenographically by me, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing events.

Suzanne B. Young

Ann Riley & Associates, Ltd.

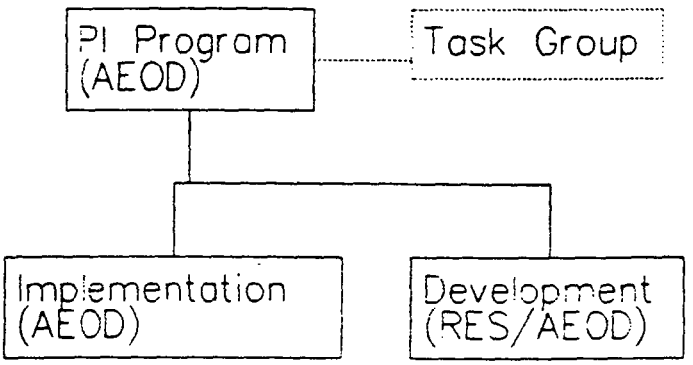
PERFORMANCE INDICATORS

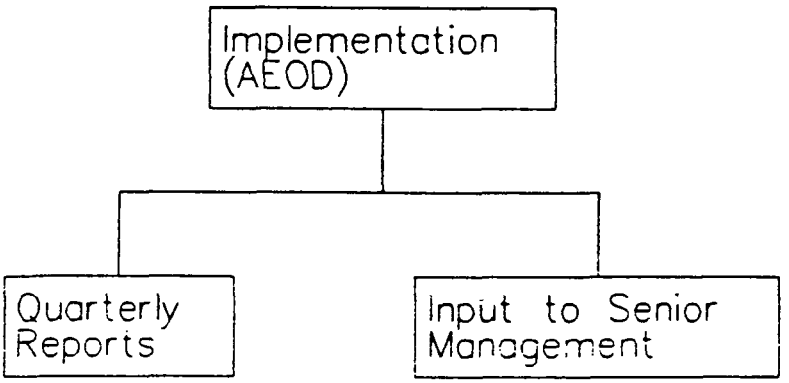
STATUS REPORT

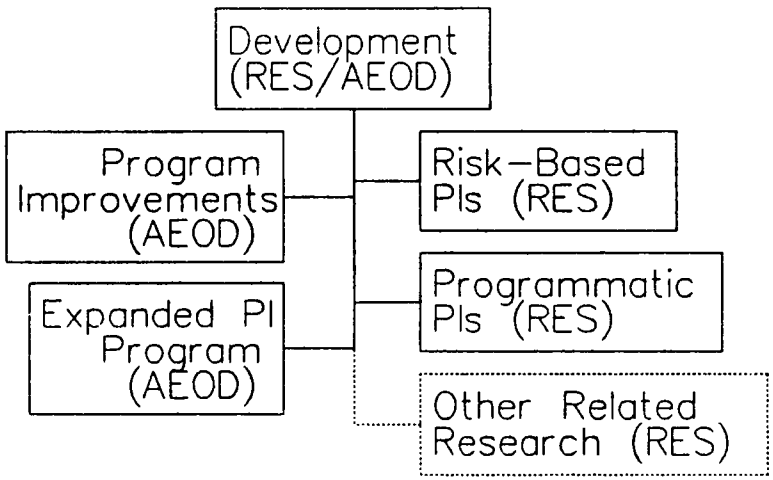
E. JORDAN, ET. AL.

APRIL 28, 1988

PI PROGRAM STATUS




Implementation
(AEOD)
Quarterly
Reports
Input to Senior
Management


Development (RES/AEOD)
Program Improvements (AEOD)
Expanded PI Program (AEOD)
Risk-Based PIs (RES)
Programmatic PIs (RES)
Other Related Research (RES)

RESOURCES FOR THE PI PROGRAM

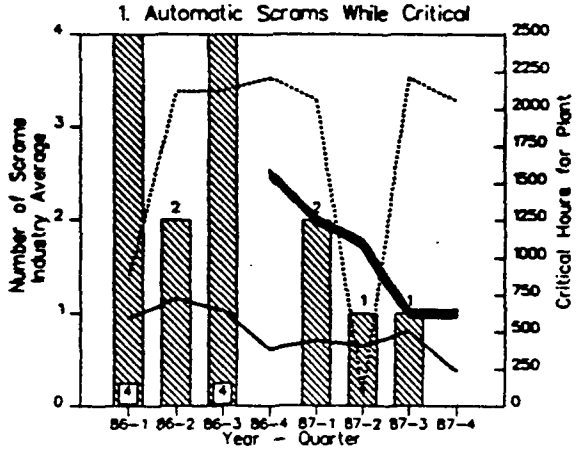
	STAFF	CONTRACTOR
	FY88	FY 88
AEOD	4	$230K ($540K)
RES		
- RISK-BASED PIs	0.5	$400K
- PROGRAMMATIC PIs	0.75	$350K

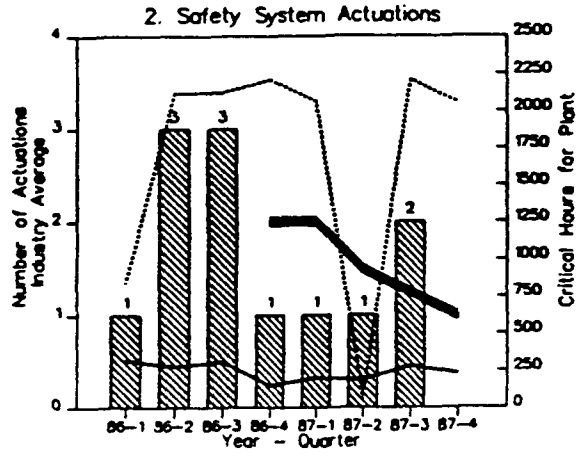
FIGURE 1

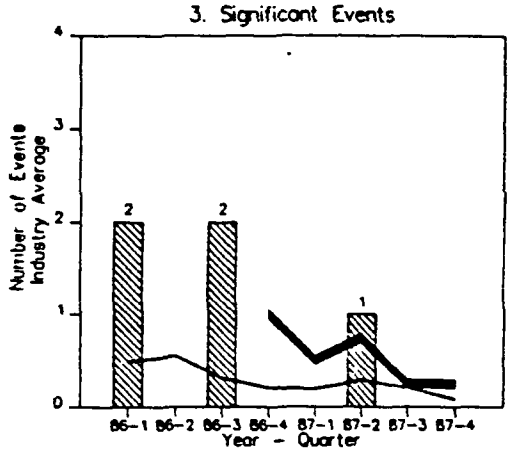
PLANT X

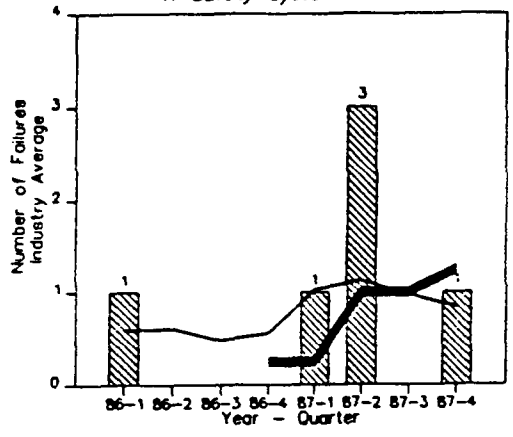
86-1 to 87-4

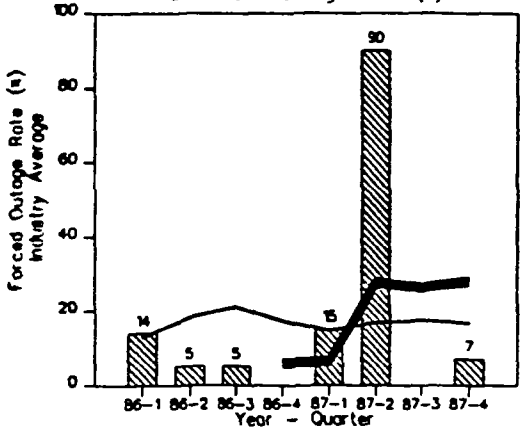
Legend:
- Indicator
- Older Plant Average
- Critical Hours
- 4 Quarter Moving Average

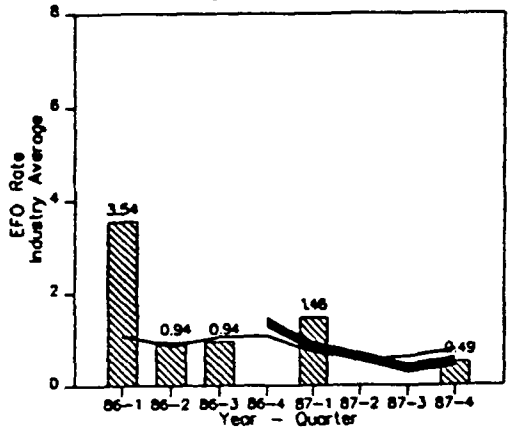


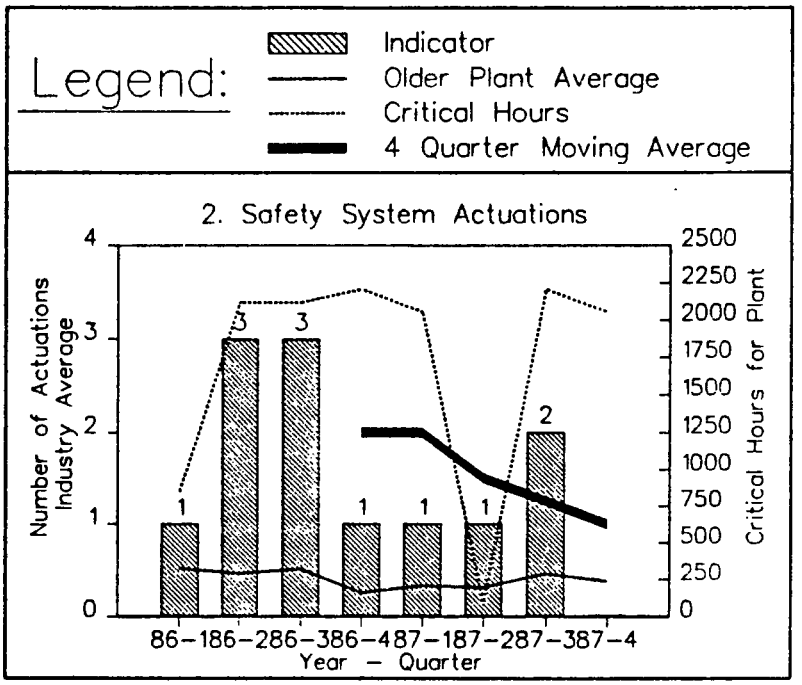


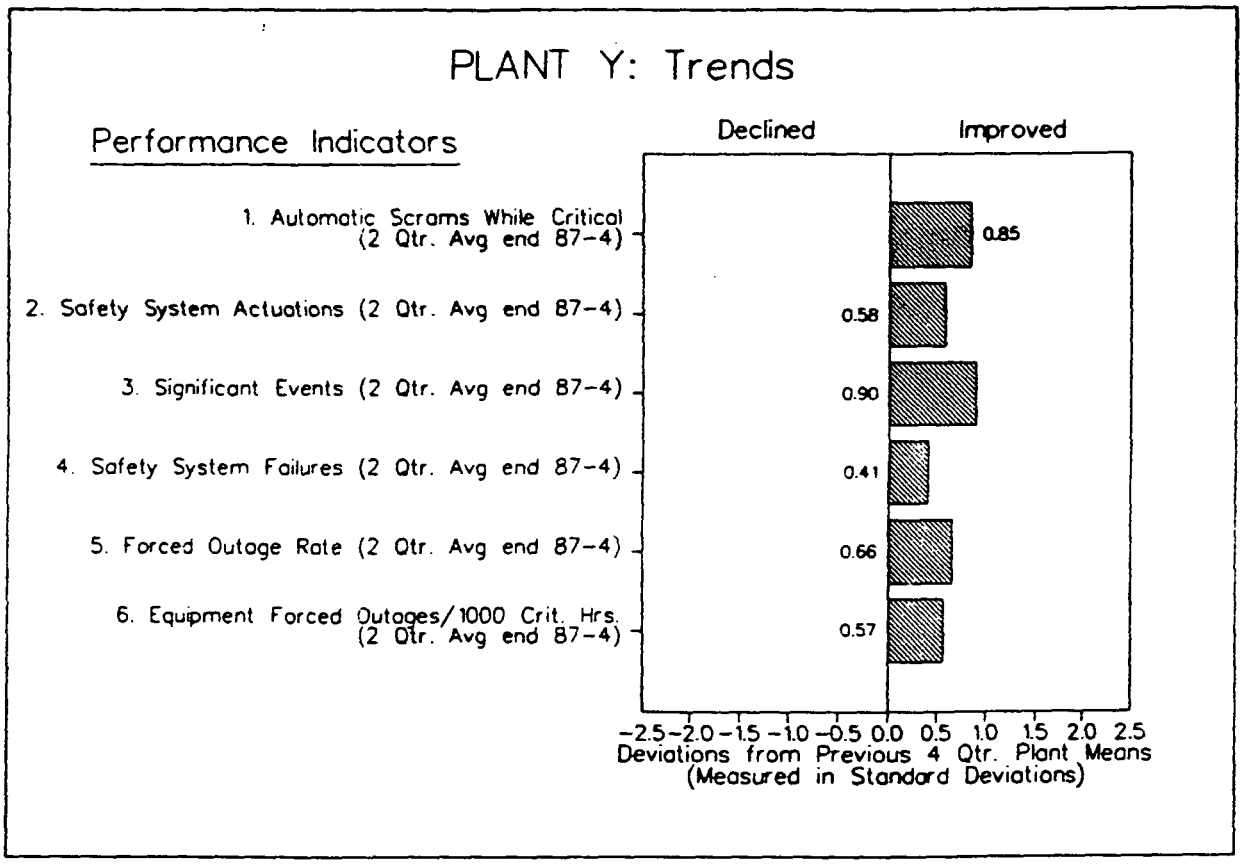


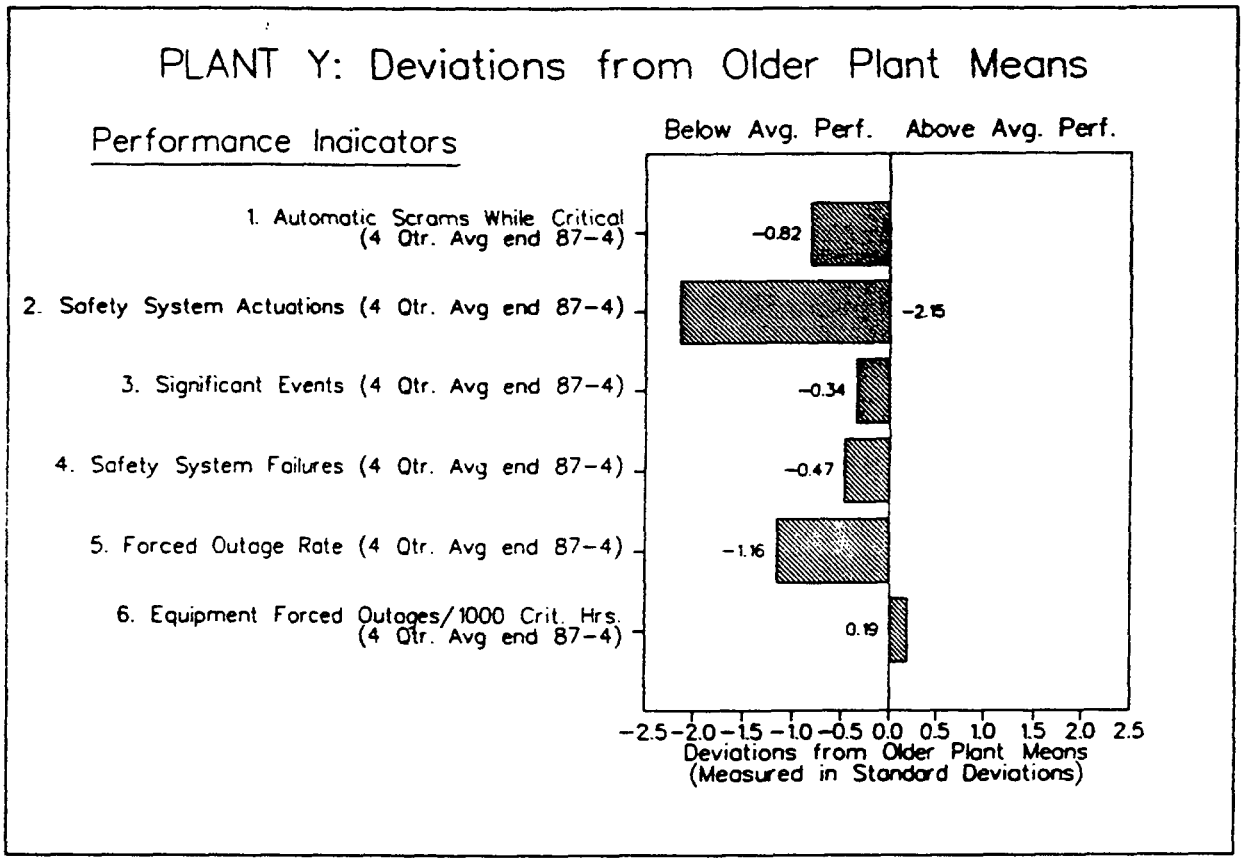







Legend:
Indicator
Older Plant Average
Critical Hours
4 Quarter Moving Average
2. Safety System Actuations
Number of Actuations
Industry Average
Critical Hours for Plant
0
1
2
3
4
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
1
3
3
1
1
1
2
86-1 86-2 86-3 86-4 87-1 87-2 87-3 87-4
Year - Quarter


PLANT Y: Trends
Performance Indicators
Declined
Improved
1. Automatic Scrams While Critical (2 Qtr. Avg end 87-4)
2. Safety System Actuations (2 Qtr. Avg end 87-4)
3. Significant Events (2 Qtr. Avg end 87-4)
4. Safety System Failures (2 Qtr. Avg end 87-4)
5. Forced Outage Rate (2 Qtr. Avg end 87-4)
6. Equipment Forced Outages/1000 Crit. Hrs. (2 Qtr. Avg end 87-4)
0.85
0.58
0.90
0.41
0.66
0.57
-2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5
Deviations from Previous 4 Qtr. Plant Means
(Measured in Standard Deviations)


PLANT Y: Deviations from Older Plant Means
Performance Indicators
Below Avg. Perf.
Above Avg. Perf.
1. Automatic Scrams While Critical (4 Qtr. Avg end 87-4)
2. Safety System Actuations (4 Qtr. Avg end 87-4)
3. Significant Events (4 Qtr. Avg end 87-4)
4. Safety System Failures (4 Qtr. Avg end 87-4)
5. Forced Outage Rate (4 Qtr. Avg end 87-4)
6. Equipment Forced Outages/1000 Crit. Hrs. (4 Qtr. Avg end 87-4)
-0.82
-2.15
-0.34
-0.47
-1.16
0.19
-2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5
Deviations from Older Plant Means
(Measured in Standard Deviations)

STAFF'S PLANS

- INCLUDE CAUSE CODES IN THE PROGRAM
- ASSESS MEASURES FOR IMPLEMENTING SAFETY SYSTEM FUNCTION TRENDS
- CONTINUE DEVELOPMENT AND IMPLEMENTATION

CAUSE CODES

- VALUE AS A DIAGNOSTIC - IDENTIFY AREAS OF WEAKNESS
- MONITOR EFFECTIVENESS OF CORRECTIVE ACTIONS
- PREDICTIVE
- USE IN CONJUNCTION WITH CURRENT EVENT BASED INDICATORS
- INDEPENDENT VIEW OF PROGRAMMATIC EFFECTIVENESS
- QUALITY CONTROL

CAUSE CODES
(PROGRAMMATIC FACTORS)

LICENSED OPERATOR ERROR

OTHER PERSONNEL ERROR

MAINTENANCE PROBLEM

DESIGN/INSTALLATION/FABRICATION PROBLEM

ADMINISTRATIVE CONTROL PROBLEM

RANDOM EQUIPMENT FAILURE

CORRECTIVE ACTION

TRAINING

PROCEDURE

DISCIPLINE

MANAGEMENT CHANGE

DESIGN MODIFICATION

EQUIPMENT REPLACEMENT/ADJUSTEMENT

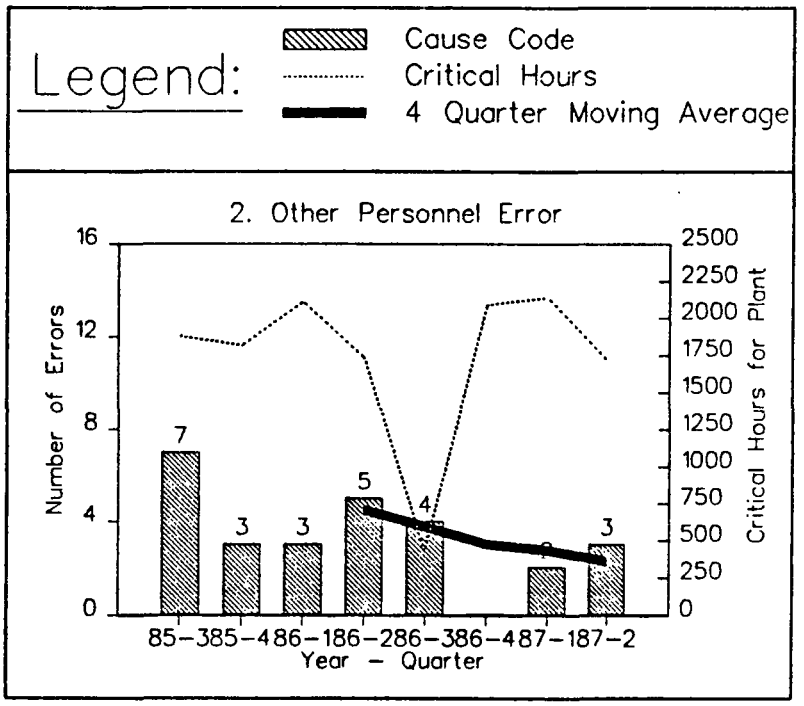
NA 12/17/87 LER#: 34187055 50.72#:
10933 POWER: 60%

CAUSE: OPERATOR/PERSONNEL

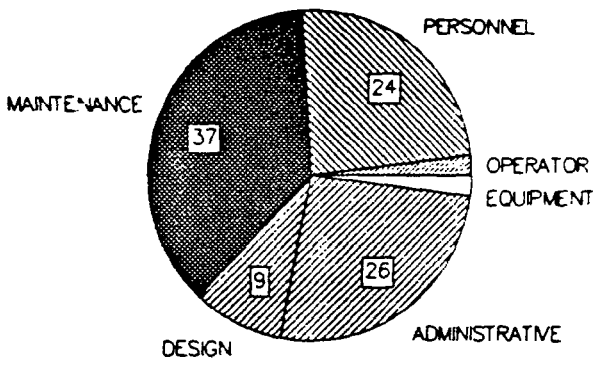
CORRECTIVE ACTION: PROCEDURE/TRAINING

SYSTEM: REACTOR CORE ISOLATION COOLING SYSTEM

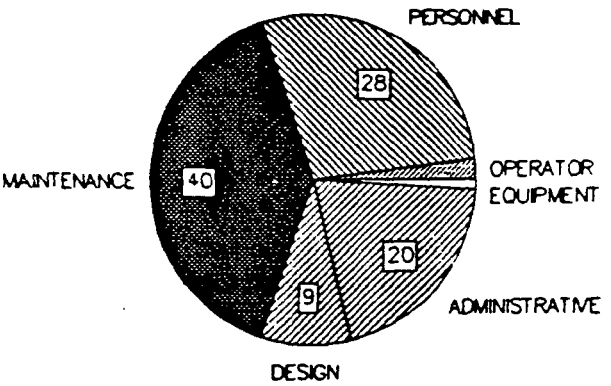
DESC: ISOLATION OF RCIC STEAM LINE WITH RESULTING HIGH DIFFERENTIAL PRESSURE


Legend:
Cause Code
Critical Hours
4 Quarter Moving Average
2. Other Personnel Error
Number of Errors
Critical Hours for Plant
16
12
8
4
0
2500
2250
2000
1750
1500
1250
1000
750
500
250
0
7
3
3
5
4
3
85-3 85-4 86-1 86-2 86-3 86-4 87-1 87-2
Year - Quarter

PERFORMANCE INDICATOR CAUSE CODES
PLANT Z: Trends

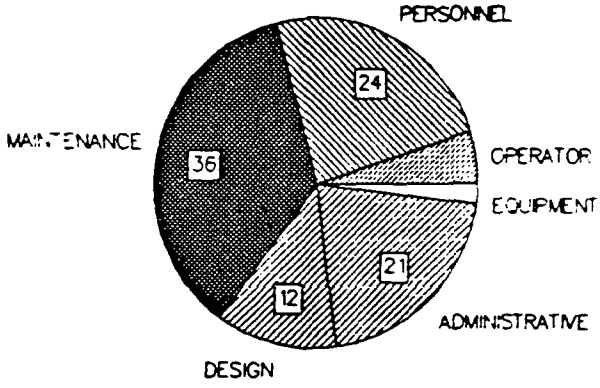


PREV. 4 QTR. AVG.
FOR 31 LERs

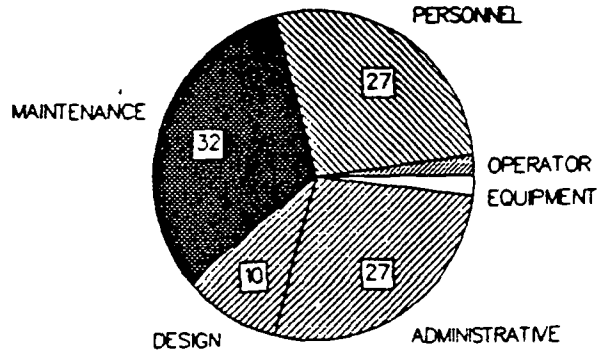


2 QTR. AVG. ENDING 87-4
FOR 12 LERs

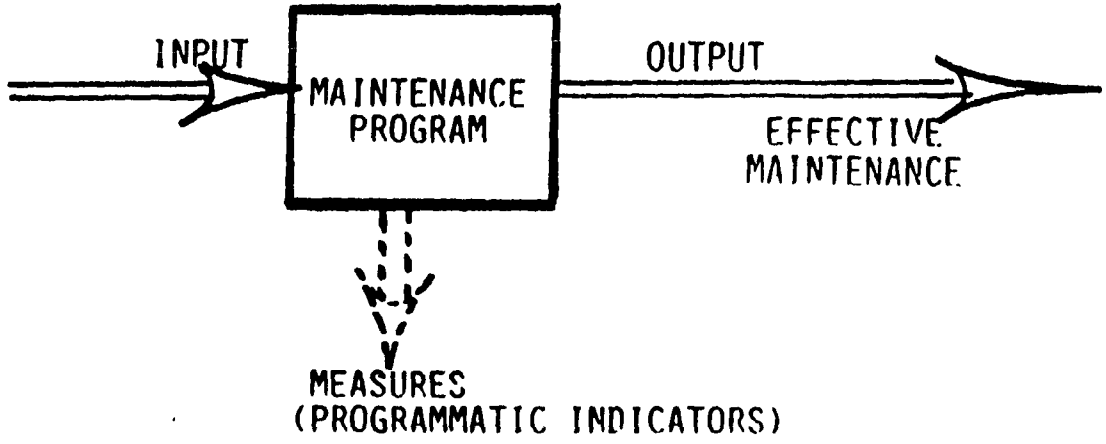
PERFORMANCE INDICATOR CAUSE CODES
PLANT Z: Deviations From Industry



INDUSTRY DISTRIBUTION FOR 1987
FOR 30 LERs/PLANT



PLANT DISTRIBUTION FOR 1987
FOR 37 LERs


INPUT
MAINTENANCE PROGRAM
OUTPUT
EFFECTIVE MAINTENANCE
MEASURES
(PROGRAMMATIC INDICATORS)

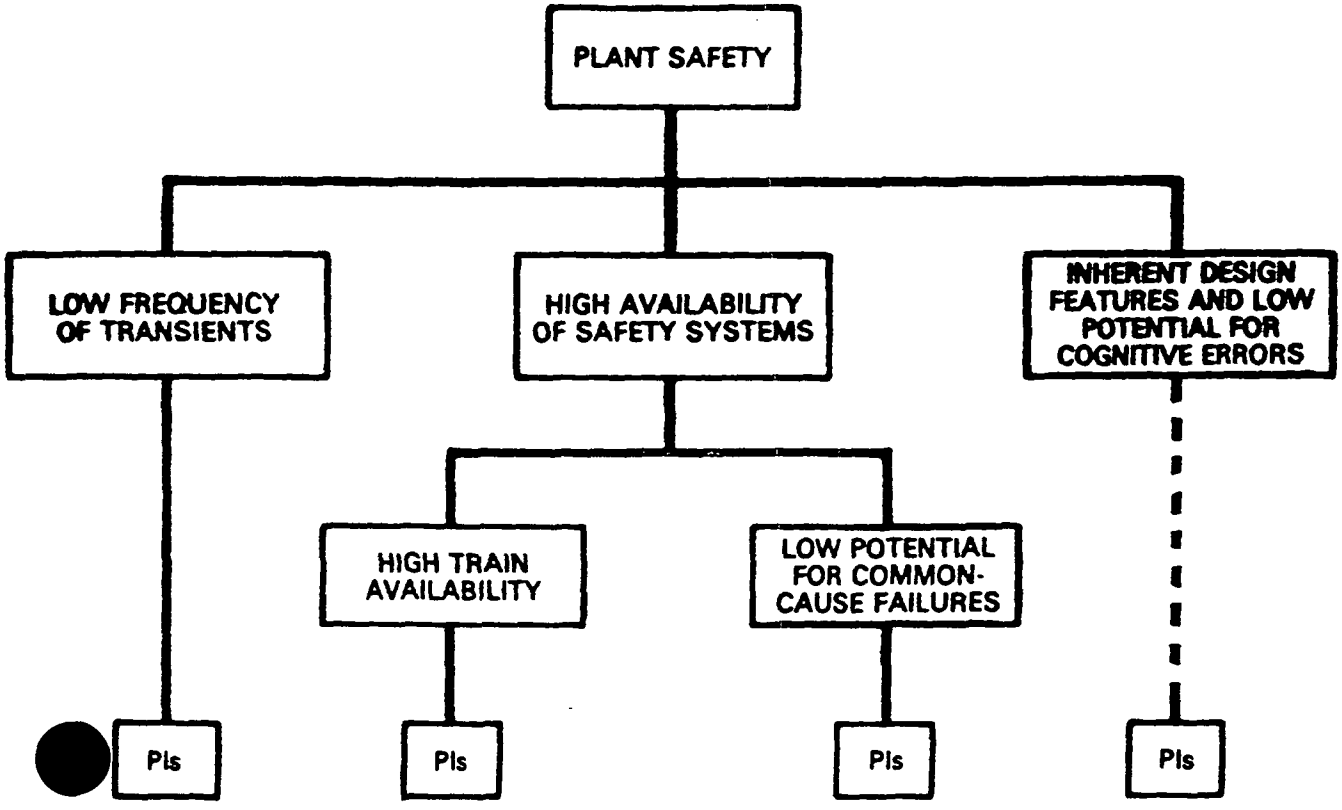
CANDIDATE INDICATORS OF MAINTENANCE

- MAINTENANCE REWORK
- REPEAT EQUIPMENT FAILURES IN INDIVIDUAL SYSTEMS
- ITEMS OUT OF SERVICE
- MEASURES OF MAINTENANCE BACKLOG
- OVERDUE PM
- CORRECTIVE & PREVENTIVE MAINTENANCE RATIOS
- MEANTIME TO REPAIR

EXPANDED PI PROGRAM

- VOLUNTARY
- FEW PLANTS
- RAPID ASSESSMENT OF PLANTS
- INFORMATION (EXAMPLES)
  - LCO HOURS
  - NUMBER OF ITEMS OUT OF SERVICE
  - OVERTIME
  - SIMULATOR TRAINING HOURS

PLANT SAFETY LOGIC MODEL



NEW PIs

- CAUSE CODES

- CAUSE CODES
- Safety System Function Trends

- CAUSE CODES

- CAUSE CODES
- Safety System Function Trends

EXISTING PIs

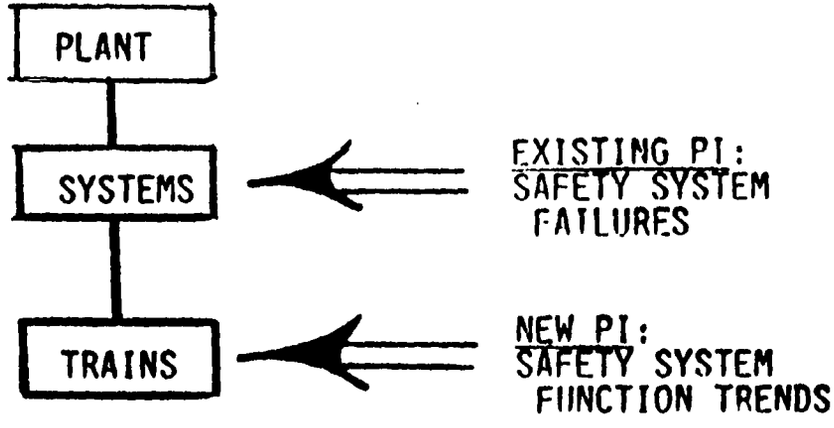
- SCRAMS
- SAFETY SYSTEM ACTUATIONS

- SAFETY SYSTEM FAILURES

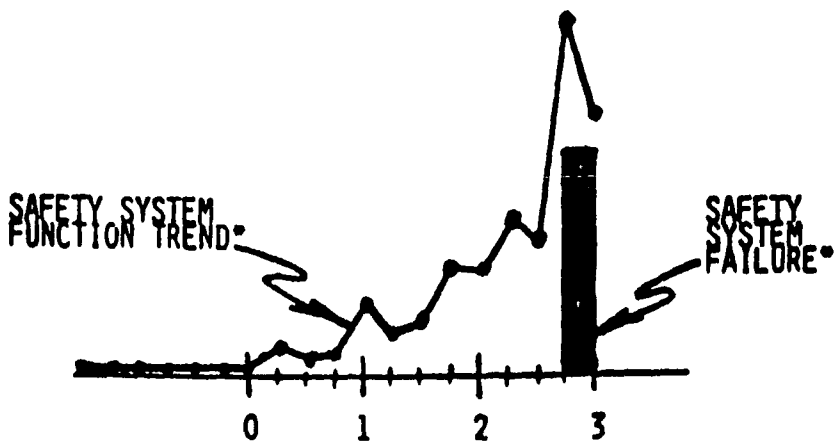
- EQUIPMENT FORCED OUTAGES
- COLLECTIVE RADIATION EXPOSURE

- SIGNIFICANT EVENTS
- FORCED OUTAGE RATE

SAFETY SYSTEM FUNCTION TRENDS



SAFETY SYSTEM FUNCTION TREND RESPONDS FASTER THAN SAFETY SYSTEM FAILURES



7 SELECTED SYSTEMS

- 6 ACCOUNT FOR APPROX 90% OF INCREASE OF CORE-MELT LIKELIHOOD DUE TO TRAIN OUTAGE.
- PLUS CONTAINMENT SPRAY.

SIGNIFICANCE OF SAFETY SYSTEM FUNCTION TRENDS

- SAFETY SYSTEM UNAVAILABILITY TRENDS.
- MAINTENANCE EFFECTIVENESS.
  - OVERALL
  - PREVENTIVE

INPUT DATA

- NUMBER OF TRAIN FAILURES.
- HOURS TRAIN IS OUT-OF-SERVICE.

DATA SOURCES

RULEMAKING: ASSESSING RULEMAKING FOR OBTAINING THE DATA.

VOLUNTARY: REVIEWING SIMILAR INDICATOR BEING DEVELOPED BY INPO. DISCUSSIONS WITH INPO WILL CONTINUE.

FUTURE DEVELOPMENT OF RISK-BASED PERFORMANCE INDICATORS

- IMPROVED INDICATOR OF FREQUENCY OF TRANSIENTS.
- IMPROVED METHOD FOR EVALUATING COMMON-CAUSE EVENTS.

SUMMARY

- PROGRAM FULLY IMPLEMENTED
- REPORTS BENEFICIAL TO SENIOR MANAGEMENT
- INDUSTRY PERFORMANCE TREND USEFUL BYPRODUCT
- STAFF PLANS TO ADD CAUSE CODES AND SAFETY SYSTEM FUNCTION TRENDS
- DEVELOPMENT OF PIs CONTINUING