# UNITED STATES OF AMERICA

# NUCLEAR REGULATORY COMMISSION

**Title:** BRIEFING ON STATUS OF MAINTENANCE RULE - PUBLIC MEETING

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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BRIEFING ON STATUS OF MAINTENANCE RULE

PUBLIC MEETING

Nuclear Regulatory Commission
One White Flint North
Rockville, Maryland

Wednesday, July 26, 1995

The Commission met in open session, pursuant to notice, at 10:02 a.m., Shirley A. Jackson, Chairman, presiding.

COMMISSIONERS PRESENT:

SHIRLEY A. JACKSON, Chairman of the Commission

KENNETH C. ROGERS, Commissioner

STAFF SEATED AT THE COMMISSION TABLE:

JOHN C. HOYLE, Secretary of the Commission

KAREN D. CYR, General Counsel

PRESENTERS:

JAMES TAYLOR, AEOD

ED JORDAN, AEOD

WILLIAM RUSSELL, NRR

ASHOK THADANI, NRR

SUZIE BLACK, NRR

RICHARD CORREIA, NRR

P R O C E E D I N G S

[10:02 a.m.]

CHAIRMAN JACKSON: Good morning. I am pleased to welcome all of you here to brief the Commission on the status of the Maintenance Rule. As we all know, the rule was established in 1991, and it will take effect July 10th of '96.

The Commission determined that a Maintenance Rule was needed because, of course, our concern is plant safety, and proper maintenance is essential to that.

The Staff has made several pilot site visits to review early implementation of the rule. The reviews were performed at sites that had volunteered for this early review of their programs for implementing the rule.

Today, my understanding is that you will be briefing us about lessons learned while visiting those pilot sites, and in particularly, you will discuss the adequacy of the inspection and industry guidelines in meeting the requirements of the Maintenance Rule.

I would like to say that the backdrop to today's presentation is the fact that the Agency is essentially moving along many avenues toward risk-based regulation. The Maintenance Rule is performance-based, and risk is being considered in its implementation.

Whether we are talking about the Maintenance Rule,

which is our topic for today, in-service inspection, in-service testing, graded QA, or our actual inspection program, a process for the determination of risk-significant structures, systems, and components seems to be an important aspect of the transition to a more risk-based regulatory regime.

Such a process has been developed for the Maintenance Rule by the industry and has been endorsed by the Staff.

So, as we go along today, I am interested in knowing the generic applicability of this process, and we can perhaps have some commentary on this later to other risk-based initiatives.

It is extremely important that we clearly understand the salient features of the categorization schemes, so that the structure systems and components are appropriately categorized for the various applications.

I understand that viewgraphs are available at entrances to the room, but before we begin, I would like to ask, Commissioner Rogers, if you have any opening comments you would like to make.

COMMISSIONER ROGERS: Nothing much in addition to your own, Madam Chairman, but I am interested in how one perceives this to be a performance-based rule in itself, not just risk, but performance-based. I am particularly

interested in that because that is how we thought about it in the very beginning, and it has been advertised as a performance-based rule. I would just be interested in your comments of exactly how it is a performance-based rule.

CHAIRMAN JACKSON: Now that you know what is on our minds, you may proceed.

MR. TAYLOR: Good morning. With me is Ed Jordan from AEOD, and then from the Office of NRR, Bill Russell, Ashok Thadani, Suzie Black, and Rich Correia.

We believe that the industry is on course to implement the Maintenance Rule by its effective date, and the staff is finalizing the inspection procedure, preparing to train the inspectors who will be assessing industry's implementation of the rule.

Staff will address what we believe are the features of the performance base in the briefing.

The Staff has, as you noted, Chairman, interacted extensively within industry in an open public forum in developing both the guidance for implementing the rule and the procedure for conducting inspections of the licensee's maintenance programs. This was the approach we outlined when we decided to develop a performance-based approach.

Cooperative effort has led to development of an industry guideline, NUMARC 93-01, as well as the regulatory guide which endorses that NUMARC document.

Also, in conjunction with industry, we conducted a pilot program that verified that the guidance and draft inspection procedure can be used to implement and inspect the Maintenance Rule.

The largest challenge still facing the Staff is ensuring that our inspectors have the appropriate depth of knowledge and are consistent in their approach towards inspecting each licensee's implementation of the rule. This is a major concern to the industry.

The Maintenance Rule is expected to be more difficult to inspect than other rules because it allows licensees great flexibility in how they implement it.

Staff is developing a training program for inspectors, and they will provide this training to all resident and region-based inspectors before the effective date of the rule.

We will open with further remarks by Mr. Thadani on the background information of the rule, and then Rich Correia who was on every pilot site visit will present the results of the pilot program and other Staff activities.

Ashok?

MR. THADANI: Thank you, Jim. Good morning.

May I have viewgraph number 2, please?

I am going to briefly cover the rule background and, in particular, what the requirements of the rule itself

are, and then Rich is going to go through the implementation guidance or lessons that we have learned from the pilot visits that have been conducted, as well as our inspection activities. So he is going to go through some of the details of what we have actually found and where we are going.

The next viewgraph, please. May I have the next viewgraph? I'm sorry. No. Go back to that viewgraph.

The rule is this is really the first rule that is pretty much completely a performance-based rule, and it was published in 1991. The Commission decided that it was important to allow plenty of time, in this case, five years, to make sure that the guidance is developed that is adequate in terms of its scope, depth, and implementation, for implementation purposes, to allow time to apply this guidance and learn some lessons by applying this guidance, and that there ought to be enough time available after such initial applications, so that the licensees all across, all the licensees would determine what lessons were learned through these initial pilots, so they could revise their programs and still have a plan that was implemented by July 10, 1996.

The five-year period was provided to go through all of these activities because, to a large extent, of unique aspects of this particular rule. I will touch upon

some of these unique aspects.

As you know, most of our rules, a number of our rules are much more specific in terms of specifying methods, acceptance criteria, limits, and so on. They are very, very particularly, and that, generally, we have characterized as fairly prescriptive rules.

The Maintenance Rule is much more results-oriented and risk-based. I will come back to this issue, how results are used to determine what needs to be done.

As Mr. Taylor mentioned, because this is a performance-based rule, there is, in fact, a great deal of flexibility for the licensees to develop their own acceptance criteria, their own programs to implement what they plan to do, and that makes a challenge, then, to come up with oversight activities to make sure that what we do is, in fact, consistent all across the regions and plants. So that is truly a challenge, in a way, driven largely by the fact that the rule itself provides a great deal of flexibility to the licensees and how they go forward.

I think the good news that you will hear is that at least to the extent we have completed our activities so far, it is our judgment that the guidance is adequate, with some clarifications, and that now we are embarked upon also making sure, as Mr. Taylor said, we implement appropriate training programs and to develop appropriate inspection

guidance for consistent oversight to this rule.

May I go to viewgraph number 4, please?

The rule itself has really a fairly broad scope. It captures a very significant number of system structures and components. The scope covers all those system structures and components that are needed to mitigate transients and accidents and any of those SSCs that appear in emergency operating procedures or failure of non-safety structure systems and components that may impact safety systems.

In addition to that, the scope also includes failures that could cause scrams or actuation of safety systems. So it really is a fairly road scope in terms of content.

Having defined the scope, the next step is as you indicated, Chairman. You have to split these SSCs in two groups, those of high-safety significance and those of low-safety significance.

The techniques that are used to get there are two-fold, basically. One is to utilize individual plant probablistic assessment, IBE or some version of an IBE; in addition to that, conducting importance measure studies to try to isolate what is more important and what might be less important through these measures.

Overall decisions are then made by a

multidisciplinary panel. Not all decisions are based on PRAs, but oversight is provided with this panel. Rich Correia is going to talk some more about that as to how that is done at the plants.

So having now identified, A, the scope and identified what is of high-safety significance and low-safety significance, what I would do is to go first to paragraph (a)(2) of the rule rather than (a)(1). I think it is easier to understand that way.

It could be if the maintenance preventative program is working well, everything in the scope could be put under (a)(2) of the rule, and for the high-safety significant SSCs, monitoring performance against some specified criteria, criteria specified by the licensee. If those criteria are not satisfied, then those SSCs would be moved up to (a)(1) of the rule because their performance was not as the licensee expected them to be.

Also, for those structure systems and components which are not of high-safety significance, if they experience multiple failures, two or more failures, which relate or indicate maintenance-type problems, then those components would also move up to the (a)(1) category of the rule.

Under (a)(1) category, the licensees would then establish goals, monitor performance, and train. The idea

of (a)(1) basically is there are some parts of these SSCs which may not be performing as well as the licensees expected. So, under (a)(1), it enhances the attention of the utilities, and one would expect much more attention to what is under (a)(1) because there is a need to make some improvement. Monitor the performance over a time period and see if, in fact, the expected goals are being met. The goals could be numerical or performance-type goals.

CHAIRMAN JACKSON: Let me make sure I understand something. Since you speak of moving certain SSCs or the possibility from the (a)(2) to the (a)(1) category, that suggests that there is a kind of monitoring --

MR. THADANI: Yes.

CHAIRMAN JACKSON: -- that implicitly goes on in (a)(2) --

MR. THADANI: Yes.

CHAIRMAN JACKSON: -- but that by movement to the (a)(1) category, the degree of monitoring is heightened by virtue of the goals, the performance goals that are set, and the monitoring that is required relative to those goals.

MR. THADANI: Yes. There are two parts. Yes, basically, that is correct.

You will do more training under (a)(1) because you want to enhance. So you want to make sure at some intervals, and I will come back and say what is done under

(a)(3) because that also relates to assessing performance over a time period.

CHAIRMAN JACKSON: Right, but I am saying the fact that there is a mechanism that would move certain SSCs from the (a)(2) to the (a)(1) category implicitly says that there is some monitoring in the (a)(2), for SSCs in the (a)(2) category.

MR. THADANI: That is correct, further high-risk significance motion of the SSCs.

For those that are of low-risk significance, you can wait until they are failures. So one can tolerate failures because there is much lower safety significance to those, and if there are two or more failures relating to maintenance, then you would enhance attention because that would raise questions is there a problem with the maintenance program itself. So that is the distinction in terms of where you monitor. Where you may not need to monitor, you can, in fact, wait until there are actual failures.

COMMISSIONER ROGERS: Just before we move on, how did the licensees -- and maybe that will come later with Mr. Correia -- how did the licensees in the pilot program identify something as category (a)(1) if there had not yet been any opportunity to develop a performance history to make that judgment?

MR. THADANI: If you do not mind, I think that is a very important question, and that is part of what Rich is going to cover, and some of the industry concerns as well, because one of the concerns -- I don't want to take away Rich's ideas.

CHAIRMAN JACKSON: Steal his thunder.

MR. THADANI: That is right, but there is a concern on the part of the licensees as to what gets put in (a)(1) and how it is perceived by the Agency, but Rich is going to go into more detail.

Paragraph (a)(3) of the rule calls for two key things. First relates to once during refueling outage not to exceed a 24-month period. It does not have to be done during an outage, but at least once during that period, the licensee needs to evaluate performance of their activities; that is, goal-setting, trending, performance criteria, and so on. They need to take a look at how things are working.

In that look, the rule recommends that industry feedback experience be considered if a new failure mode has been identified; for example, the specific licensee would gain by taking a look at the industry experience. So there is an encouragement to the licensees to take into account industry experience as they look at their goal-setting and so on and their performance over that time period.

They also have to evaluate during this period how

well did they really do in terms of balance and unavailability and unreliability. In other words, if you were looking for, let's say, a system or component, your expectation was it is unavailable and unreliable. The total needs to be, let's say, 10 to the minus 3 per year or so, and you find that your unavailability through preventive maintenance was much higher. You used up many, many days conducting preventive maintenance.

So, in facts, its overall unavailability was much higher than 10 to the minus 3. Then you probably have not balanced well the idea of preventive maintenance and reliability of this system.

So the licensees need to take a look to make sure there is a reasonable balance in maintenance and expected reliability of the SSCs.

COMMISSIONER ROGERS: Is there any way to judge what is reasonable?

MR. THADANI: Let me use an example. In your IPE, you looked at historical data. You have done the best you can and assigned overall unreliability of auxiliary feedwater system or trained to be 10 to the minus 2.

Then what you would want to do is you would probably want to track both the failures, failure on demand, as well as outage due to preventive maintenance. So, if you keep taking a look at the integral aspects, at least it will

tell you generally where you are.

The easier part of that is going to be if you take the system out for preventive maintenance too long. I think that will catch right away. So that is the kind of thinking that we are encouraging licensees to do under (a)(3).

The other part of (a)(3) -- and this one has received a great deal of attention over the last year or so, and in fact, Bill Russell first raised this issue as a result of one of the visits he made to a plant, and since then, a number of us have been making sure and following up on this issue in our visits to plants, and that has to do with, for a variety of reasons, licensees are doing more and more preventive maintenance while the reactor is at power.

That may be perfectly okay as long as careful attention is given to the configuration the plant is in.

Bill noticed, at least this one plant, they could have done a lot better; that they may be exposing the plant to significant risk by conducting certain maintenance activities on more than one systems which may appear in an accident scenario.

The Maintenance Rule requires of the licensees before they pick a system, let's say, out for preventive maintenance, they need to do a safety assessment to make sure that they are not exposing the plant to significant risk.

So, while I think over the last year the awareness of the industry has grown, our expectation is that the licensees would have, by the time this rule is effective next July, in place procedures to make sure that they are paying attention to the configuration.

So I think this aspect of the rule is also very important in terms of focussing attention on risk, operational risk management issues.

COMMISSIONER ROGERS: Can that be done in real time?

MR. THADANI: Yes.

This is some of the background of the rule. Rich has the tougher job of telling you how things are going and how we are going to get there. We have some ideas on how we can bring consistency in our decision-making.

Rich?

COMMISSIONER ROGERS: I think it is very fair to say that this aspect of the situation can, in fact, lead to greater safety --

MR. THADANI: Yes.

COMMISSIONER ROGERS: -- because I think when the licensees have to contemplate very seriously the entire status of the plant, everything that is going on, and the risk significance, that is quite different, I think, from the way they have looked at the plant in the past.

Sometimes they have; sometimes they haven't.

We have known of instances where things were going on that not everybody knew about.

MR. THADANI: That is right.

COMMISSIONER ROGERS: That is very serious in increasing core damage probability.

So I think, in a way, it is a healthy development because if done very well, it will, in fact, assure us that the licensees are looking at the entire system at the same time if they contemplate on-line maintenance and have to look at the risks of more than one system being out at the same time.

MR. THADANI: Yes. I fully agree with you.

MR. CORREIA: Thank you, Ashok.

Before I start discussing the results of the pilots, I would like to briefly mention the three documents that were used during the pilots.

Slide 5, please.

The industry guidance document, NUMARC 93-01, we have determined provides an acceptable method for implementing the rule. It was developed with quite a bit of staff interaction with industry when it was developed.

Industry performed a verification and validation effort before it was issued in May of '93, and as a result of the pilots, NEI plans to clarify the document.

Our regulatory guide 1.160 endorses NUMARC 93-01, and we also may revise that as a result of the changes to 93-01.

Our draft Maintenance Rule inspection procedure was first issued in December of '93. We followed up with a public workshop in March of '94, made some subsequent changes to the document. Then we proceeded with the pilots. After the pilots, we made some additional changes and had another public workshop to give industry and the public an opportunity to look at the results of the pilot and the changes we made to the inspection procedure.

We plan to have the final version of the procedure issued next month.

Next slide, please.

Ashok has already gone over most of these implementation steps that licensees will use to implement the rule. There was some specific questions on the risk determination.

Basically what they do is after they determine which SSCs are within scope, they would then evaluate using PRA insights or importance measures, which of those SSCs are more risk-significant than others, and come up with basically two categories, high and low risk.

Those lists then go to what we call the expert panel, a multidisciplinary team from operations, maintenance

engineering, PRA, site-specific staff, that would evaluate the relative risk ranking, which SSCs are risk-significant, which are not, to make the final determination for that particular site, which ones are considered risk-significant and which are not.

The idea behind the expert panel was to compensate for the limitations of the PRA insights. For example, containment systems may not be included.

Once they have determined which are high risk and low risk, then they would determine for the high-risk significant SSC's specific performance criteria that they would monitor against. So both risk-significant and standby systems would have specific performance criteria.

The low-risk systems could be monitored at the plant level, such as plant scram, safety system actuations.

Once they have determined the criteria, then they would go back and look historically at actual system performance and compare that to the criteria that they have established. If the actual performance has been better than the criteria, then it goes to the (a)(2) category essentially saying that preventive maintenance has been effected up to that point.

If performance has not been acceptable, then that would be cause to go to (a)(1) and set goals and monitor there until such time performance has improved, and then

they could move it to (a)(2). That is essentially how they make that first determination.

I think we recommended two refuel cycles of three years of historical performance reviews.

CHAIRMAN JACKSON: Again, what is the trigger, though, to go from (a)(2) to (a)(1)?

MR. CORREIA: Basically, there are two methods. If actual system or equipment performance exceeds the criteria that have been established by the licensee, that would be reason to move to (a)(1), or if there are repetitive maintenance, preventable functional failures.

There could be situations where you could have repetitive failures, yet not exceed the criteria, which would be cause of concern that preventive maintenance has not been effective and it should move to the (a)(1) category. Those are essentially the two methods.

CHAIRMAN JACKSON: Wasn't there a fair degree of variability even for similar plants of the SSCs that should be included within the scope of the rule as well as those that were considered to be risk-significant, and how do you account for that?

MR. CORREIA: Yes, there was, and we included in our NUREG the lessons learned from the pilots 1526 three tables that I think will demonstrate the variability between plants, and a lot has to do with plant-specific design,

architect/engineer configuration of systems, and the flexibility that the Maintenance Rule allows licensees in determining which SSCs are within scope and also the relative risk ranking.

We wanted to point that out that it was perfectly acceptable to have differences between plants because each licensee determines which SSCs at their plant are within scope and which are risk-significant, and we didn't want necessarily our inspectors to start comparing plants to make sure, if you will, that similar plants had similar numbers of SSCs. It is not the numbers that are important. It is which SSCs are important.

COMMISSIONER ROGERS: Are you going to talk about those tables any more?

MR. CORREIA: Only to mention that it demonstrates the variability that we noticed.

COMMISSIONER ROGERS: I did have a question on table 2 with respect to the risk-significant structures for the different vendor designs. BWR/3 utilities were evaluated. So we don't have a measure there, but the number that stood out to me was for the CE plants, 28, whereas most of the others are just one or none. Why is that so different?

MR. CORREIA: I believe it is because that particular plant broke down their structures in very, very

small areas.

For example, one of the structures that they included were the fire barrier walls in between transformers. I think most plants would have included that in, say, the turbine-building structure.

This particular plant, for whatever design reasons or monitoring reasons, did break down their structures to that degree and, therefore, had 28 structures within the scope.

COMMISSIONER ROGERS: That sounds as if this is really a different standard being applied by and kept in mind by the individual participants in this study. It troubles me a little bit.

I wouldn't read it that the CE plants consist of more risk-significant structures. It is how they analyze. I wonder if that is at all troubling to you that there is one example of a very different way of making the call and whether that added degree of conservatism is, in fact, a useful approach.

MR. CORREIA: I think it would certainly be encouraged. We didn't see anything wrong with the way they decided to monitor their structures. Rather than re-create groups of structures that they would monitor for the Maintenance Rule, they used exactly what they had in place.

COMMISSIONER ROGERS: The important question is:

What are the ramifications of that? What does that lead to? Anything? Is it just an intermediate step in some way that doesn't really make much difference in the long run?

MR. CORREIA: I think for that particular licensee, it would mean more criterion to evaluate. They would have to have condition or performance criteria for each one of those structures and monitoring for each one. It would certainly be more to monitor on a much smaller scale than would if they had, say, five or six structures that they were monitoring.

MR. RUSSELL: Let me clarify. I think two things need to be kept in mind. One, in the license renewal activities, we have identified that an area that is to be developed relates to long-lived passive components, structures, piping, components which have historically not been subject to surveillance activities or testing.

So, as we get into the Maintenance Rule aspects as it applies to long-lived passive components, there is some uncertainty, and there is technical work that is going on now with industry effort and Staff effort looking at structures, long-lived passive components.

I think there is some uncertainty. If they have included, for example, fire barriers, fire is risk-significant in maintaining separation. So, to the extent that they have structures which are fire barriers

between divisions that they have considered separately, that is understandable how that could come out.

CHAIRMAN JACKSON: Mr. Russell, are those passive components what is reflected in this figure? Do you know?

MR. THADANI: Yes, they are.

MR. RUSSELL: It is also not uncommon for different plants to name systems differently even though they are both BWR/4's, you may find that there are different systems, different combinations of components that have gone into the systems, different terminology for structures, different layouts. So we don't see an issue with respect to the initial classification and how it was done. It could very well be different from plant to plant.

If on the other hand we had standard plant designs, if this were a Part 52 facility with a design certification, given that we have already done PRAs and done risk-significant measures, you would see consistency from design to design.

So I think this is more of a fact-of-life change that we have different designs that exist, and the licensees have applied processes where we have agreed to the process for identifying what is in scope and to determine risk significance, and what we are seeing is that those results seem reasonable based upon the way they have applied the process, but it does illustrate that we are going to have a

significant issue, I think, with training because you could have one inspector inspect one BWR/4 and find it comfortable with how they have done the process, go to the next one and want to compare the results between plants as compared to looking at the approaches. So we see this as a significant training issue. That is why we are allowing nearly a year.

We want to start training this fall to have gone through all the regions and all the inspectors with a comprehensive training program before next summer, but this is an element of a performance-based approach where you are looking for the result of how the equipment is performing and not necessarily requiring to put them in particular categories to try and force some standardization of the process.

MR. CORREIA: Thank you. That was basically why we developed those tables of variability between plants, and in most cases, they were all perfectly acceptable.

If I could go to slide 7, please.

The pilot program, we felt was necessary to determine the usability and acceptability of our Maintenance Rule inspection procedure and to provide those volunteer licensees some feedback on implementation of the Maintenance Rule and to share that with the industry.

We went to nine sites. The first site visited was last September, and we finished the program this March. The

sites visited were Byron, Crystal River, Grant Gulf, Hatch, Maine Yankee, Pilgrim, Shearon Harris, South Texas, and Vogtle.

The teams were composed mostly of headquarters people from our branch, the Probablistic Safety Assessment Branch. AEOD had an observer on two of the site visits, and NEI also had observers at all the site visits.

The regions also had at least one to two people on each of the site visits.

Again, the results and lessons learned from the pilots of NUREG 15-26 that we provided by the SECY 95-179, I think in conclusion we determined that the industry guideline document, 93-01, as it is currently endorsed, and Reg Guide 1.160 can be used by the industry to effectively implement the rule, and that the effective date of the Maintenance Rule should be maintained on schedule.

Next slide, please.

This slide and the next lists all the areas that we observed during the pilots, and I would just like to discuss some of the more significant ones.

The recommendations we made were specific to a site, to that licensee, in ways that could help them improve implementation of the rule, and we believe we were consistent with the intent of 93-01 and the Regulatory Guide 1.160.

I know we tend to focus on weaknesses rather than strengths, but I would like to point out that overall we thought these nine plants did a very good job of implementing the rule.

The issues that we found, I think, were not major, and they were not numerous, but I would like to highlight some of those.

The first one is the use of the industry guideline. All the plants used it. Eight of the nine took some minor exceptions. One took what we considered major exceptions, but in the end, generally, they all met the intent of the guideline document. So we didn't see any real problems there.

Scoping. The results we saw, were very thorough. Plants had done an extensively thorough job of reviewing all plant SSCs to determine which were within scope and which were not.

There were a few instances where we recommended they go back and reevaluate a few systems that we thought should have been included that they had not.

Examples were control room annunciators, circulating water systems, extraction steam systems, that typically you would expect to see included within the scope.

On average, there were two to three systems per plant that we asked them to go back and reevaluate.

There were some reasons that some plants used to exclude SSCs from scope that we didn't think were appropriate, and they were the SSC was very reliable, inherently reliable, or it never failed; that the system would never completely fail due to redundant trains; that operator actions could prevent failures of a system that would result in a reactor scram; and that the failure of a system would not directly cause a reactor scram.

We didn't think the rule nor the statements of consideration really addressed any of these. So we asked them to reconsider including these systems back in scope.

Risk determination, we have talked about somewhat already. We felt that the process in 93-01 was used very carefully and very closely. It met the intent of what our expectations were. The results, we thought, were all very reasonable, and for purposes of the Maintenance Rule, we thought it was an appropriate and practical method to determine which SSCs were risk-significant.

In fact, some plants used their expert panel to do more than just risk ranking of SSCs. They got involved with scoping of performance criteria and goals. It was a very good job.

The only recommendations we had were in cases where they had other PRA calculation methods that they could consider other than the ones in 93-1. They should consider

those, and to perhaps make their expert panel a permanent part of their organization.

If there were any changes to the plant design or PRA insights changed, they should reconsider the risk of ranking that they had performed earlier.

COMMISSIONER ROGERS: Just on the expert panel, these were all in-house?

MR. CORREIA: All in-house, site-specific.

COMMISSIONER ROGERS: No consultants?

MR. CORREIA: Not at all, not at all, and I think, in every case, extensive plant and industry experience.

The next item is categorizing SSCs in (a)(1) and (a)(2). I think in all cases, plants did a very good job of putting them into the (a)(2) bin. The processes and procedures they used all appeared to be very reasonable.

There were in some cases some reluctance to put SSCs in the (a)(1) category for fear that management would view that as an ineffective preventive maintenance program. We saw that as part of the process.

If preventive maintenance has resulted in SSC failures, then it has to go to (a)(1) for management attention to improve performance.

The next item that I would like to talk about is industry operating experience. The main issue at the pilots with this particular requirement was plants had what we

considered all the information they needed to meet the intent of the rule. It is just that it was not being effectively used.

They had the NRC information, INPO information, vendor information. It was all there readily available, but for some reason, it wasn't being used to the extent that we thought necessary to implement the rule.

CHAIRMAN JACKSON: So what guidance are we providing to facilitate that?

MR. CORREIA: We basically told them that they need to make sure that the procedures emphasize the fact that this is a rule requirement and that the responsible engineers in most cases, system engineers when setting goals and doing periodic evaluations, go back and look at this information as required. I believe that would suffice.

The next slide, please.

The next issue was monitoring and trending of systems and components. We found that, I think in most cases, trending we expected to see of equipment performance was not well integrated with goals and performance criteria.

Most plants had established trending programs. The quality and quantity varied. It is just that, for some reason, it wasn't well integrated with the performance criteria and goals that they had established.

I believe many of their existing programs would

look at the condition of performance of equipment and components, and it was being evaluated. It is just that you didn't see it being brought into the Maintenance Rule perspective. We recommended that they do that.

Certainly, the rule encourages maximum use of the existing programs. We saw that these programs were very effective, and we just thought they should be implemented more effectively with rule requirements.

COMMISSIONER ROGERS: These plants, to what extent did they use system engineers?

MR. CORREIA: I think in every case, they may not have all been called systems engineers, but effectively, the systems engineers were the Maintenance Rule engineers. They are responsible for a series of systems. They would monitor performance. They would assure if criteria or the trend was showing that performance was degrading, they had to take some action. If it did result in criteria not being met or repetitive failures, then it would go to the (a)(1) set goals. They were essentially the people that would implement the rule.

COMMISSIONER ROGERS: Why do you think there appeared to be this disconnect between trending and other data, performance data? Wouldn't that be that the system engineer should perform an integrative function?

MR. RUSSELL: I think you need to recognize that

this was a pilot activity, and it was a snapshot in time. We had only recently had the regulatory guide out, and some of the earlier ones were less developed than the later ones.

The expectation was that each licensee would have essentially one full cycle of experience in implementing the rule prior to the effective date of the rule. That was some of what went into this five-year time frame.

So, in some cases, the full integration of operating experience, looking at some of these issues, is somewhat understandable given the state of implementation at the time and that these were recognized as pilots to look at the guidance.

So we looked at this as feedback. We clearly found some cases where they had not been fully implemented. I think it would be fair to say that there were not significant disputes as to whether something was needed or not. They may just not have been that far along in their implementation at the point in time we conducted the pilot.

We clearly expect that these types of things would be met when we go to do the baseline inspection starting in July of '96 and that they would have processes to effectively feedback operating experience and that that operating experience would have been considered in setting performance criteria and goals. So I think there is a bit of contemporaneous nature with respect to the timing of the

pilot and where they may have been in implementing their program that may be contributing to some of these.

COMMISSIONER ROGERS: Well, yes, in terms of complying with the Maintenance Rule, but if you didn't have a Maintenance Rule, wouldn't those be activities that you would expect the system engineer to be involved with in the system to be carried out anyhow?

We did hear for many years that we didn't need a Maintenance Rule, and that it was totally unnecessary and just a big waste of everybody's time and everybody's effort and so on and so forth, and the Commission finally came to the conclusion that we thought it very advisable that we have a Maintenance Rule, and we have one, but I think it is very interesting to see that what one might expect to have taken place in the absence of the Maintenance Rule did not, in fact, take place.

MR. RUSSELL: If I go back to -- and I agree with your observation. When we did the maintenance team inspections at all plants in the United States, we found generally that root cause analysis, trending, and application of risk were weaknesses that 20 percent or more of the facilities had at that time.

We felt that those activities were getting better. We had been emphasizing engineering. We have modified self-processes, et cetera. So these have been areas which

had been evolving.

Five years ago, you would not have found that all plants even have the system engineering function. It may have still been in design engineering or some other place. They would not have integrated on a system basis.

We had facilities that I visited where oil analysis was done by an individual independent of where the systems were, and yet, vibration analysis was done by another individual, and the stuff didn't come together in a system basis where you could take and combine vibration analysis, oil analysis, and other tools. So we are seeing progress being made in those areas, but I do believe that this is one that is changing with time as they go more to reliability-centered maintenance approaches.

There were pilots going on in the '89-'90 time frame looking at how you improve maintenance using a reliability approach.

So the fact that there were some areas that had not been fully implemented consistent with what our expectations were, we think was understandable, but that is also why we wanted to have a full cycle of experience before the effective date of the rules. So, when we go out and do inspections in July, we don't expect to have these kinds of findings.

COMMISSIONER ROGERS: Okay. Thank you.

MR. CORREIA: The next issue is monitoring of redundant trains. The guideline document recommends that risk-significant systems with redundant trains be monitored at the train level, and we found in a few instances that systems with these redundant trains that were risk-significant or used in standby service would not be monitored on the individual train basis. It wasn't widespread, but we did find a few cases.

Trending of zero failures was another interesting observation. Some licensees had set performance criteria goals for zero failures, or 100-percent reliability, and even though the rule allows maximum flexibility on how they establish their programs, the rule also intends that their evaluations be predictive in nature such that if they start seeing trends and degrading performance, they take action before failure, and setting goals of performance criteria at 100-percent liability wouldn't accommodate that, would not accommodate trending.

So we just recommended that they select goals and trending for particular SSCs that are compatible in that they can monitor performance, see degradation, and take actions appropriately.

COMMISSIONER ROGERS: It seems to me you have got to have some data to develop a trend.

MR. CORREIA: Right.

COMMISSIONER ROGERS: If your goal is no data, then no trend.

MR. CORREIA: Precisely.

Monitoring of structures, we have talked about somewhat.

Most plants we consider made this a relatively low priority. Most of the focus was on systems trains, and components. Most assume that it was inherently reliable. The tables show that. Where monitoring was established, it wasn't very predictive in nature.

We believe that the guidance in 93-01 is adequate and that we asked them to go back and reevaluate the guidance and look at their existing structural monitoring programs, which we felt in most cases would be more than adequate to meet the requirements of the rule and to take maximum advantage of those, and if necessary, enhance them.

The next item I'd like to discuss are plant safety assessments for taking equipment out of service. Ashok has already mentioned this, and we saw basically two processes that plants were using or planning to use. One was the matrix approach. Basically, what they would do is they would have the list of systems that could not be taken out of service at the same time because of the impact on plant safety of risk, and they followed that.

Others either had or were planning to have real

time or near real time risk monitors where they could actually re-run their PRA showing which SSCs would be out of service for maintenance and look at changes in plant risk and then to adjust the planning processes to minimize the impact on risk.

I think we have seen that trend during the pilot program process, and I think most plants tend to go that way with an on-line risk monitor.

Basically, our recommendations in this area was to complete implementation, either go over the matrix or the risk monitors and, as Bill said, get experience with implementing the rule.

COMMISSIONER ROGERS: Excuse me. I think that is a very interesting approach. It seems to me that maybe I am not quite looking at this in the right way, but doing that seems to me implies a living PRA. I mean, it is a dynamic PRA.

MR. THADANI: That is correct.

MR. CORREIA: Yes.

COMMISSIONER ROGERS: It seems to me in looking at some of these tables that some of these licensees did not intend to have a living PRA; is that right?

MR. CORREIA: Living PRA in the sense of --

COMMISSIONER ROGERS: Those that are either yes, no, and update frequency, there were three that said no. So

how do they fit into this? Is that something that is short of a full PRA, but still doing this analysis, time-dependent risk analysis, or what?

MR. CORREIA: I think the difference was that the earlier sites we visited did not plan to update their PRA in the IPE sense.

COMMISSIONER ROGERS: Full-blown?

MR. CORREIA: Full-blown.

As the technology improved and these on-line risk monitors were more available and reasonably priced, I understand, then there was a shift towards that direction.

I don't believe these on-line risk monitors reevaluate the whole plant. It is parts of it, but it gives them a good sense of what happens to risk when they take equipment out of service for maintenance.

MR. RUSSELL: There is one other aspect that I think needs to be considered, and that is following each refueling outage after the rule has been into effect. On periods not less than two years, there needs to be an assessment of how well all of the systems have performed against their goals and the assumptions that were used in establishing those.

One outcome could be that equipment is not performing to an appropriate goal and that you need to work on the equipment.

Another would be that you have set a goal that is not reasonable; that you may have over-specified.

The allocation of risk and availability to various systems can change with time. We see that this will be an incentive to keep track of and maintain at least a level 1 PRA, reasonably up to date, so that you can feedback your experience and you can test on what the assumptions were that went into the IPE against what the actual performance has been and not use as much generic data, but this allocation of goals has to be done on some logical basis.

Clearly, we have indicated that the IPEs or sensitivity studies or PRAs are one way of doing that. So we think there is going to be a tendency with time to both question if I didn't meet the goal, was the goal reasonable, or could I do some goal allocation that may have a different system that is performing better, and maybe it was an unreasonable goal. I think these are some of the considerations that different licensees are going through.

So I think there will be a trend in that direction, and maybe they have not developed it fully. There are some that are still using the matrix approach where they pre-analyzed conditions and said even though this may be allowed by tech specs, avoid having high-pressure injection out at the same time you have aux feed out in the same division, for example.

So I think this is an evolving area that we just need to watch with time.

MR. CORREIA: Could I go to slide 10, please?

The lessons learned from the pilots were presented at a public workshop on June 27th. We included basically highlights from our NUREG and also changes we made to our inspection procedure as a result of the pilot inspections. We may hold an additional workshop in the future.

The industry guideline document, NUMARC 93-01, NEI is suggesting clarifications to the document. Our position is that the document as written is adequate to implement the rule, that the schedule should be maintained, but that some clarifications might be helpful to 93-01.

We have had three working level meetings with NEI thus far to discuss and try to understand the clarifications they are proposing. We will continue to work with them. I think we are down to just a few more significant changes which I would like to mention now, the first being component failures.

The question that has been raised is: Must failures at the component level be evaluated and tracked, and repetitive component failures be considered from moving from (a)(2) to (a)(1)?

Our position is that if systems fail because of ineffective maintenance, repetitively, they should be

evaluated and tracked and most likely moved to (a)(1) of the rule for goal-setting and monitoring.

Industry's position is that only trains of systems that experience repetitive failure should move to (a)(1).

COMMISSIONER ROGERS: What arguments are they advancing in support of that position?

MR. CORREIA: My belief and understanding is that we have used certain words and phrases that mean something different to the industry. For example, we say monitor SSCs, systems and trains. IT has come about that when we say monitor, we mean establish system or train-specific performance criteria, monitor those individual trains and systems.

We say you should also monitor components. The first thought was they would have to establish individual component performance criteria or goals for the thousands of components within scope. It is not our intent.

Within the system or train that they exist, if they have repetitive failures of components that are important to the system or train function, they should be tracked, the root cause evaluation performed, and corrective actions taken, and if they are repetitive, then they should be considered candidates for (a)(1).

I think once we understand that, we can reach resolution. I believe it is just a wording in the terms

that we are using.

MR. RUSSELL: I would point out that most of the early work that was done on risk significance of SSCs did identify that there were a number of components which were quite significant. I recall all the dialog back and forth on reactive trip breakers.

Clearly, if you have repetitive failures of reactor trip breakers, we would expect those to be addressed, monitored, and trended. So I think this is a terminology issue at this point in time, and it may be an area where some clarification is appropriate.

We believe that there are risk-significant components, and repetitive failures of those components which are related to maintenance, that is, it is a maintenance preventable functional failure as defined in the guideline, that two or more would be the basis for concluding that the preventive maintenance program is not effective. Therefore, the exception under (a)(2) would no longer apply and that they must be addressed under (a)(1) provisions of the rule.

MR. CORREIA: The next issue we have been discussing is masking SSC performance. The issue is if you have a risk-significant or a standby system with multiple trains, you have to monitor the individual train performance, and the question comes up what constitutes a

train because there are some systems that have two trains that are normally used to perform the function, and there may be an additional train that can either be used in case one train fails. It can come into service or it can be used to perform the function of one is taken out for preventive maintenance.

The question is do we expect licensees to monitor that additional or standby train, as they would the others, and I think a lot will be plant-specific on just exactly what function that train performs, is it truly an additional spare train or is it relied upon to support the system or train function, and I think, again, clarification on the expectations and different scenarios is what may perhaps resolve this issue.

COMMISSIONER ROGERS: Will this be a plant-specific type of decision that has to be made?

MR. CORREIA: Yes, it will.

COMMISSIONER ROGERS: It will. So there may be a lot of work there.

MR. CORREIA: The last issue is related to the scoping criteria of the rule.

Non-safety-related SSCs whose failure could cause a reactor scram or safety system actuation. We believe the rule is clear. The guideline document is clear. Some licensees are concerned that that is unbounded. They would

prefer to have the rule or guidance state that only those SSCs whose failure did cause a reactor scram be included within the scope of the rule.

We didn't see very many cases of this during the pilots. We don't consider it a major concern. We think the guidance document is clear as written.

We are not asking them to look at hypothetical situations of system interdependencies that in some way could eventually result in a scram. We are looking at the normal sequence of events if a system fails and would result in a scram.

Again, I think maybe some clarification to the guidance document may be warranted here.

CHAIRMAN JACKSON: What is the definition of failure? Degradation and performance is not failure; is that correct?

MR. CORREIA: That is correct.

MR. RUSSELL: We have used functional failure in the guidelines. So we are not addressing it in the context of degraded performance, and we have regulatory guidance out on degraded non-conforming conditions and guidance on when it is operable and when it is not.

We have always relied on when it is capable of performing its intended function. So you go back to what is the intended function, and if it is not capable of

performing that function, then it is considered inoperable.

CHAIRMAN JACKSON: That is the definition of failure.

MR. RUSSELL: If it is inoperable based upon lack of maintenance, then it is a maintenance-preventable functional failure.

CHAIRMAN JACKSON: Okay. Fine.

MR. RUSSELL: I would add on the train issue, I don't believe that the issue is going to be that difficult. If a plant does have a built-in spare and they have not modeled that in their IPE, that is, they have not taken credit for it, so it is still is a spare, so instead of modeling three trains, they have only modeled two, then that might have one outcome.

If on the other hand they have modeled all three in their evaluation, so they look at only one out of three being needed, then we would expect them to manage it in a manner consistent with what their assumptions were and what they used in the IPE.

So I don't think it is going to be as difficult an issue to resolve as may first appear because what we are looking at is really consistency within their own assumptions. So it is not really an issue for the Staff to get into a lot of debate with them. We would simply ask what did you assume, how have you treated it, and are you

maintaining it consistent with those assumptions and performance goals.

CHAIRMAN JACKSON: I think we need to move on.

Did you have something?

MR. THADANI: No. I was just going to add to what Bill was saying. I think, clearly, one issue is how they model the system in the IPE and impact on safety.

The second issue is that if you have redundant trends or redundant components and if you were to experience failures, let's say train one today, train two next month, train three the month after, not that that is going to happen, but nevertheless, the issue is if those failures are related to maintenance-related activities, then one would have to focus attention to say what does it mean about the program, and that is going to be an issue for discussion.

CHAIRMAN JACKSON: Okay.

MR. CORREIA: Once NEI submits the revised guidance document, we would review it and go through the normal agency process to revise our regulatory guide, and we would advise the Commission on the results of our review and the schedule we plan to implement.

The inspection procedure, again, was modified based on the pilot programs. The Commission had requested that we have this final procedure issued by January of '96. We planned to have it issued by the end of next month. At

that point, we will begin inspector training on the procedure.

If any of these schedules change, we would inform the Commission, and the procedure also contains some initial thoughts on enforcement guidance for the inspectors, and as we gain more experience with the rule, that guidance would change and be enhanced.

The next slide, please.

Our remaining activities, as Bill mentioned, is to develop the training program, and we expect to have that ready this September. In the future, we are considering a training course at the Technical Training Center.

The regional and resident inspector trainings will be done at least once in each region beginning in September to be completed in the spring of '96. After the rule goes into effect, we would perform a baseline inspection on each of the sites. Our goal is to have these completed within two years and taking into account plant-specific performance.

These baseline inspections would be conducted by the regions, but headquarters staff would support them as needed.

The next slide, please.

We have concluded that the Maintenance Rule guidance and the pilot program has demonstrated that the

performance-based approach to regulation is workable. We were able to interact with the industry to develop guidance that meets the requirement of the rule, yet allowed the industry the flexibilities to develop their own guidance, and that the guidance document and inspection procedures were developed in an open public manner. We started that early on and we continued to do that.

The pilot program, I think, demonstrated that licensees can use the existing guideline document, 93-01, as it is endorsed in reg guide 1.160, and although the variability between licensees definitely poses a challenge to inspectors, I think the pilot program verified that the procedure can be used to monitor compliance with the rule.

CHAIRMAN JACKSON: Thank you.

MR. CORREIA: Thank you.

CHAIRMAN JACKSON: Commissioner Rogers?

COMMISSIONER ROGERS: I wonder if you have any feeling about how the other licensees, the other 90-some-odd licensees stand with respect to being able to identify the systems structures and components within the scope and how ready they are to implement this rule fully next year, in July of next year.

MR. CORREIA: I personally don't have that knowledge, but I do believe that NEI is keeping very close tabs on the rest of the industry. I believe they have

meetings amongst themselves to share information and keep track of where they stand. I think the industry committed, as Bill said, to be fully implemented on July 10, 1996.

MR. RUSSELL: Some facilities that I visited and have had reports from other members of the NRR executive team and regional administrators are not as far along as those who are under the pilots, and we have pointed that out to their management. There are activities being taken to catch up because our expectation is that they would have had sufficient experience in implementing the rule, but on the effective date of the rule, they would be in full compliance.

MR. THADANI: I might note that when we had the workshop in St. Louis in late June, there were 370 or -80 participants from the industry, and subsequently, NEI had their workshop, and the feedback I got was that they seemed to be optimistic about getting there.

CHAIRMAN JACKSON: You mentioned possibly having another workshop. Do you think that would help facilitate the process?

MR. THADANI: I think it might.

What I said to the industry, basically, was we will be prepared to have one. If you think that will help the industry get there on time, we would be ready and willing to help. We will do what needs to be done, and

basically, the industry is looking at two options, as I understand.

The first option is they are certainly going to have another workshop amongst themselves.

The second option that we broached and didn't conclude on was would it be worthwhile to have another workshop six or eight months after the rule has been in effect and we have conducted a number of inspections and is there something that can be gained at that point. That is what the industry is looking at now, also.

MR. RUSSELL: That has been a practice with this staff where we have an area of emphasis inspection or something that we are going across all plants; that after we have had experience with a number of the earlier inspection activities, we would document those results in an information notice, potentially hold a workshop.

We have done that with electrical system inspections, surface water inspections, and others, and we have generally provided feedback back to the Commission on the status of early implementation. So those types of things would be normal practice for the Staff to provide feedback from early implementation results.

COMMISSIONER ROGERS: Are there any issues, outstanding issues, with respect to, for example, categorization of SSCs that have yet to be resolved?

MR. THADANI: I don't believe there are any issues.

One of the things that we have to emphasize, and that is what we meant by clarification, is to use all of the measures because one worries about some limitations and IPE in terms of methods data. We have talked about those things.

We have talked about scope issues and so on, and at least, partially, you can compensate for that by making greater use of some of these importance measures.

So what we are talking about is that those kinds of clarifications -- right now, 93-01, for example, calls for considering not just change in core damage frequency, but to also look at the importance measures. I think emphasis in some areas would be beneficial.

COMMISSIONER ROGERS: I see Mr. Jordan sitting here, and I was thinking about the reliability data rule discussions that we have been having in considerations.

I wonder if you could comment, anyone could comment, on the difference between the data that one might expect to be put in the database of the reliability data rule and the data which are being collected by licensees for the Maintenance Rule.

MR. JORDAN: Yes. I was sitting here in case you thought of something, not to respond to something.

[Laughter.]

MR. JORDAN: Yes, sir. The systems and the trains associated with the reliability data rule are, in fact, a subset of the systems structures and components of the Maintenance Rule.

The data elements that are needed to support this reliability rule may be more detailed and more extensive than the data elements for those same systems for the Maintenance Rule.

So there is, I think, an overlap in both directions in that fashion.

COMMISSIONER ROGERS: Does everybody agree with that?

Well, thank you very much. I thought this was a very useful and informative briefing.

CHAIRMAN JACKSON: You took the words out of my mouth.

I think it is important that we have a process in place, and that is what you have obviously been developing for evaluating the effectiveness of maintenance, and I think this performance-based approach that you have outlined and had the pilot on definitely seems to be moving in the right direction.

I think the lessons learned, the more quickly they can be iteratively folded into place, it will make it

useful.

I encourage a continued focus on risk and risk assessments and how they are done because the categorization is important. It is a question of monitoring and effective maintenance, but you have to monitor the right things and to be constantly sure, particularly when you have a situation where, as you point out, because of the differences in the plants, there is a lot of variability.

Also, as you have indicated, the training of our inspectors is critical, particularly in terms of doing it in a real-time process as the licensees themselves are moving along the timeline to get ready, and I think also as part of our inspection, the issue of the training of the licensee staff in using and working to this new performance-based approach, but again, we realize it is an iterative process. So I encourage you to keep working with the industry to resolve or clarify the understanding of what we feel are important remaining issues.

So, with that, I thank you very much.

[Whereupon, at 11:22 a.m., the meeting was concluded.]

CERTIFICATE

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

TITLE OF MEETING: BRIEFING ON STATUS OF MAINTENANCE RULE - PUBLIC MEETING

PLACE OF MEETING: Rockville, Maryland

DATE OF MEETING: Wednesday, July 26, 1995

was held as herein appears, is a true and accurate record of the meeting, and that this is the original transcript thereof taken stenographically by me, thereafter reduced to typewriting by me or under the direction of the court reporting company

Transcriber: Jennie Malloy

Reporter: Mark Mahoney


# STATUS OF THE MAINTENANCE RULE

July 26, 1995

Ashok C. Thadani
Richard P. Correia
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# AGENDA

- Maintenance Rule background
- Maintenance Rule requirements and guidance
- Pilot program results

# MAINTENANCE RULE - BACKGROUND

- Published July 10, 1991
- Effective July 10, 1996
- Performance-based rule

# MAINTENANCE RULE - REQUIREMENTS

- Requirements in 10 CFR 50.65
- Paragraph (b) - Scope of rule
- Paragraph (a)(1) - Performance and condition goals and monitoring
- Paragraph (a)(2) - Effective preventive maintenance
- Paragraph (a)(3) - Periodic assessments and preventive maintenance safety assessments

# MAINTENANCE RULE - GUIDANCE

- Industry guidance document, NUMARC 93-01
- Regulatory Guide 1.160, Revision 1
- Maintenance Rule Inspection Procedure IP 627XX

# MAINTENANCE RULE - IMPLEMENTATION

- Determine scope
- Risk determination process
- Categorize as (a)(1) or (a)(2)
- Perform (a)(3) periodic assessment
- Perform (a)(3) preventive maintenance safety assessments as necessary

# MAINTENANCE RULE - PILOT PROGRAM

- Purposes
- Nine voluntary sites
- Visit team composition
- Results and lessons-learned in NUREG-1526
- Conclusion: Maintenance Rule can be successfully implemented

# PILOT PROGRAM - RESULTS AND RECOMMENDATIONS

- Use of industry guideline
- Scoping
- Risk determination
- Categorizing SSCs in (a)(1) or (a)(2)
- Corrective actions
- Safety consideration in goal setting
- Industry operating experience

# PILOT PROGRAM - RESULTS AND RECOMMENDATIONS

- Monitoring and trending of systems and components
- Monitoring and trending of structures
- Functional failures
- Periodic evaluations
- Balancing unavailability and reliability
- Plant safety assessments for taking equipment out of service

# RESOLVING LESSONS LEARNED

- Public Workshop
- Revisions to Guidance Documents
  - Industry guidance document, NUMARC 93-01
  - Regulatory Guide 1.160
  - Inspection Procedure IP 627XX

# REMAINING STAFF ACTIVITIES

- Complete training program
- Regional and resident inspector training
- Baseline inspections

# CONCLUSIONS

- Performance-based approach workable
- Maintenance Rule can be implemented

Table 1. Structures, systems, and components under the scope of the Maintenance Rule[1]

| | BWR/3 | BWR/4 | BWR/6 | WEST 3 Loop | WEST 4 Loop | WEST 4 Loop | WEST 4 Loop | CE | B&W |
|---|---|---|---|---|---|---|---|---|---|
| Total number of SSCs | 102 | 131 | 341 | 205 | 176 | 194 | 112 | 160 | 137 |
| Number of SSCs within scope | 67 (66%) | 86 (66%) | 127[3] (37%) | 115[4] (56%) | 103[5] (59%) | 100[6] (52%) | 76[7] (68%) | 110[8] (69%) | 90[9] (66%) |
| Number of structures (only) within scope[2] | n.a.[10] | 6 | 16 | 15 | 6 | 17 | 23 | 32[8] | 7[9] |
| NRC-identified SSCs requiring reevaluation | None | None | 1[3] | 4[4] | 1[5] | 1[6] | 3[7] | 1[8] | 15[9] |

1. The data on this table is based on a review of the licensee's documentation for rule implementation at the time of each NRC site visit and is subject to change.
2. Three licensees were still evaluating structures under scope at the time of the NRC site visits ( i.e., These include the licensees for utility data in columns one, eight a,nd nine); therefore, the number of structures and the total number of SSCs under scope may change. All other licensees included structures under scope.
3. The licensee found 126 SSCs. The NRC recommended that control room annunciators be added.
4. The licensee found 111 SSCs. The NRC recommended that the site grounding system, the plant computer, heat tracing and freeze protection and the reactor coolant pump vibration monitor be added to the scope.
5. The licensee found 102 SSCs. The NRC recommended that the circulating water system be added to the scope.
6. The licensee found 82 out of 151 plant systems and 17 out of 43 plant structures within scope. The NRC recommended that the extraction steam system be added to the scope.
7. The licensee found 73 SSCs. The NRC recommended that the lighting protection, site grounding and cathodic protection be added to the scope.
8. The licensee found 109 SSCs under the scope of the rule; however, the NRC recommended that one additional structure, the shield wall around the startup transformers, be added to the scope.
9. The licensee found 75 SSCs. The NRC recommended that the circulating water, extraction steam, condenser air removal, screen wash water, gland steam, gland seal water, generator gas, turbine lube oil, and turbine generator seal oil systems be added to the scope. The licensee identified the reactor containment as the only structure that is under scope and being monitored. The licensee considers the remaining structures to be inherently reliable. The NRC recommended that 6 additional structures (i.e., the auxiliary building, control complex, emergency diesel generator building, intermediate building, NSSW intake structure, and the emergency feedwater tank enclosure) be added to the scope.
10. Utility continuing evaluation at the time of site visit.

Table 2. Risk-significant structures, systems, and components and risk determination methods[1]

| | BWR/3 | BWR/4 | BWR/6 | WEST 3 Loop | WEST 4 Loop | WEST 4 Loop | WEST 4 Loop | CE | B&W |
|---|---|---|---|---|---|---|---|---|---|
| Number of SSCs within scope | 67 | 86 | 127 | 115 | 103 | 100 | 76 | 110 | 90 |
| Number of risk-significant systems | 25 (37%) | 41 (48%) | 24 (19%) | 44 (38%) | 41 (40%) | 23 (23%) | 22 (29%) | 27 (25%) | 17 (19%) |
| Risk-significant structures | Utility evaluating | All structures are inherently reliable | All structures are inherently reliable | Reactor containment | Reactor containment; all other structures inherently reliable | Reactor containment; utility evaluating | Reactor containment | 28 | Reactor containment |
| Living PRA (yes/no) and update frequency | Yes. Update frequency undetermined | Yes, 3-year update frequency | No | No | Yes, Update frequency every refueling cycle | Yes, 3-year update frequency | Yes, Update frequency undetermined | No | Yes, Update frequency every refueling cycle |
| Risk determination methods[2] | EP Delphi process, IMs (RRW, RAW, F/V,) | EP Process IPE RISKMAN software, IMs (RAW, RRW, CDF contrib.) | EP Delphi process, IMs (RAW, RRW, CDF contrib.) | EP Process, IMs (RAW, CDF, contrib.) | EP Delphi process, IMs (RAW, RRW) | EP Delphi process, PRT software, IMs (RAW, CDF contrib.) | EP Process, PRT software, IMs (RAW, RRW, F/V) | Working group, IMs (RAW, CDF contrib.) | EP Delphi process, IMs (RAW, RRW) |
| Online maintenance risk evaluation methods[2] | CAFTA, RMQS and EOOS software, safety monitor | Configuration equipment OOS matrix | Configuration matrix, RAW ranking | PRa configuration matrix | Online maintenance PRA procedure | ORAM matrix | RMQS and OSPRE software | PRA procedure for taking SSCs OOS | PSAM risk monitor software |

1. The data in this table is based on a review of the licensee's documentation for rule implementation at the time of each NRC site visit and is subject to change.

2. Acronyms for risk determination and evaluation: IM (importance measure), ORAM (outage risk assessment and management), CAFTA (computer-aided fault tree analysis), PSAM (probabilistic safety assessment monitor), PRT (probabilistic risk tree), RMQS (risk management query system), EOOS (equipment out of service), OOS (out of service), OSPRE (operational safety predictor), F/V (Fussell-Vesely importance), RAW (risk achievement worth), RRW (risk reduction worth), CDF (core damage frequency; in accord with NUMARC 93-01, the utility defined cut sets that account for 90 percent of the overall CDF contribution), and EP (expert panel).

Table 3. Structures, systems, and components categorized under paragraphs (a)(1) and (a)(2)[1]

| Paragraph | BWR/3 | BWR/4 | BWR/6 | WEST 3 Loop | WEST 4 Loop | WEST 4 Loop | WEST 4 Loop | CE | B&W |
|---|---|---|---|---|---|---|---|---|---|
| (a)(1) | 1[2] | 1[3] | 4[4] | 6[5] | 3[6] | 1[7] | 5[8] | 5[9] | 3[10] |
| (a)(2) | 66 | 85 | 123 | 109 | 100 | 99 | 71 | 105 | 87 |

1. The data on this table is based on a review of licensee's documentation for rule implementation at the time of each site visit and is subject to change.
2. At the time of the NRC site visit, the licensee was considering adding the salt service water (SSW) system to paragraph (a)(1).
3. The only SSC categorized under paragraph (a)(1) was the post-accident sampling system; however, the utility was still evaluating the performance of SSCs to determine if other SSCs should be placed under the paragraph (a)(1) category.
4. The SSCs categorized under paragraph (a)(1) include the residual heat removal system, the service water system, containment integrity and the ESF switch gear room coolers.
5. The SSCs categorized under paragraph (a)(1) include the turbine-driven auxiliary feedwater pump, the LK-16 circuit breaker, the BIF butterfly valves, the "B" emergency diesel generator, the reactor cavity seals, and the "A" heater drain pump motor.
6. The SSCs categorized under paragraph (a)(1) include the auxiliary feedwater system, the emergency diesel generators, and the solid state protection system (i.e., 7300 process support system).
7. The reactor coolant system was the only system categorized under paragraph (a)(1) of the rule.
8. The SSCs categorized under paragraph (a)(1) include the control rod drive system circuit cards, 4 kv circuit breakers, 125 vdc circuit breakers, steam generator power-operated relief valves (PORVs) and pressurizer PORVs.
9. The SSCs categorized under paragraph (a)(1) include the containment control air system, the condensate system, the heater drain system, the service water system, and the circulating water system.
10. The SSCs categorized under paragraph (a)(1) include the emergency diesel generators, the instrument air system and the demineralized water system.

# NUMARC 93-01
# MAJOR DISCUSSION AREAS

- Component failures
- Masking of SSC performance
- "Could cause" versus "did cause"

# NUMARC 93-01
# MINOR DISCUSSION AREAS

- Monitoring structures
- Performing risk assessments on EOOS while at power
- Periodic assessments
- Establishing risk significance criteria
- Use of industry operating experience
- Terminology involving "risk" and "non-risk" significant

# NUMARC 93-01
# MINOR DISCUSSION AREAS

- Use of existing programs
- Support system unavailability
- Design functional failures
- New construction and extended shutdown plants