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BRIEFING ON IMPLEMENTATION OF MAINTENANCE RULE, REVISED REGULATORY GUIDE, AND CONSEQUENCES

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PUBLIC MEETING

Nuclear Regulatory Commission
One White Flint North
Rockville, Maryland

Monday, March 10, 1997

The Commission met in open session, pursuant to notice, at 2:42 p.m., Shirley A. Jackson, Chairman, presiding.

COMMISSIONERS PRESENT:

SHIRLEY A. JACKSON, Chairman of the Commission
KENNETH C. ROGERS, Commissioner
GRETA J. DICUS, Commissioner
NILS J. DIAZ, Commissioner
EDWARD McGAFFIGAN, JR., Commissioner

STAFF PRESENT AND PRESENTERS SEATED AT THE COMMISSION TABLE:

JOHN C. HOYLE, Secretary of the Commission

KAREN D. CYR, General Counsel

JOE CALLAN, EDO

ASHOK THADANI, Associate Director for Inspection & Technical Assessment, NRR

JEFFREY SHACKELFORD, Senior Reactor Analyst, PRA Branch

SAM COLLINS, Director, NRR

SUZANNE BLACK, Chief, Quality Assurance & Maintenance Branch, NRR

RICHARD CORREIA, Section Chief, NRR

P R O C E E D I N G S

[2:42 p.m.]

CHAIRMAN JACKSON: Good afternoon, ladies and gentlemen. We are pleased to have the NRC Staff here this afternoon to brief the Commission on the maintenance rule implementation.

But before we begin, I'd like to ask for a moment of silence for Nelson Sievering. About two hours ago, this good friend and outstanding public servant, his funeral was held in Chevy Chase a few miles from here.

Now, many of you knew Nelson Sievering who served in many important positions with the United States Government in the nuclear field. Most recently, he was our governor to the IAEA. He served for many years at the IAEA as Deputy Director General for Management.

His career began, like many of you, in the NRC in the nuclear Navy, but he soon used his impressive technical skills to advance vital United States policy objectives in non-proliferation and the peaceful uses of nuclear energy, first in Brussels and later with the State Department in Washington.

I would like to salute Nelson Sievering for his tremendous contribution to nuclear affairs. He fought a courageous battle against the cancer which eventually took his life this past Thursday morning.

I had an opportunity in my short tenure at NRC to in fact interface with Nelson on a number of IAEA issues, and we will all miss a true gentleman and nuclear statesman of the highest caliber.

So I would like you, before we begin, to join me in a moment of silence in recognition of Nelson Sievering.

[A moment of silence was observed.]

CHAIRMAN JACKSON: Thank you.

As you know, the maintenance rule was issued because the Commission believed that proper maintenance is essential to plant safety, and that there was a clear link between effective maintenance and safety as it relates to the number of transients and challenges of the safety system. The rule became effective in July of 1996.

During this meeting, the Staff will discuss the status and the results of maintenance rule implementation to date, the changes to regulatory guide 1.160, and any implications that these changes have on future maintenance rule implementation activities.

Copies of the slide presentation are available at the entrances to the meeting and also available are copies of SECY 97-055, Maintenance Rule Status Results, and Lessons Learned, which contains a copy of regulatory guide 1.160, Revision 2.

And so, unless my fellow commissioners have any

introductory comments, Mr. Callan, please proceed.

MR. CALLAN: Good afternoon. With me today at the table are Sam Collins, the Director of the Office of Nuclear Reactor Regulation, on my right; and on my left is Ashok Thadani, the Associate Director of Technical Assessment in NRR.

To Sam's right, Suzanne Black, the Chief of the Quality Assurance and Maintenance Branch in NRR; to her right, Richard Correia, the Chief of the Reliability and Maintenance Section in Suzie's branch; and then at Ashok's left, Jeff Shackelford, a senior reactor analyst in the Probabilistic Safety Assessment Branch. And just as an aside, Jeff will be heading to Region IV next week. One of my last official acts in Region IV was to recruit him.

CHAIRMAN JACKSON: It was only fair.

MR. CALLAN: It was only fair. Region IV comes out ahead in that trade.

CHAIRMAN JACKSON: By the way, I would like to welcome Mr. Collins in his first appearance before the Commission as Director of NRR.

MR. COLLINS: Thank you.

CHAIRMAN JACKSON: And I didn't get a chance to say that kind of thing to you. You even have a real nameplate. So welcome.

MR. CALLAN: Sam and I are used to sitting next to

each other.

We last briefed the Commission on the maintenance rule status almost two years ago on July 26th, 1995. At that time, we had completed our pilot inspection program and issued the Lessons Learned in new reg 1526.

We were also finalizing a revision to the maintenance rule inspection procedure and were about to begin training inspectors on the rule in preparation for the July 10th, 1996 effective date.

Our presentation this afternoon is on the status of the Staff's activities regarding the maintenance rule and the results and lessons learned from our inspection efforts to date.

And now, I'll turn the presentation over to Mr. Thadani.

MR. THADANI: Thank you. Good afternoon. May I have viewgraph number 2, please?

[Slide.]

MR. THADANI: Our intention is to cover some of the background and rule requirements specifically, results of the activities that we have been involved in since the last Commission brief, and implications of -- at least our understanding of what the implications might be of performance-based rules, how it might impact some other considerations. We will catch up on some of the issues that

develop as a result of our actions.

And then finally, we will summarize our future actions to complete the inspections.

May I have the next viewgraph, please?

[Slide.]

MR. THADANI: I thought I'd make just a few general remarks, and then the presentation by Susan Black and Richard Correia will provide additional information and more details.

The Chairman noted the need for the rule and some of the reasons that led to development of the maintenance rule, so I will not repeat that.

Our thinking over the years has clearly evolved as to what kind of rules one should be writing. Some of the attributes that are very important, will the rule be clear, that it can be and should be consistently implemented, the requirements and meeting those requirements be inspectable, that the rule include consideration of risk information and be performance based.

A lot of attributes one would like to look for. That's quite a challenge, as we're finding out, to insure that these attributes are being satisfied by a given rule.

In fact, the maintenance rule is one of the first risk-informed and performance-based regulations. As you know, most of our recent regulations have been risk-

informed. 50.62 is anticipated transients without scram, is clearly based on a fair amount of risk analysis done by the Staff, and the requirements are deterministic and fairly proscriptive, but those requirements are, in fact, based on considerations of risk.

50.63 is station blackout. Once again, a similar approach was followed. Because there has been considerable interest in the subject matter of the importance of safety, and safety related, I will note that for these regulations, the Staff clearly indicated that non-safety-related components would be acceptable but the focus was on reliability and availability. So these areas were laid out in regulatory guides in terms of what would be acceptable to meet these regulations.

As far as the maintenance rule is concerned, risk information is used in a number of ways. First, since each plant has done an individual plant examination based on the inspections we have done to date, each licensee has in fact utilized this IPE, although that is not required by the rule. But that is the practice and that was the encouragement provided both in NUMARC's document as well as our regulatory guide.

Areas where they have used the IPE was, first of all, to try to understand what structures, systems, and components have higher safety significance and which ones

have lower safety significance. And in some cases, if the licensees choose to establish goals for performance of these components, those goals could be numerical and, if numerical, consistent with what was done in the IPE.

The third area that utilizes risk techniques is assessing impact of removing any equipment out of service for preventive maintenance. You recall the issue of on-line maintenance where we were quite concerned about what some of the practices might be, the need to pay close attention to configuration control.

Having IPE provides an opportunity for the licensees to understand impact on risk before taking any components out for preventive maintenance.

In the fourth area, we are --

CHAIRMAN JACKSON: So let me just ask a question. This use of IPE in the context of the maintenance rule implies, then, a high degree of competence on our part in the use of IPE for identifying systems and within the configuration and control methodology for on-line maintenance as opposed to specific numbers?

MR. THADANI: I think in relative terms, that's exactly right, but I might add, it's more than the IPE itself. IPE is one input.

The maintenance rule really -- implementation calls for a panel. First, there's information coming from

various sources, one of them being the individual plant examination, and this interdisciplinary group takes a look at the information and prioritizes it in terms of what is high safety significance, what is low safety significance, so it's more than just the use of the IPE in the -- as far as the implementation is concerned.

CHAIRMAN JACKSON: Mr. Shackelford looks like he wanted to say something. No?

MR. SHACKELFORD: I can just say that we've seen a variety of approaches to using IPE, in particular in assessing equipment out of service for maintenance, and it's not always quantitative. In the spirit of the risk-based, performance-based approach, we entertained a number of approaches and we evaluate them on a case-by-case basis.

MR. THADANI: And the fourth area where risk information is utilized is in trying to understand the unavailability due to maintenance at periodic intervals trying to make sure there's some balance in terms of availability and reliability of structures, systems, and components.

So those are areas where the implementation does rely on risk assessments, at least as one input to those decisions.

From a performance-based perspective, the maintenance rule does give a great deal of flexibility to

the licensees and, in fact, the definition of what is required can vary from plant to plant because its flexibility is provided, and I'll give you some examples and then you'll hear some more details.

And this flexibility does make it challenging for inspectors to get some assurance that the maintenance rule is consistently implemented and enforced. This allowed flexibility leads to differences among plants in many areas. Differences can be driven by plant-unique design considerations, different levels in terms of some emergency operating procedures, as well as perhaps even different definitions of system boundaries and so on, which leads to the sense that the scope of the SSCs can be a variable from plant to plant, and in fact is. Performance criteria can vary from plant to plant.

If I may use an example, if one is interested in focusing attention on, say, a pump, an identical pump, high-pressure safety injection pump or some other in these plants, performance criterion could be pressure drop across the pump, could be flow, could be vibration or some other indicator of performance of the pump.

One licensee could choose -- let's use vibration as an example. One licensee could choose performance criterion of 5 mills vibration as a trigger point, saying maybe something's wrong if that vibration level is exceeded

and taking further actions.

Another licensee may use 7 mills as a trigger point, as a performance criterion. Both of them are perfectly okay depending on the pump performance, and the pump can very likely perform its function even beyond a vibration level of 7 mills, but there are differences.

As a result of these differences, the inspectors need to really understand what is the fundamental reason for looking at that component, and that takes additional effort by and large.

This was recognized up front, and because of that, we have really expended significant resources up front in the development of the guidance documents.

When we have a performance-based regulation, the intent -- at least one element of that certainly is to give licensees flexibility. It is very important to get up front the industry input in terms of guidance, criteria, understanding of criteria and so on. It does become somewhat of an iterative process, and it was, indeed, very important to allow a fairly long time period for these interactions to take place. Naturally, this iterative process also means expenditure of higher resources.

The training of inspectors becomes absolutely essential and we'll come back and touch on what we mean by that.

In order to make sure there is consistency in the early inspections, we make sure that there is -- all the regions were participating in the inspection.

We have also a panel at NRR. Every time there are issues coming up, the panel evaluates these issues and makes decisions in terms of what enforcement actions, if any, are to be pursued. This is, again, to make sure that issues are being looked at in a consistent manner.

To be able to do these things, it's clear that we have to expend significant resources and we have spent a lot of resources on the maintenance rule.

CHAIRMAN JACKSON: I think Commissioner McGaffigan has a question.

COMMISSIONER McGAFFIGAN: I just want to break in at some point. At the very outset, you talked about the ideal rule, clear, consistently implemented, inspectable and enforceable, risk-informed, performance-based.

You've talked about the risk-informed aspects of this rule and the performance-based aspects of this rule so far, but the paper also goes in to point out that there is also -- this is less than a pure risk-informed rule, because of the term risk-informed, the PRA implementation plan followed four years later, and so there are elements that aren't risk-informed.

And then on the performance-based, there's a lot

of deterministic/proscriptive elements to the rule, and there obviously are tradeoffs. If we're headed -- if this is the goal, there are tradeoffs that one faces among these various items. Resources, you've just been mentioning. Performance-based rules, at least this one has been very, very resource intensive.

What advice do you have to the Commission with regard to balancing these various things, and should we recognize that it's a spectrum, that there's no -- we have to tailor it to each circumstance?

MR. THADANI: I think, broadly speaking, this approach is quite reasonable to go forward if we recognize that, until we get a lot of experience, there may be some return down in later years. Having gone through this intensive interaction up front, these intensive -- these inspections are programmatic inspections. These are not performance-based inspections.

So I think we have to wait and see, are there other issues that are going to develop. Once we truly get into inspections for cause, that is, performance criteria are established, and our intention is not to get involved unless the performance criteria are tripped, some trigger initiates NRC involvement, that there may be a problem.

COMMISSIONER McGAFFIGAN: But you have to get somewhat proscriptive. You're going through this level of

inspections now, and I don't want to preempt the whole briefing, but you're going through this level of inspection now, which is somewhat prescriptive or programmatic, in order to establish a baseline from which you can then judge later and hopefully get some resource benefits, both to the Commission and to the licensee, but we're not there and we won't be there for some time.

MR. THADANI: I think it will be difficult to predict. We need some experience to see how it comes out, what kinds of problems we run into at a future date.

But you are quite right. Some elements ultimately will end up being proscriptive. And again, let me use an again.

I indicated that the performance criteria could be probabilistic, numerical, or deterministic, like I used the flows, vibration level.

Now, it's very difficult if one is looking for an unreliability of, let's say, failure of 1 in 1,000 demands. One needs a fair amount of data, and data in terms of challenges, successes to be able to make some estimates of what the underlying reliability might be.

And in fact, there may be yet another concern. Can we wait until that component fails before we take action?

One of the attributes we were looking for was

early indication of failure so that one does not take action after a failure has taken place, but rather, degradation is taking place, to be able to identify some trigger points in terms of degradation. That necessarily, I think, has to be deterministic.

So it seems to me that the approach that is being utilized is a mixed approach, probabilistic in terms of, as I said, looking to see where one ought to be doing more and where one ought to be doing less.

In terms of components, structures, and systems that come up in the most safety significance category, one could perhaps tolerate failures, but I think in the high safety significance category, very likely you would have to have a mixture of the two.

We'll wait and see once we get more experience in terms of our reaction, industry actions, can they maintain the performance criteria, how often do they get tripped, what our involvement will be. I think time will tell how that plays out.

COMMISSIONER McGAFFIGAN: My only comment is, this paper, the SECY 97-055 that they're basically briefing on today, it's very informative for somebody coming to the Commission as I did six months ago in terms of laying out the nuances here.

We tend to use risk-informed and performance-

based all the time, and when you get into the nuances of actually looking at probably the most risk-informed, performance-based rule we have, it's -- we're well into gray areas. We're well into the continuum.

And several pages go through the examples of where we're being less than pure if we're headed towards a pure model, which we probably won't because life is not -- doesn't allow us to work --

CHAIRMAN JACKSON: Purity is an ideal.

MR. THADANI: Yeah, it's an ideal.

CHAIRMAN JACKSON: Why don't you go on.

MR. THADANI: But in any case, the 20 inspections that we have conducted so far, and I want to make sure I don't overstate this, they indicate that, generally, the programs that the utilities have in place are adequate. That's not to say that we haven't found problems.

We've found problems, a range of issues, and we would come back to one issue that relates to the language in the rule itself in the -- what we have found in terms of the industry actions in that area, and we'll talk about, is there need to revise the regulation proposal, at least for the Commission to revise the regulation or not, but we'll come back and indicate to you our thinking at this point.

By and large, I think the language in the rule has had some impact in terms of licensees having taken that part

of the rule less seriously than the other parts.

COMMISSIONER McGAFFIGAN: That's the configuration control part?

MR. THADANI: That's basically the configuration control on-line maintenance issue where the rule does not say that the licensee shall have those programs. It says they should, and so OGC will say it's very difficult to enforce that part of the rule.

And I might as well note that we did identify -- in fact, Jeff was actively involved -- did identify a number of concerns, and these concerns have been relayed to the licensees. They appear to be receptive to those comments.

We intend to go back, take a look to see what's actually being done and come back to the Commission with a recommendation subsequent to that once we get all that information together. We're not prepared at this time to say we propose changing the regulation, at least at this time.

Since the last briefing, we have trained, as I said, a number of other inspectors and other Staff. Total number of people -- we have three levels of training and we'll go into that. The number of people we have at least trained or given them some sense of what the maintenance rule calls for is 900, and a fairly large number of people have had fairly thorough training in the maintenance rule

itself.

We have developed enforcement guidance and established an enforcement panel. We work with the industry to revise guidance documents, and, as I said, we have completed 20 inspections so far.

Suzie Black will cover the rule background and then Rich Correia has been on every inspection --

MR. CORREIA: Half.

MR. THADANI: Half of them, okay -- most of the inspections, is going to go through the status and some of the details.

MS. BLACK: Thank you. As a way of background, the rule was issued on July 10th, 1991 and it was to take effect on July 10th, 1996. This was giving two years for the guidance documents to be issued, as well as three years for licensees to establish their programs and have them in place by the effective date of the rule. They were to gather two cycles of data.

The industry guidance document is NUMARC 93-01. It was -- it provides one acceptable method of implementing the rule. Currently, to date, all licensees are using that method.

Revision 2 was issued in April 1996, and that was after our pilot program. It included the lessons learned from our pilot program.

Regulatory Guide 1.160 endorses 93-01. Revision 2 was just completed a couple weeks ago and is attached to your Commission paper.

Our Inspection Procedure 62706 provides guidance for our inspectors for the baseline inspections.

We also have an Inspection Procedure 62707 which is used by our residents as part of the core program.

This is more what you would call performance-based inspection procedure. It's used to observe maintenance activities as well as follow up on events.

Now, the maintenance rule itself, if you use the guidance in 93-01 to implement it, first what you do is determine which structure, systems, and components are within the scope of the rule. I hope you won't mind if I start saying SSCs because it gets to be quite a tongue twister after the 15th time.

But anyway, the scope of the maintenance rule is safety-related structures, systems, and components, as well as some non-safety-related.

The first category is those that are relied on to mitigate accidents or transients or used in the emergency operating procedures. An example of that would be a startup feedwater pump or perhaps gas turbines.

The second category is those whose failure could prevent safety-related SSCs from fulfilling their safety

function. An example would be perhaps instrument error or heating, ventilating, or air-conditioning systems.

The third category would be those whose failures could cause a reactor scram or actuation of a safety-related system, for example, feedwater or circulating water.

CHAIRMAN JACKSON: And that would be an example of perhaps what would not be in what we call safety related?

MS. BLACK: Right.

CHAIRMAN JACKSON: But it has safety significance within the scope of this rule?

MS. BLACK: True, because they initiate transients, and that was one of the purposes of the rule.

CHAIRMAN JACKSON: Right.

Commissioner Diaz.

COMMISSIONER DIAZ: I'm glad to see that the EDO came with reinforcements this afternoon. I'll go back to my original point this morning and I'm sure you're ready for it now.

Let's look at the definition of safety-related system or components, and I -- you know, I am puzzled. It is not a complete definition. It essentially excludes all those SSCs that have no relationship to a design-basis event.

You can say, which ones are those? Well, we used to really be very specific in detailing any SSC that was

part of the fuel, the primary coolant, you know, pressure boundary, every one of those things that we relied upon to prevent the consequences of an accident that are outside of the design basis.

Well, the rule, of course, specifically, I'm talking about the SSCs that are inside of an envelope of a design basis and excludes the systems that are used or put to use or normally used for normal and anticipated transients, and I'm sorry, but I don't understand it.

There is something in here that is implied in the word, and I'm sure it was meant to be included, but I don't see it. And it's not there anymore.

And, you know, you look back at Appendix B, you look back at whatever you want to, you see, you know, structure -- SSCs, not repeated, that prevent or mitigate, and that includes all of the systems. But in this definition, they're excluded.

We only are dealing with -- the scope of the rule is dealing exclusively with systems that are inside of the design basis accident envelope and no other system structures, and we deal with those that are safety related and those that are not safety related.

Those that are non-safety related but are required to function for the function of the safety related are of course what we used to call safety significant. It's just

one level below safety related, safety related being one level below important to safety, and -- but it's out of there. Where are they? I don't see where these systems are. I'm sorry.

CHAIRMAN JACKSON: Let me ask a question in this the generic way. Where is "safety significant" defined for the purposes of this rule?

MS. BLACK: Well, that goes beyond the scope issue. Safety significance goes into how you monitor, and so safety -- once you get the scope of what's under the rule, then you determine what's safety significant and what isn't, and that's done by the expert panel that Ashok was mentioning before.

They do use PRA insights and performance -- or importance measures that are defined in 93-01, but that -- it doesn't relate back to what's in our "outside of scopes."

COMMISSIONER DIAZ: You know, it's easy to fix. Now, it might take two years, but all you have got to do is, when you get into the definition, are relied on to remain functional during normal operations, anticipated transients, and following design postulated events to insure the integrity of the reactor cooler. And those are the kinds of things we always said, but it doesn't say it.

MR. THADANI: By and large -- I may be getting into this and regret it later on, but by and large --

COMMISSIONER DIAZ: I assure you, you will.

MR. THADANI: Safety-related structures, systems, and components are clearly a subset of what is important to safety. Those languages appear in different regulations, as you well know. Appendix B applies to safety-related structures, systems, and components.

COMMISSIONER DIAZ: I'm sorry. I need to interrupt you. Appendix B specifically goes and says those systems to prevent or mitigate, and then it goes and says, those systems are needed during normal operations, maintenance.

And this doesn't say that. This specifically says that those systems are only -- they are in the envelope of the design basis, and we have left all the other systems out.

MR. THADANI: When you say "this," you mean the maintenance rule?

COMMISSIONER DIAZ: Absolutely.

MR. THADANI: No. I think the maintenance rule's scope is much broader than that and it's broken down in parts. One part says all safety-related structures, systems, and components. That's one part.

Another part is --

COMMISSIONER DIAZ: No, sir. Read the defining paragraph above it. It doesn't say that. It says, means

those safety -- those SSCs that are relied on to remain functional during our --

CHAIRMAN JACKSON: I think that we're not going to resolve this issue in this meeting. I think it is more important for us to try to understand where the Staff is at this stage of the game and then we can come back and consider, you know, how that is affected by lack of clarity with respect to the definitions.

Perhaps once they've gone through it, we can have a clearer understanding, so why don't you go ahead.

MS. BLACK: As I was saying, the scope of the maintenance rule usually is about 60 percent of plant structures, systems, and components, although that can vary a lot depending on how licensees do their scoping. It can be as low as 50 percent and I've seen it almost 80 percent at some plants.

Then the expert panel determines the safety significance or makes that cut between high safety significant and low safety significant, and that is usually about 30 percent of the in-scope systems end up being high safety significant.

The monitoring then varies depending on the safety significance of the structure, system, or component. High safety significant SSCs are monitored at the system or train level and reliability and availability are both monitored.

For low safety significant, normally operating system, they are monitored at the plant level, monitoring scram safety system actuations or unplanned capability loss.

Standby systems are monitored like they were high safety significant. They're monitored at the train level and at least reliability is monitored.

COMMISSIONER ROGERS: Excuse me. Could you just explain what you mean by monitored at the plant level?

MS. BLACK: Monitored at the plant level would be, you would set performance criteria of no more than two scrams per cycle or no more than X number of safety system actuations, and then when you reach that trigger, you would go and look at what components were causing that and monitor it more closely under (a)(1).

But if you monitored all the systems under the maintenance rule like you do the high safety significant, the monitoring requirements would be pretty extensive.

And also, monitoring varies with performance. Most -- using 93-01, licensees before the date of the rule are supposed to go back and look at their data to see if they meet the performance criteria.

You can monitor your SSCs under paragraph (a)(2) but you have to demonstrate effective preventive maintenance, and this you do by meeting your performance criteria that the licensees set for themselves. And if

these standards aren't met, then the SSCs must be monitored under (a)(1) or licensees must take corrective actions and set goals and monitor against those goals.

And the final part of the rule is the periodic assessment in which the program must be assessed every refueling cycle to evaluate the overall effectiveness of maintenance at the plant. And also, they must balance at that point reliability and availability to determine if they're not doing too much preventive maintenance and causing too much unavailability of the system.

COMMISSIONER McGAFFIGAN: Could I clarify if this is the right time? The Staff has clarified to the industry that it is not a problem to be under (a)(1).

MS. BLACK: Right.

COMMISSIONER McGAFFIGAN: There is nothing you're going to hold against them if they're in paragraph (a)(1) as opposed to paragraph (a)(2)? There was apparently at the outset some misgiving with regard to the staff's intentions on that, but you have clarified that?

MS. BLACK: We hope so, and I'll do it again right now. Having systems in (a)(1) is not looked upon as a problem by the NRC and won't be considered in the self-grades and that type of thing.

And the other part of (a)(3), which Ashok talked about, was the part that encourages licensees, when

performing preventive maintenance, to assess the total plant equipment that's out of service to determine the effect on safety functions.

COMMISSIONER DIAZ: Excuse me. Is there a difference between performance goals in (a)(1) and performance criteria in (a)(2)?

MS. BLACK: Yes.

COMMISSIONER DIAZ: Could you --

MS. BLACK: A lot of times the goals that are set when somebody goes into (a)(1) can have the performance criteria from (a)(2) as the goals, but we like to see a goal that is specific to the problem.

For instance, if there was a -- one of the plants we went to had a reactor coolant pump shaft problem and one shaft had actually broken and they were concerned that the other shafts which had the same material were going to perhaps fail, and so they set a goal of a certain level of vibration. If they hit that level of vibration, they thought there was a greater chance of that shaft breaking too and so they were going to shut down and replace it.

So we like to see the goal specific to the corrective action or the problem and have them monitor it more specifically under (a)(1) than it is under (a)(2).

COMMISSIONER DIAZ: So there is a difference in actually the level of specificity or the --

MS. BLACK: Usually.

COMMISSIONER DIAZ: -- level of demanded safety usually between --

MS. BLACK: We like to say usually because of the flexibility in the rule, but, yes. If there hasn't been a problem identified, specific corrective actions that have been taken for that problem should be monitored to make sure that the problem has been corrected before you go back into (a)(2).

COMMISSIONER DIAZ: Have there been problems between performance goals and performance criteria, or that is very well understood by everybody?

MS. BLACK: Has there been a problem? I think that during the pilots there was a problem because we had to put out more clarification on that specific issue that we expected the goals to be more specific to the problem than the performance criteria, yes.

And now Rich will discuss the results of the baseline inspections and the clarifications in the regulatory guide.

MR. CORREIA: Thank you, Suzie.

Could you go to slide 6, please?

[Slide.]

MR. CORREIA: As Ashok said earlier, we have just completed the 20th baseline inspection last week. Each

inspection, we're finding, is unique because of this flexibility licensees are given to develop and implement their program.

Each time the inspectors prepare, they have to start fresh with a new program, the different ideas, and evaluate those as to whether or not they meet the regulation.

For example, one of the differences we have seen is how licensees scope SSCs into the rule. Some have done it by systems, some have done it by function, which tends to increase the overall number. We have determined that both are perfectly acceptable but, again, it causes you to step back and evaluate these programs in more detail.

You can't necessarily take what you learn from a previous inspection on to the next because it may be quite different.

Overall, I believe licensees are doing an adequate job implementing the rule. As Ashok said, we have seen problems; we have issued many violations, but the violations tend to be specific to a particular part of the requirement, not that they did not meet a requirement.

For example, high safety significant SSCs should be monitored against both availability and reliability. In some cases, we found that one of the two was not being monitored, so they established the (a)(2) programs, but how

they were monitoring a particular system or group of systems varied and that was one example.

Two of the sites have had no violations. One site had a Level 3 violation with no civil penalty, and the rest, a combination of some varied Level 4 violations.

COMMISSIONER DIAZ: Any program that was not acceptable, not adequate of the 20 that you could say --

MR. CORREIA: No. They've all implemented programs, developed programs. The problems we've seen are specific to a certain part of the rule.

One of the problems that seems to be related to some of these violations are that some licensees did take full advantage of the three years that the Commission gave them to implement the rule. They got late starts -- they all developed the programs but took longer times to actually implement them and resulted in some of the problems we've seen.

Next slide, slide 7, please.

[Slide.]

MR. CORREIA: Two of the common findings we have seen on these baseline inspections, one is inadequate reliability performance criteria/goals. Some licensees were monitoring reliability by counting the number of MPFFs, which is a maintenance preventable functional failure, failure of the function that placed the SSC in the scope of

the rule.

Without an adequate technical basis -- for example, if they chose to monitor unavailability for the high-risk system, high-safety system, there may not have been a link back to the PSA assumption, for example.

COMMISSIONER DIAZ: So this implies that everybody monitored availability in an adequate fashion, because the only inadequate was reliability?

MR. CORREIA: In this particular case I was citing here, it related to reliability, using a number of failures over a period of time without considering demands or a link back to the PSA assumption.

CHAIRMAN JACKSON: How do the inspectors judge the adequacy of reliability, performance criteria or goals, and what role does the licensee's PRA play in setting the goals?

MR. CORREIA: Typically the inspector would ask, what is the basis for this particular value you've chosen? In most cases for high safety significant SSCs, there is a link back to the assumption in the PSA, and based on that assumption or some sensitivity analysis that they've chosen to do, the inspectors determine whether or not this performance criteria is acceptable.

For example, if they chose 95 percent reliability for their emergency use generators, you would expect to see a reliability criteria that was equal to that, or if it was

different, some basis for why that difference was acceptable. And it may be some type of sensitivity analysis to show that perhaps 90 percent is acceptable and -- for particular reasons.

MR. THADANI: If I may, assessing underlying reliability for any given component requires a fair amount of data, demand information, and one can use estimators rather than regular statistical assessments because then the need for data goes up quite significantly.

So like diesel generators, there may be enough information on -- that includes testing and actual demands. It would be difficult if the expected reliability is much better than what we demand for emergency diesel generators.

For example, if it's a passive structure, one would demand fairly high reliability. It wouldn't be very -- one can establish numerical criterion, but it doesn't really mean very much. So one has to then go back to something else to assess.

For example, structure may depend on, is it anchored properly, are the bolts in place, are some of them loose, et cetera, is there a lock-down necessary?

So I think all these facets sort of have to be considered as one goes forward in these inspections, particularly when one looks at reliability performance against what was assumed in the probabilistic safety

assessment.

I think it's going to continually be an issue we have to watch, see how well it works.

MR. CORREIA: Another area that the inspections have focused on is scoping. Certain SSCs were not included in the scope of the rule, and one example we found fairly commonly are non-safety-related SSCs that are relied upon to mitigate accidents or transients or use the EOPs, such as emergency lighting and communication systems.

And one could say, well, they do not perform a mitigating function, but I think history tells us that these systems are very important to the -- to assure that the mitigation functions are achieved for use in EOPs.

CHAIRMAN JACKSON: Was that an issue where the guidance was not clear enough?

MR. CORREIA: I believe it was discussed during the pilot programs. I think we probably didn't make it a big issue at that time. It certainly was covered during all the pilots, but it is important and it is in our regulatory guide now.

A similar issue we've seen recently in the baselines is a reluctance to identify maintenance preventable functional failures. I'm not quite sure why. It may be something similar to why there was reluctance to put things in (a)(1) during the pilot programs. It may be

seen as an indication of poor maintenance programs. We don't view it as that. It's an indication that there's a problem that needs attention and corrective actions, and there's certainly no penalty on our part.

Structural monitoring. As we recognized during the pilot program, structures cannot be monitored using performance criteria as active systems. They need more of a condition monitoring approach.

We all agreed, though, with industry that more guidance was necessary. NUMARC NEI did add guidance to 93-01, and we have added additional guidance in our reg guide also to address this issue.

And the main problem we've seen during the baselines is that licensees have established criteria that would move something from the (a)(2) category to the (a)(1) category after a failure. I think for a structure, that's unacceptable, something -- the problem needs to be identified as a -- if left alone, would result in a failure; at that time moved to the (a)(1) category for corrective action.

The (a)(3) safety assessments we have discussed somewhat already. All licensees are doing something. They vary from using a fixed deterministic blend with PRA matrix of combinations of systems that cannot be taken out of service simultaneously.

Some licensees have an on-line safety monitor or risk monitor that they use to determine what configurations are acceptable or not. As Ashok said, they are all treating the "should" in the regulation like a "shall." They are all doing something. The question comes up is, are these weaknesses we are seeing in their methods such that we need to change the rule? We don't believe we do at this time.

COMMISSIONER McGAFFIGAN: Could I follow up on that? You don't believe you need to at this time, but on page 17, I think, of the paper, you say you're going to continue to assess that. And what you just said, they're treating the "should" as a "shall" is -- at a briefing last week -- you were present -- I didn't hear that then. They are doing something. They aren't doing as much, was my impression, as if the word "shall" was there rather than "should."

And it strikes me, in the PRA implementation plan, we're talking about in-service inspection and in-service testing, at some point being able to do this configuration control is going to be important and have consequences in other areas. Isn't that the case?

When will we or when should we get you guys to come back to us and tell us whether we need to change "should" to "shall"? What's the proper time period in which to get that assessment out of you?

MR. THADANI: Let me comment on that. I think the concern is real. The issue of configuration control, on-line maintenance, I think is a safety significant matter. We have to deal with it very carefully.

As Rich mentioned, we have identified problems, weaknesses is what we call them, and what we're finding is that the licensees are listening to our concerns and would like to take a crack and see as feedback, are they actually taking advice and comment they're getting and implementing changes. We would like to be able to get that information before coming with a proposal to change the regulation or not.

As far as other activities are concerned, as you know, we've been working and using risk insights in technical specification activities. South Texas is an example, have come to us and proposed changes to their technical specifications, to high-pressure safety injection and on-site AC power source.

We have made it a practice basically to make sure that for those cases, at least that configuration control becomes part of the technical specification changes, that is, while you can grant longer outage time for some components, that is not allowed if another component that might appear in a sequence is also out for preventive or corrective maintenance. So that concept we're applying in

other areas makes sure that that's built in. But that's sort of ad hoc.

CHAIRMAN JACKSON: So if it's ad hoc, it begs the answer to his question.

MR. THADANI: Absolutely. What I was getting to was, in the pilot studies, we're certainly looking at that element. What I was saying was that even within the maintenance rule itself, we need to get some level of confidence that the utilities are actually paying close attention to on-line maintenance even though the rule itself says "should." That relates to enforcement activities.

CHAIRMAN JACKSON: Well, but on page 17 -- now I'm going to play Commissioner McGaffigan -- it says that because -- this is under the conclusions, "Because the provision in paragraph (a)(3) that states that licensees should assess the impact on safety when removing equipment from service is not a requirement, this provision is unenforceable. But at this time the Staff doesn't believe a rule change is necessary."

MR. COLLINS: Chairman, I think perhaps this is just a matter of a level of expectations, and I think there is probably some history that goes with this wording that it might behoove us to understand better.

But in any case, clearly, if we are going out and inspecting with the premonition that we want this done and

we're satisfied because licensees are doing it, but at the same time the licensees have the option perhaps not to do it, and we need to reevaluate whether we need to change the rule.

And I believe, based on the inspections that we have, we should be able to derive a fairly good database of, is this provision necessary for us to have confidence in the overall implementation of the rule? And if it is, then we need to be willing to make a recommendation to the Commission on whether the word should be changed.

CHAIRMAN JACKSON: Commissioner McGaffigan.

COMMISSIONER McGAFFIGAN: I don't want to keep beating a dead horse here, but the South Texas example is one where it's sort of unique. They have an extra train or an extra half a train or whatever that allows you somewhat more flexibility to get a spec change there, but even there you're sort of, through the back door, requiring configuration control. I think it's going to come out, I'll bet, in an in-service inspection and several of the other initiatives that are underway.

So all I'm urging is that you continue to think about being up front about it rather than having it come in the back door. If you all think it is necessary, let's put it in through the front door.

CHAIRMAN JACKSON: When do you anticipate having

all of your inspections done?

MR. CORREIA: The goal is July 1998, two years to do all sites.

COMMISSIONER ROGERS: Just before we leave this dead horse, I think it's important to understand why they're not doing this if they're not doing it.

It seems to me -- it's very puzzling to me. It seems to me this is so fundamental that we better understand why they're not just accepting this without any question in doing it because it's -- you know, it's as plain as the nose on your face how important it is.

So if they're not doing it, I think we ought to really understand what the reasons are that they are apparently not doing it, because I think they're going to be as important as making the change in the rule, understanding what the underlying problem is, if there is a problem.

MR. THADANI: I hope we're not leaving you with the impression that the licensees are not doing it. I think the issue is how good an evaluation are they conducting, have they got the right scope when they look at, for example, a matrix. Let's say they cannot take certain -- two trains out simultaneously, one from system A and one from system B.

COMMISSIONER ROGERS: I don't want to go on with this, but if it's -- for this purpose, if it's an incomplete

and inadequate job, it might as well not be done at all. I mean, you've got to do it right, and so I think that the notion that something less than an adequate job is even contemplatable is troublesome to me. I think that somehow we have to get at that.

COMMISSIONER DIAZ: If I could beat on the dead horse --

CHAIRMAN JACKSON: Well --

COMMISSIONER ROGERS: Put a saddle on it and ride it.

COMMISSIONER DIAZ: I understood from the comments that, you know -- and I -- obviously it is true, that the issue of reliability is more complex and requires much more data, and obviously that's true.

However, the issue of availability should be simpler and therefore more enforceable, and I think that definitely should give us the line saying we will not require you to start looking at reliability up to the last significant place, but we do require that you maintain a configuration that operates under conditions.

Is that correct?

MR. THADANI: Yes.

CHAIRMAN JACKSON: Do you know any of the "why's"?

COMMISSIONER McGAFFIGAN: Why the "shall" and the "should"?

CHAIRMAN JACKSON: No.

COMMISSIONER ROGERS: No. Why an inadequate job.

MR. SHACKELFORD: I don't think we've found any that are inadequate at this point. We found a wide variety of what I should call weaknesses. As I said, they go from -- risk monitor for a licensee is really an endeavor to monitor their entire plant on a real-time basis right down to what you might call business as usual.

I think licensees have always assessed the impact of taking equipment out for maintenance. The control room SRO, that's part of his job description, but we don't necessarily think that that's probably the most comprehensive way to do it, given the tools that they may have now. So we are looking harder at that than we may have in the past.

The maintenance rule requires them to look at all equipment out of maintenance, not just safety significant, frontline systems, and those are the types of weaknesses that we're pointing out, that while you still have to keep track of the tech spec outages, you also need to look at these other systems that may challenge your plant.

And those are really the issues we're talking about here. And I think the industry has been receptive to that. They haven't necessarily been happy to hear our comments, but I don't think we've had a disagreement that

those are important issues to address.

CHAIRMAN JACKSON: In saying that you don't hear disagreement that these are important issues to address, does that mean, then, that you see a change?

MR. SHACKELFORD: As I said, I don't think you'd find a single utility who would say we're not going to do assessments before we take the equipment out of service. I think they will all tell you they've always done it and they will continue to do so.

The exact nature by which they do them and the level of specificity I think is what the issue is, and that's where the weaknesses which we have identified are coming into play.

CHAIRMAN JACKSON: Why don't you go on.

MR. CORREIA: Slide 8, please.

[Slide.]

MR. CORREIA: I mentioned earlier enforcement on 11 of the 20 inspections are complete. Two had no violations at all. One had a Severity Level III but no civil penalty, and eight had one or multiple Severity Level IV violations, and the remaining inspection findings are still under Staff evaluation.

CHAIRMAN JACKSON: Let me ask you a question. Have any of the violations or enforcement actions been related to what you might call the performance aspect of the

rule?

MR. CORREIA: I would say not as many as more of the programmatic problems that we've seen.

CHAIRMAN JACKSON: Let me ask you this second question. Can we make a statement yet as to whether maintenance, in fact, or equipment performance has improved since the implementation of the rule? Because in the end, that's what we want, right?

MR. CORREIA: Right. I think several plants have told me -- managers have told me that they're much more aware of equipment performance now than they were previously.

CHAIRMAN JACKSON: Well, I guess I'm asking a different question.

Do we have an inspection program that does, in fact, look at maintenance, and it looks at various things in terms of equipment failures, whatever? Have we done a marriage to know, or just in general, do we see any improvement in equipment performance?

MR. CORREIA: I think the latest data from AEOD still shows a high number of reactor scrams initiated from a balance of plant, which is one of the main reasons that the Commission wrote the rule. So in that aspect, I guess we have not seen a change.

CHAIRMAN JACKSON: So in the end, performance is

as performance does, my favorite phraseology. And the question is, if we still don't see any change, what are we getting?

MS. BLACK: I think one of the benefits we're getting is the understanding of unavailability that wasn't there before, either in non-tech spec systems or tech spec systems that the licensees were in and out of, but never tracked total unavailability throughout the year.

MR. THADANI: Also, I might note that it's probably going to take quite some time before we can get objective information to see if there is a big difference. How we can send out the awareness is the issue.

CHAIRMAN JACKSON: So the awareness has increased but we don't know yet?

MR. THADANI: And I think it will take quite some time before we will know with objective information.

CHAIRMAN JACKSON: All right.

MR. CORREIA: Slide 9, please.

[Slide.]

MR. CORREIA: Slides 9 and 10 contain the clarifications we've made to regulatory guide 1.160. The ones I have listed on the slide are the ones we feel are the more significant ones, and I'd like to review those. And then if the Commission would like to talk about any on slide 10, we can do that also, if that's acceptable.

Regulatory guide -- Rev. 2 to regulatory guide 1.160 endorses NUMARC 93-01, Rev. 2, with clarifications.

For example, one of the clarifications we have made are those non-safety-related SSCs whose failure could cause a scram. We've tried to clarify when one of those systems should be in the scope of the rule, to say that if it has failed at a particular site and caused the scram, obviously it's in the scope.

Then, if it has caused a problem at a similarly configured plant, the licensee should seriously look at whether or not that system in his plant or her plant should be within the scope of the rule.

Or if there's an existing analysis that said, if this system fails, it will result in a scram, that would place that within the scope of the rule.

I talked earlier about certain SSCs that are used in EOPs and they're used to mitigate accidents and transients, such as emergency lighting and communications are very important, even though they directly are not used to mitigate the action functions.

We talked before about MPFFs as a reliability indicator. We have now concluded on a regulatory guide that this is acceptable provided that there is a sound technical basis for whatever number of MPFFs the licensee chooses as a means of monitoring reliability.

Structures, we touched on earlier. We've added some additional guidance in our reg guide, in addition to what changes were made to 93-01, to say that structures should be monitored differently than active mechanical and electrical systems and that condition is a better process or method of monitoring the condition of structures, and that actions need to be taken to correct the problem before failure occurs, if there should be an indication of a problem, corrective action taken and placed in (a)(1) with goals in monitoring before a failure.

COMMISSIONER DIAZ: Excuse me. Could you give me an example of a non-safety-related SSC that is relied upon to mitigate accidents?

MR. CORREIA: That could be -- feedwater systems or condensate systems typically are non-safety related. They could be used as a core cooling system. I think the condensate system was the non-safety system at Saint Brown's Ferry when they had their fire. That's one example that comes to mind.

COMMISSIONER DIAZ: And we classify them as a non-safety system because it's not in the Q list? Is that --

MR. CORREIA: It doesn't meet the definition of 50.65 for safety related, yes.

COMMISSIONER DIAZ: Is that the clear interface? Is it in the Q list or it's not?

MR. CORREIA: Quite often, Q lists contain more than just safety-related SSCs. Most licensees are fairly conservative with the Q lists.

Normally operating SSCs of low safety significance, the clarifications to the reg guide. Typically these systems are monitored at the plant level, again, such things as plant scrams. Some licensees are only monitoring against automatic scrams. We wanted to clarify that unplanned manual scrams are just as important also and should be monitored for these types of systems.

Are there any particular items on slide 10?

COMMISSIONER DIAZ: Number one.

MR. CORREIA: Number one, safety-significance categorization process. The only point we wanted to make here is that the process used to implement the maintenance rule, to categorize SSCs, is either high or low safety significance. It's specific to the maintenance rule and doesn't necessarily -- or cannot necessarily be used in other applications, for example, greater QA or ISI or IST approaches.

We do recognize, though, that we are doing a lot of work in this area and if at a future time there is information that is developed in the SRPs or the reg guides for the PRA implementation plan that could be beneficial, we would again revise the reg guide to reflect that.

COMMISSIONER ROGERS: It's really not a question, but it's an observation, that is that in this definition of maintenance, we are focusing very much on what we regard as related. I don't want to use the terminology incorrectly, but it has some connection with safety. Let's put it that way.

And I wonder whether you've seen any effect or you think there might be any effect as the plant focuses its resources this way, on plant housekeeping, whether, for example, the place starts to look worn out, even though the important equipment is in good shape. I'm not going to comment on whether that's good or bad.

I think it may relate somewhat to a general state of attitude and safety culture, but I wonder if that is something that one might expect to happen in the future as a result of our move in this direction and the economic stresses that are coming to bear on licensees.

MR. CORREIA: Certainly material condition is one of the items that all baseline inspections cover, and I think, to date, generally the reports are fairly good, that material condition is generally good, that I think there have been certain cases that on a certain particular piece of equipment, that it may be less than desirable. But it may be for a very good reason. Perhaps they just finished a major overhaul and haven't had a chance to bring it back up

to some specification.

I really don't know if we will see changes in that area because of the stresses you mentioned.

COMMISSIONER ROGERS: I wouldn't be surprised. I think we may have to decide what our position is in that case, if any.

CHAIRMAN JACKSON: How do we deal with the issue of living PRAs and their effect on categorization of systems and performance requirements? You know what I mean when I say living PRAs?

MR. THADANI: Yes, yes. That is one of the elements in the various pilots that we're working on, and the concern we have -- first of all, as one makes changes, one needs to keep track of those changes and needs to know on a real-time basis the plant as is versus reflection of the study itself.

So we are looking at finding ways for those licensees who want to use these techniques to make changes or seek relief in some areas, that they do need to keep track of those changes, that that would basically be a living PRA, so that at any given time, we know the PRA does reflect the plant as is rather than what it might have been like six years earlier.

So that's the path we're on as part of the PRA implementation plan.

In this case, they have to make an assessment -- I believe it's every two years -- to see what the plant performance was and, in fact, whether it might change their initial judgments. They have to revise their earlier decisions. They do have to make an overall assessment, I believe, every two years for the program.

CHAIRMAN JACKSON: And that includes looking at an updated risk profile?

MR. SHACKELFORD: We have been looking at that issue in the inspections. We've asked that question. Those licensees are using the PRA to derive performance criteria or ranking.

We typically ask them questions about their plans to update and go even further about how their current PRA, what's the time frame of the data in the model that they're using for that.

In those situations where we find problems, we certainly document them. We're not enforcing a living PRA requirement on anyone, of course, but I think the biggest issue in that area we've seen are a lot of licensees may be using what you might call outdated data as opposed to outdated models.

I mean, they pretty much reflect the configuration of the plant, but they may be using generic data or data that hasn't been updated in several years.

In those cases, on a case-by-case basis, where we think there might be a problem, we'll make challenges on a specific point, but that is part of the inspection process.

MR. THADANI: We would expect, as, for example, if new information comes out -- and it could be NRC issues generic communication because we learn something new -- clearly those factors have to be considered by the utility in the assessment of its program.

CHAIRMAN JACKSON: You were asking about page 10. Tell me about MPPFs related to the design deficiencies. What do you mean by this? Can you give an example?

MR. CORREIA: As a point of clarification, that should have been MPFF. I apologize.

The issue came up during the pilots, I believe, where licensees, for economic reasons, had decided not to change the design that was -- of a piece of equipment that was giving them performance problems.

Understanding that, we said our expectation was, you should enhance your preventive maintenance program as much as reasonable to assure that future failures don't occur, increased frequency of tests or surveillances or changes to consumables or whatever, but just to live with a bad design and walk away with it without some type of change to the maintenance program we didn't think was acceptable. We just wanted to clarify that point in the regulatory

guide.

COMMISSIONER DIAZ: Number of SSCs in category (a)(1)?

MR. CORREIA: That's what Suzie mentioned earlier. During the pilots, for some reason, some licensees felt that (a)(1) was a penalty box. It might trigger some huge NRC inspection if they had too many SSCs in (a)(1). We just want to make sure everyone understands that that is not the case, (a)(1) is a requirement. As long as they meet the requirements, there's no problem.

Any others?

Slide 11, please.

[Slide.]

MR. CORREIA: I believe we've touched on all of these items. Certainly Ashok did. We mentioned communications was very critical during the developing phases, and we still believe it is today. We continue to believe that open and effective communications with the industry and the public is essential to the success of implementing the rule.

Pilot programs, we believe, are very important. We learned an awful lot, and it was also easier to do during a non-enforceable environment. It was easy to discuss issues openly with licensees.

Ashok mentioned that guidance was developed

through the iterative process. The industry developed 93-01. We discussed it over a two-year period. We did the pilot programs; it changed somewhat again. We revised our regulatory guide twice since then, all through information that we gathered during each phase of the implementation of the rule.

Ashok mentioned training. Also, we've trained in varying degrees over 900 people in the NRC on the maintenance rule.

COMMISSIONER DIAZ: Is that -- do you have a breakdown whether that's regions or quarters?

MR. CORREIA: By regions, I don't. By far, most of the inspectors are in the regions. I think we've trained over 130 inspectors that do the baseline inspections, close to 400 other inspectors that may have some involvement with the rule, like resident inspectors, though I have to admit, Region IV did have every resident -- or one resident at every site take the full three-day course, and the rest are NRR Staff that may have some dealing with the maintenance rule.

Ashok mentioned earlier that we believe the rule can be consistently inspected and enforced through the communications that we've had with the regions and licensees and to the enforcement panel that's established.

Resource requirements have been high through the

iterative process of developing guidance, inspection procedures, meetings with the public, workshops, and what we're doing on the baselines to maintain oversight.

CHAIRMAN JACKSON: Do you expect that to continue at that level?

MR. CORREIA: I believe until the baseline -- baselines are complete, it will. They will.

MR. COLLINS: Madam Chairman, I think it's important to note here that we're dealing with history also. This is one of the first inspections of this type. We're taking 30 to 40 years of agency momentum as far as types of inspections, qualification of inspectors, enforcement approach, and we're trying to turn the corner with the initial inspection here, and it takes some time.

It takes some orientation; it takes some recalibration and sorting through the results and understanding where we are, and adjustments, as indicated by the revisions to the guidance.

So I would anticipate, if we continue on this type of track, that the initial resources as far as the development might be somewhat the same, maybe even a little less, but the actual practitioner application and the thought process that it takes to shift gears from deterministic to performance-based will be easier as to generations of inspections continue on.

There will always be, in our mind, initially a programmatic inspection for the application of the rule, and any more performance-based routine follow-up, typically by the residents. In the maintenance rule here, it is more event driven than it is programmatic.

The real insights to the maintenance rule, I believe, will be forthcoming as a result of challenges to the plant that result from component malfunctions, and using the programmatic inspections, we'll go out and take that cut and look back into the rule based on a malfunction and determine whether the rule is being applied appropriately. That will be the real insights into the long-term application of the rule.

COMMISSIONER ROGERS: Well, it also may be that you want to look and see what the effect is on the license renewal activities that we get into, that this may be partly an investment in a sense, unrecognized at this point, but as licensees come forward with applications for license renewal, it may be that this investment will pay off in that area.

MR. THADANI: Absolutely. In fact, for past structures and so on, this becomes critical for license renewal activities, and that's why the procedures that Rich mentioned earlier in terms of guidance, we have tried to make sure that the guidance we're using here would be

sufficient even when we get to license renewal activities so we don't have to come up with yet different guidance to look at the same structures.

So you are quite right, and our internal activities we have integrated that way.

COMMISSIONER DICUS: Mr. Collins may have -- may have answered this question, but it is on the resource commitments. I want to pose the question in terms of future resource commitments, particularly in light of the fact that we may well continue down this road of looking at regulations that are risk-informed, performance-based and new kinds of regulations that may be written.

And in the lessons learned here, and particularly -- and it's referenced a bit I think in the paper itself, are we to assume that future regulations of this nature might also be very resource intensive, certainly on the front end of those regulations, or are there lessons learned that perhaps future regulations might not have to be so resource intensive on the front end of the regulation?

I raise the issue in terms of long-term budgetary planning, because if this is a course that the Commission may well be going down, we have to continue -- concern ourselves with the year '99 and 2000 and so forth budgets, are we going to need to consider these things as well?

CHAIRMAN JACKSON: Before you answer it, I'd like

for you to answer it in the context of what kind of resource requirements go into our initial implementation of any new rule that's of significance.

MR. THADANI: I'll give you a judgment. It seems to me that the maintenance rule is quite broad. It's our first -- by and large, it's our first truly performance-based rule, and therefore, probably we have had to expend more resources than we might have for future changes in the regulations.

But I think the real issue is the degree of increase in resources is going to depend on the type of rule we have in front of us. This affects the whole plant and it's pretty complex. If it's a fairly simple rule, I don't know that there would be much impact.

But if we were to, let's say, revamp fire protection radically to go to performance-based, I would anticipate that, again, the initial resource commitments could be pretty high, because the idea behind these approaches is: let's agree on what kind of a program makes sense up front and then we'll walk away.

The agency basically would say, okay, we will not get involved unless there are some signal indicators that there may be a problem, and then we will react to that.

CHAIRMAN JACKSON: You don't really mean we're going to walk away?

MR. COLLINS: No, we don't.

MR. THADANI: What I meant was, we have placed our residence in other people watching. When I say walk away, a significant intervention on our part would come if we have reason to believe that there may be a problem.

It seems to me that it is very important that the ground rules be agreed to up front and both sides need to understand, and because there is so much -- because the whole idea is to provide flexibility, one should have some agreement on what does that really mean up front.

So it seems to me that one would have to do early performance -- for performance-based rules, programmatic inspections very likely would have to be done.

And if I use this experience, then that says you probably have to spend more resources. How much more, I think, is going to be determined by the scope and range of activity we're talking about.

But I think it does mean, up front, an increased resource commitment.

CHAIRMAN JACKSON: But isn't it also a function of the expertise of the Staff going in?

MR. THADANI: Definitely. And because the concepts utilized are pretty multidisciplinary -- and that means you have to get all those resources together and go take a look, and it's -- quite frankly, it's been very tough

on us to support these inspections.

The gentleman sitting to my left can tell you how often we called him, because the PRA resources are tight. There's no question. We have a lot of activities that are going on, and we had to beg, borrow, and do everything we could to support these inspections, and I anticipate similar challenges if we have major rules that are revised.

MR. COLLINS: Really, I think the most efficient way is very similar to the way the maintenance rule was handled in that there's a performance-based, fairly brief rule with stated goals -- we can argue about the one, and that's our last bullet -- that the industry provides some measure of input as far as the guidelines for application.

And that's recognized by the staff and in fact endorsed by the Staff, and that's a fairly clear-cut process which I think in the future we should continue to embrace whenever it's appropriate.

The resources, to my mind, come in when you're trying to inspect a performance-based rule at each site, where each site has options for implementation, have perhaps very different structures and resources available to them, so you cannot go out and do the same inspection on each site.

So to gain confidence that the performance-based rule does have enough of a platform for us to then turn to

measure only performance of that rule, we have to do a very in-depth, very focused inspection on each site, and that's difficult.

I don't see that changing very much. I think we still have to do those types of inspections on the performance-based rule.

The payback, hopefully, is on the back end of the process where we free up our on-site resources to look at other issues or to redirect them in other areas, and then we allow the licensees in their performance-based realm to focus on what they believe is important, not what the agency --

CHAIRMAN JACKSON: -- has agreed with them is important?

MR. COLLINS: Right.

CHAIRMAN JACKSON: So how do you measure those?

MR. COLLINS: I think that's a good question. It's a fair question that was stated, Madam Chairman, and I wrote it down. We have to be able over a period of time to measure that this rule has met the mutual goals that warrant the type of investment that was made. And we owe you that answer.

CHAIRMAN JACKSON: Anything else?

MR. CORREIA: The last item I think we've talked about quite a bit, but from an enforcement perspective, the

rules must only contain requirements.

The last slide, please, number 12.

CHAIRMAN JACKSON: I'm confused. Is this new information? You say rules should only contain requirements.

MR. CORREIA: We're referring to the (a)(3) part of the rule that says they should do safety assessments versus shall do safety assessments.

MR. COLLINS: We covered it earlier in the discussion.

CHAIRMAN JACKSON: Not exhortations but requirements?

MR. CORREIA: Yes.

MR. THADANI: There's something in the rule, but the rule itself says should be done, but we're having a hard time enforcing it, so it's the language in the rule.

CHAIRMAN JACKSON: I think there's a lesson there in terms of, A, what gets propagated to the Commission in terms of a proposed rule, and B, the scrutiny the Commission gives to a rule and what it signs off on or may, in fact, modify, okay, to make an exhortation as opposed to a requirement. So I think there's a lesson for all concerned in that regard.

[Slide.]

MR. CORREIA: Slide 12, status of future

activities we're working on or planning on working on. Again, we plan to -- our goal is to complete all baseline inspections by July 1998.

We have drafted an information notice based on lessons we've learned from the baseline so far. We expect that to be issued next month, and, again, communicate to the industry what we found, what kind of information they should be considering.

We will now revise our baseline inspection procedure to reflect changes to our regulatory guide. If we keep it current, we think we can have that done by this July.

We are also working on a Home Page to share with industry, maintenance rule documents and information that are already publicly available but haven't been easily accessible through the Internet. Our goal is to have that completed by this June.

The Office of Enforcement plans to revise the EGM that we are currently using for the maintenance rule. We have discussed with them options on how soon that could be done. We basically feel we have enough experience now with the baselines to go ahead and clarify some of the guidance that's in the EGM at this time.

We are also working with the Technical Training Division at TTC to transfer the training program from NRR

now to TTD for them to -- for future training. We hope to have that transition completed by the end of the year.

CHAIRMAN JACKSON: Let me ask you a more mundane question. What's the typical makeup of the expert panel, and is there consistency or does it vary from plant to plant?

MR. CORREIA: Typically, there's representatives there from plant operations, maintenance, engineering, certainly the PSA area, and most licensees will bring in the system engineers for the particular system they may be evaluating. I think most are pretty consistent with that makeup. Some involve quality assurance personnel also.

CHAIRMAN JACKSON: Any further comments?

COMMISSIONER DICUS: One last question. We consider this basically a fairly successful rule. I think that's a fair statement. Some members of the nuclear power plant industry have raised some criticisms of the rule and I would ask if those -- if you believe those criticisms are fair or reasonable or valid, and if so, what are we doing to address them.

MR. CORREIA: One of the issues that came up early on was this issue of using MPFFs as a measure of reliability. We felt the guidance was clear. It was discussed during the development stages of the guidance document in the '91, '92 time frame, and we responded to the

industry concern that way, what our expectations were in that area.

Another concern of some licensees is that the baseline inspections are very programmatic, as Sam mentioned. We need to do programmatic inspections to gain the confidence that licensees have established programs that will effectively monitor the effectiveness of maintenance, and until such time, I think we need to evaluate very broadly, horizontally, the programs they've established to implement the rule.

Once we have confidence that the programs are in place, it's stable, then I believe we can focus more on performance issues than the programmatic issues.

CHAIRMAN JACKSON: Okay. Commissioner.

COMMISSIONER ROGERS: Well, just one -- I'm sorry.

COMMISSIONER DIAZ: Go ahead.

COMMISSIONER ROGERS: Just one point, and that is -- a general observation, and that is that in trying to develop measures of how successful or not this is, I think there are both quantitative measures, failures, scrams, so on and so forth, but there's also the impact on what I'll call the safety culture of the plant.

Right now, I think it's sort of an article of faith with me that the more ownership that the plant people actually feel towards their plant, ultimately the better

results and the more safe plant you're going to get.

But that's really an article of faith more than demonstration, and I think that it's something to watch, that whether this -- this approach of a performance-based rule which ultimately looks at results -- that's the idea in the end -- looks at results more than methods, although we have to go through our programmatic inspection program to make sure that we have some confidence that they can deliver what they may -- what their objective -- performance objectives turn out to be.

Once you get through that, and that will take some time, whether one then finds that the general attitudes within the plant are strong with respect to taking initiatives to do things the best way themselves and to use their resources in the best way, and that's a subtle measure, but I think it is something to watch for because, to me, that's one of the long-term benefits that I would hope to see come out of this general approach.

CHAIRMAN JACKSON: Commissioner Diaz.

COMMISSIONER DIAZ: Thank you, Madam Chairman.

Although it might not be obvious from my previous comments, I do love the maintenance rule, and let me tell you why I love it.

Rather than just looking at the rule and the language and the problems, I think for the first time, we

took a risk and went out there with something that was not completely known, and probably for the first time, in writing, we went and said, those known safety-related systems which might be safety related, okay, that we know about and you know about have to be treated in an equal part with safety-related systems.

That was a great thing to do, because we have known they're there. Everybody has known they're there, and we keep feeling around, as it were, and we say, look, it doesn't matter what we call it. If they are really, you know, important to the safety of the plant, they have to be addressed, and I think that was a major thing.

On the other hand, there are some words in here that do need to be fixed, and I think you realize that there is a little bit more specificity that needs to be described, that the rule actually does apply to all those systems, structures, and components that are in the plant during not only the design basis and so forth.

I do think that we have done some great strides in that availability should be clearly and further, you know, analyzed and enforced if necessary, while we need to go on our own learning curve on reliability, but I really commend you. I think it's just going the right way.

CHAIRMAN JACKSON: Well, thank you. I'd like to thank the Staff.

MR. CALLAN: Chairman, I think I'd like to just make one comment and remind you, Chairman, of the June 1996 senior -- Staff briefing at the senior manager meeting before the Commission at which time you, in closing, went to each of the four regional administrators and asked us our opinion. This is a month before the rule was implemented, and asked us our opinion, our prognosis of how we thought the rule -- how we thought it would go.

And as you know, regional administrators are a tough audience, a skeptical audience, and I think you heard -- if you remember, you heard a lot of concern from each of us, a lot of trepidation from each of us.

It was not a scientific survey, but my sense is, speaking for my colleagues, I think if you were to poll each of the regional administrators now, I think you'd get a sense from them that certainly their worst fears weren't realized and probably that they view the implementation as one of our more successful endeavors. I think it's gone quite well.

And one final comment. When you look at resource expenditure in implementing a rule of this nature, I think you have to also consider that if those resources weren't used in implementing the maintenance rule, a lot of resources would still be poured into maintenance in a different way, and it wasn't that long ago, how many years

ago, we expended significant resources doing maintenance team inspections.

MR. THADANI: Right.

MR. CALLAN: I think the resources we spent doing maintenance team inspections as an initiative would rival the resources that we spent implementing this rule, and I think -- in all candor, I think we would all agree that the results of the maintenance team inspections were probably a disappointment, given the resource expenditure.

So maintenance is one-fourth of the process. We do inspect maintenance, and I think certainly the regions do not begrudge the resources spent implementing the rule, and those resources would have been spent doing maintenance anyway.

So I don't know how you parse that, how you split that away and just look at the delta resources of overhead in implementing the rule and not the total resources, and so that's it.

CHAIRMAN JACKSON: That's the important point.

Well, thank you again and it's been a very informative briefing. I thank all of you.

I think that considerable progress, in fact, has been made in implementing the maintenance rule, and, Mr. Callan, your comments relative to the opinion of the regional administrators helps to reinforce that perspective.

And as you've heard, obviously the Staff should continue to focus on insuring consistency in the implementation and enforcement across the industry. As many of us have said, the maintenance rule is often referred to as an example, maybe the first real one of a risk-informed, performance-based regulation. That's certainly the way I've been advertising it.

And because of that, the lessons learned from its implementation should serve and must serve as a useful guide to assist NRC in the future development and implementation of risk-informed, performance-based regulation.

And in that regard, I will bring three things to your attention. One has to do with this issue of -- and Commissioner McGaffigan made this point before he left, is asking you to consider again this question of whether the category (a)(3) safety assessments, whether there needs to be some clarification in terms of the language.

What you said about requirements should be in the rules as opposed to exhortations, and I think you need to come back to us on as short a time scale as we can work out here with some more definitive statement in that regard, because we've had histories in the past of saying, well, we don't think we need to do anything, and then -- I won't be here, but 15 years from now, we'll be talking about what we could have done and should have done.

And in the meantime, I think you should -- as you go forward, I'd like to see some sense of how you're going to track the efficacy of configuration control a la the rule in our regular inspection program, even as we get information through these baseline inspections from the plants that haven't had them so far.

And secondly, I think it is very important that this issue of being able to measure how efficacious the rule is in terms of the net effect of the quality of maintenance, that is, on equipment performance -- and again, I think this is rooted in a basic inspection program, but it has to be tied into the judgments we are making on the efficacy of the rule itself, and then the issue of clarification of language used is always out there.

So unless there are any further comments, adjourned. Thank you.

[Whereupon, at 4:27 p.m., the briefing was adjourned.]

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 IMPLEMENTATION OF MAINTENANCE RULE, REVISED REGULATORY GUIDE, AND CONSEQUENCES - PUBLIC MEETING

PLACE OF MEETING: Rockville, Maryland

DATE OF MEETING: Monday, March 10, 1997

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: David Sisson

Reporter: Jody Goettlich

STATUS OF THE MAINTENANCE RULE

Ashok C. Thadani
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Richard P. Correia

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March 10, 1997

AGENDA

- Maintenance Rule Background
- Baseline Inspection Program Results
- Clarifications in Regulatory Guide (RG) 1.160, Revision 2
- Lessons Learned and Insights
- Future Activities

OVERVIEW

- Need for a Rule
  - Number of Transients and Scrams
  - Maintenance Team Inspections
- Developed Risk-Informed, Performance-Based Rule
- Give Licensees Flexibility
- Can Inspect and Enforce
- Challenges
  - Variation Between Licensees
  - NRC Resources Required are High
- Completed Staff Activities

BACKGROUND

- Rule Issued 7/10/91, In Effect 7/10/96
- Industry Guideline Document NUMARC 93-01
- RG 1.160
- Inspection Procedure (IP) 62706
- IP 62707

BACKGROUND - IMPLEMENTATION USING NUMARC 93-01

- Determine SSCs Within Scope
- Determine Safety Significance of SSCs Within Scope
- Monitoring Varies With Safety Significance
- Monitoring Varies With Performance

BASELINE INSPECTION RESULTS

- 20 Inspections
- Each Inspection Unique
- Overall Licensees Adequately Implementing the Rule
- Some Licensees Implemented Late

BASELINE INSPECTION RESULTS - CONTINUED

- Two Common Findings
  - Inadequate Reliability Performance Criteria/Goals
  - Failure to Monitor Both Reliability and Availability
- Scoping
- Reluctance to Identify Maintenance Preventable Functional Failures (MPFFs)
- Structural Monitoring
- (a)(3) Safety Assessments

BASELINE INSPECTION RESULTS - CONTINUED

- Enforcement Complete on 11 Inspections
  - Two Had No Maintenance Rule Violations
  - One Had One Severity Level III But No Civil Penalty
  - Eight Had One or Multiple Severity Level IV
  - Remaining Inspection Findings Under Staff Evaluation

CLARIFICATIONS IN RG 1.160, REVISION 2

- Scoping
- MPFFs as Reliability Indicator
- Monitoring Structures
- Normally Operating SSCs of Low Safety Significance

CLARIFICATIONS IN RG, CONTINUED

- Safety-Significance Categorization Process
- Reflect Changes to Rule Since Revision 1
- Definition of Maintenance
- Timeliness
- Definition of Standby
- MPPFs Related to Design Deficiencies
- Number of SSCs in Category (a)(1)

LESSONS LEARNED AND INSIGHTS

- Importance of Communication
- Value of the Pilot Program
- Guidance Developed Through Iterative Process
- Importance of Training
- May Need Programmatic Baseline Inspection Program
- Can Consistently Inspect and Enforce
- Resource Requirements High
- Rules Must Only Contain Requirements

STATUS - FUTURE ACTIVITIES

- Complete Baseline Inspection Program
- Issue Information Notice
- Revise IP 62706
- Make "Home Page" Publicly Accessible
- Revise Enforcement Guidance
- Develop Continuing Training Program

Maintenance Rule (MR) Baseline Inspection Results

Plant	Palo Verde Units 1, 2 & 3	Peach Bottom 2 & 3	Prairie Island Units 1 & 2	Donald C. Cook Units 1 & 2
Total SSCs	128	326	100	228
# SSCs in Scope	89	133	75	173
# of High Safety Significant SSCs	35	42	30	64
# of SSCs in (a)(1) Category	10	3	4	30
Risk Determination Methods	RAW, FVI, 90% of CDF Cutsets, & Expert Panel	RAW, RRW, 85% of CDF Cutsets, & Expert Panel	RAW, RRW, 90% of CDF Cutsets, & Expert Panel	RAW, RRW, 90% of CDF Cutsets, & Expert Panel
Living PRA & Update Frequency	Yes, Every Other Refueling Cycle	Not Updated Since 1991	Yes, Every Other Refueling Cycle	Yes, Every Other Refueling Cycle
On-Line Maintenance Safety Assessment (SA) Methods	Pre-Analyzed Risk Matrix	AG-43, SA Procedure, Consults with PSA group for planning and scheduling	SAIC EOOS Software, On line risk monitor	Pre-Analyzed Risk Matrix
Inspection Findings	No Violations. A few program weaknesses noted.	One Level III MR violation, No CP. Licensee did not justify exceptions to NUMARC 93-01.	Three level IV MR violations identified	Two level IV MR violations identified

Maintenance Rule (MR) Baseline Inspection Results

Plant	St Lucie Units 1 & 2	Sequoyah Units 1 & 2	Perry	Hatch Units 1 & 2
Total SSCs	106	172 SSC Functions	233	256 SSC Functions
# SSCs in Scope	72	113 SSC Functions	141	140 SSC Functions
# High Safety Significant SSCs	31	Unknown. Ten SSCs downgraded by EP from high risk to low risk.	46	55 SSC Functions
# of SSCs in the (a)(1) Category	6	6	16	5
Risk Determination Methods	RAW, RRW, 90% of CDF Cutsets, & Expert Panel	RAW, RRW, 90% of CDF Cutsets, & Expert Panel	RAW, RRW, 90% of CDF Cutsets, & Expert Panel	RAW, RRW, & Expert Panel
Living PRA & Update Frequency	Yes, Unknown Update Frequency, Bayesian Updating Used	Yes, September, 1995, Unknown Update Frequency	No, Last Updated in July, 1992	Yes, Some Data Updating, No Bayesian updating in sample taken
On-Line Maintenance Safety Assessment Methods	Pre-Analyzed Risk Matrix	Pre-Analyzed Risk Matrix	On line Maintenance EOOS Procedure	Pre-Analyzed Risk Matrix
Inspection Findings	Three Level IV MR violations identified.	No MR Violations. A few weaknesses were noted.	No MR Violations. One Level IV Tech Spec 6.8.1 violation for failure to follow Safety Assessment (SA) QA procedure when taking EOOS for maintenance.	Three Level IV MR violations identified.

Maintenance Rule (MR) Baseline Inspection Results

Plant	Cooper	Nine Mile Point Unit 1	Surry Units 1 & 2	WNP-2
Total # SSCs	447 SSC Functions	296 SSC Functions	101	Unknown
# SSCs in Scope	302 SSC Functions	187 SSC Functions	93	142
# High Safety Significant SSCs	57 SSC Functions on	47 SSC Functions	44	86
# SSCs in the (a)(1) Category	4 SSC Functions on 3 Systems	2 Systems	3	4
Risk Determination Methods	RAW, FVI, 90% of CDF Cutsets, & Expert Panel	RAW, RRW, 90% of CDF Cutsets, & Expert Panel	RAW, RRW, 90% of CDF Cutsets, & Expert Panel	RAW, RRW, FVI, 90% of CDF Cutsets, & Expert Panel
Living PRA & Update Frequency	Unknown	No, Last Updated in June, 1992	No, Last Update in 1994	No, Last Update Unknown
On-Line Maintenance Safety Assessment Methods	Pre-Analyzed Risk Matrix	Two procedures used for performing SAs. Both use PRA to evaluate risk.	Pre-Analyzed Risk Matrix with only 12 of 44 risk significant SSCs.	Weak Procedure for performing SAs on unanalyzed configurations.
Inspection Findings	Six Level IV MR violations were identified. One level IV Appendix B, Criterion V violation for failure to follow QA SA procedure when taking EOOS for maintenance.	Four apparent MR violations were identified. An Enforcement Conference was held on 2/25/97.	Six apparent MR violations were identified. One apparent Appendix B, Criterion V Violation identified for failure to follow QA SA procedure when taking EOOS for maintenance.	Two Level IV MR violations were identified.

Plant	Indian Point 3
Total # SSCs	227
# SSCs in Scope	118
# High Safety Significant SSCs	27
# SSCs in the (a)(1) category	11
Risk Determination Methods	RAW, RRW, 90% of CDF Cutsets, & Expert Panel
Living PRA & Update Frequency	Yes, Every two years
On-Line Maintenance Safety Assessment Methods	PRA based procedure used to perform SA. Licensee in process of installing NUS EOOS Software
Inspection Findings	Two Level IV MR violations were identified.

CDF	Core Damage Frequency
CP	Civil Penalty
EOOS	Equipment Out Of Service
FVI	Fussell Vesely Importance
MR	Maintenance Rule
PRA	Probabilistic Risk Assessment
QA	Quality Assurance
RAW	Risk Achievement Worth
RRW	Risk Reduction Worth
SA	Safety Assessment

POLICY ISSUE
(Information)

March 4, 1997 SECY-97-055

FOR: The Commissioners

FROM: L. Joseph Callan
Executive Director for Operations

SUBJECT: MAINTENANCE RULE STATUS, RESULTS, AND LESSONS LEARNED

PURPOSE:

To inform the Commission about:

1. The background of the maintenance rule.

2. The status and results of the NRC staff activities related to the maintenance rule, including revising the maintenance rule regulatory guide.

3. Lessons learned from the implementation and initial baseline inspections of the maintenance rule.

4. Insights gained from the NRC staff's experience with the maintenance rule to consider when developing other risk-informed, performance-based rules.

SUMMARY:

Since the effective date of the maintenance rule in July 1996, the NRC staff has completed 18 maintenance rule baseline inspections and revised the applicable regulatory guide. On the basis of the NRC staff's findings to date, the implementation, inspection, and enforcement of the maintenance rule have been successful. Concerns have been identified, but

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SECY NOTE: TO BE MADE PUBLICLY AVAILABLE AT COMMISSION MEETING ON MARCH 10, 1997

overall, licensees inspected to date have adequately implemented the rule. Moreover, the lessons learned from the implementation, inspection and enforcement of the maintenance rule should benefit the development of other risk-informed, performance-based regulations.

The remaining maintenance rule activities the NRC staff has planned include: completing the baseline inspection program, issuing an information notice of lessons learned from the early baseline inspections, revising the baseline inspection procedure to reflect lessons learned and revising the implementation guidance documents.

BACKGROUND:

In the 1980s, the NRC became concerned about the number of transients and scrams initiated as a result of problems with balance of plant systems and components. Since most of this equipment was not addressed under existing regulations, the NRC evaluated whether a maintenance rule was necessary. As a result of NRC staff activities, in particular the maintenance team inspections, the NRC decided that the need for such a rule existed. The NRC's determination rested primarily on the conclusion that proper maintenance is essential to plant safety, and that there is a clear link between effective maintenance and safety as it relates to such factors as the number of transients and challenges to safety systems and the associated need for operability, availability and reliability of safety equipment. In addition, good maintenance is also important in providing assurance that failures *of other than safety-related structures, systems, and components (SSCs)* that could initiate or adversely affect a transient or accident are minimized. On the basis of these conclusions, the NRC developed a risk-informed, performance-based maintenance rule that addressed both safety-related and certain nonsafety-related SSCs.

The maintenance rule, 10 CFR 50.65, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants," was issued on July 10, 1991, to be effective on July 10, 1996. The text of the rule is brief, containing the basic requirements for the activities that licensees need to accomplish to monitor maintenance effectiveness. Implementation guidance was developed by the Nuclear Management and Resources Council (NUMARC, now the Nuclear Energy Institute (NEI)), resulting in NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." The staff endorsed this guideline, with clarifications, in Regulatory Guide 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." Together, NUMARC 93-01 and RG 1.160 provide sufficient guidance for licensees to develop a program that can comply with the requirements of the maintenance rule, though other methods may also be acceptable.

Requirements of the Maintenance Rule

The maintenance rule itself is simple and brief. Specifically, it consists of requirements that establish which structures, systems and components (SSCs) are included within the scope of the rule, requirements for monitoring the performance or condition of those SSCs within the scope of the rule, and a requirement that licensees periodically assess the effectiveness of

maintenance. The rule also encourages licensees to consider the impact on safety when removing equipment from service for preventive maintenance.

Paragraph (b) of 10 CFR 50.65 establishes the scoping criteria for the maintenance rule. The scope of the rule includes all the SSCs that are safety-related, and those nonsafety-related SSCs that are: 1) relied upon to mitigate accidents or transients or are used in emergency operating procedures (EOPs), 2) whose failure could prevent safety-related SSCs from fulfilling their safety functions, or 3) whose failure could cause a reactor scram or an actuation of a safety-related system.

Paragraph (a)(1) of the maintenance rule requires licensees to monitor the performance or condition of SSCs within the scope of the rule against licensee-established goals to provide reasonable assurance that these SSCs are capable of fulfilling their intended functions. These goals are to be commensurate with safety and, where practical, should take into account industry-wide operating experience. Paragraph (a)(1) also requires licensees to take appropriate corrective actions when the performance of an SSC does not meet established goals.[1]

Paragraph (a)(2) of 10 CFR 50.65 allows licensees to eliminate the goal setting and monitoring activities specified in Paragraph (a)(1) where the licensee has demonstrated that the performance or condition of SSCs is effectively controlled through preventive maintenance.

Paragraph (a)(3) of the maintenance rule has two parts. First, it requires that licensees periodically evaluate their performance and condition monitoring activities and associated goals, as well as preventive maintenance activities, at least once each refueling cycle not to exceed 24 months between evaluations. Where practical, the evaluations are required to take into account industry-wide operating experience. Licensees are to make adjustments in their programs where necessary to ensure that the objective of preventing failures of SSCs through maintenance is appropriately balanced against the objective of minimizing unavailability of SSCs due to monitoring or preventive maintenance. The second part of Paragraph (a)(3) states that licensees **should** take into account the total plant equipment that is out of service in order to determine the overall effect on performance of safety functions when performing monitoring and preventive maintenance activities. Because this provision states "**should,**" licensees are not *required* to perform the safety assessments.

Implementation Guidance Document Development

Soon after the rule was issued, the NRC staff and NUMARC concurrently began to develop implementation guidance. After it became apparent that NUMARC's proposed implementation guidance, NUMARC 93-01, would be an acceptable method for implementing

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[1]Paragraph (a)(1) of the maintenance rule was amended on August 28, 1996, to require plants undergoing decommissioning or decommissioned to include within scope only those SSCs associated with storing, controlling, and maintaining spent fuel in a safe condition.

the rule, the NRC staff determined that NUMARC 93-01 could be endorsed in a regulatory guide.

After developing NUMARC 93-01, industry conducted a verification and validation (V&V) program that was observed by the NRC staff. The purpose of the industry's V&V program was to evaluate the adequacy of NUMARC 93-01 and make changes to NUMARC 93-01 where necessary. After incorporating the changes, NUMARC issued NUMARC 93-01, Revision 0, in May 1993. The NRC staff then endorsed NUMARC 93-01, Revision 0, in RG 1.160, Revision 0, in June 1993.

Between September 1994 and March 1995, the NRC staff conducted a pilot site visit program (also referred to as the pilot program) at nine volunteer sites. The purpose of this pilot program was to confirm that the draft maintenance rule inspection procedure (IP), which was issued by the NRC staff in December 1993, could be used to verify that licensees who implemented the maintenance rule in accordance with RG 1.160 and NUMARC 93-01 were in compliance with the rule. The NRC staff documented the results of these pilot site visits in site-specific reports and in NUREG-1526, "Lessons Learned from Early Implementation of the Maintenance Rule at Nine Nuclear Power Plants" (June 1995). On the basis of lessons learned during the pilot site visits, workshops held with industry, and public meetings, the NRC staff revised the draft inspection procedure and issued the revision as IP 62706, "Maintenance Rule," on August 31, 1995. On the basis of similar information, NEI issued NUMARC 93-01, Revision 2, in April 1996.

The staff then considered endorsing NUMARC 93-01, Revision 2, and issued Draft Regulatory Guide (DG) 1051, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," for public comment in August 1996. After the public comment period expired (November 15, 1996), the NRC staff incorporated the appropriate comments and further clarified NUMARC 93-01, Revision 2, on the basis of comments received in public meetings and during maintenance rule baseline inspections conducted since the effective date of the rule. Then, in February 1997, the NRC staff completed its endorsement and clarifications of NUMARC 93-01, Revision 2, in RG 1.160, Revision 2 (attached).[2]

Implementing the Maintenance Rule Using NUMARC 93-01

When implementing the maintenance rule using NUMARC 93-01,[3] a licensee first uses the criteria in 10 CFR 50.65(b) to determine which SSCs are within the scope of the rule. The licensee then categorizes all of the SSCs within the scope of the rule as being either of high

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[2]RG 1.160, Revision 2, has been approved by NRR. The RG has been endorsed by the Committee to Review Generic Requirements and the Office of General Counsel has no legal objection. The RG will be published and distributed in March 1997.

[3]As of February 14, 1997, all licensees that participated in the pilot program (9 sites) or that have been inspected by the NRC staff as part of the maintenance rule baseline inspection program (18 sites) implemented the rule using RG 1.160 and NUMARC 93-01.

or low safety significance. It is important to emphasize that scoping is accomplished solely using the deterministic criteria in Paragraph (b) of the rule. Safety (risk) is only considered **after** the scope has been established.

SSCs that are of high safety significance must be monitored at the system, train, or component level; at a minimum, this monitoring must include SSC reliability and availability. SSCs that are of low safety significance *and in standby* must also be monitored at the system, train, or component level; at a minimum this monitoring must include reliability. SSCs that are of low safety significance *and normally operating* may be monitored at the plant level; this monitoring typically includes unplanned scrams, unplanned safety system actuations and unplanned capability loss factor.

Except for those SSCs determined to be inherently reliable or that can be run to failure, the SSC will be monitored in accordance with either Paragraph (a)(1) or Paragraph (a)(2) of the rule on the basis of performance. Those SSCs that have demonstrated effective preventive maintenance are monitored in accordance with Paragraph (a)(2), as allowed by the rule. SSCs monitored in accordance with Paragraph (a)(2) must have appropriate performance criteria[4] established. Those SSCs for which the licensee cannot demonstrate effective preventive maintenance are monitored in accordance with Paragraph (a)(1). SSCs monitored under Paragraph (a)(1) must have appropriate goals established. In either case, the goals or performance criteria are to be commensurate with safety.

Provided that an SSC meets its performance criteria or does not experience a repetitive maintenance preventable functional failure (MPFF),[5] the preventive maintenance for that SSC is considered to be effective, and monitoring can continue under Paragraph (a)(2). When the SSC does not meet a performance criterion or experiences a repetitive MPFF, the licensee must determine whether the SSC should be monitored under Paragraph (a)(1). In addition to monitoring reliability and/or availability, as appropriate, SSCs monitored under Paragraph (a)(1) are expected to have goals that specifically address the cause of the problem that resulted in the SSC being monitored in accordance with Paragraph (a)(1).

Licensees are expected to monitor the performance or condition of SSCs within the scope of the rule against the goals and performance criteria on an ongoing basis. As required by Paragraph (a)(3), licensees must assess the effectiveness of maintenance at least once per refueling cycle not to exceed 24 months between evaluations.

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[4]NUMARC 93-01 uses goals and performance criteria with a specific meaning. Goals are used for SSCs monitored under Paragraph (a)(1), while performance criteria are used for SSCs monitored under Paragraph (a)(2).

[5]The MPFF is a construct of NUMARC 93-01, defined as a failure that results in a loss of the function that caused the SSC to be within the scope of the rule (e.g., the failure resulted in a scram) and could have been prevented through more effective maintenance prior to the failure.

Transition from Prescriptive to Performance-Based Regulation

When the maintenance rule was issued, it was described as a results-oriented, performance-based rule, but it does have prescriptive aspects as well. Specifically, the maintenance rule includes the SSC scoping criteria and the requirement to periodically evaluate maintenance effectiveness. In the context of the maintenance rule, performance-based referred to two aspects of how the rule is implemented by licensees, and to how the NRC staff would inspect and enforce the rule.

From an implementation standpoint, the maintenance rule is performance-based because it gives licensees flexibility and because the regulatory requirements vary with SSC performance, as follows:

- Flexibility: The rule gives licensees the flexibility to: 1) establish the performance and condition goals, and the requisite equipment monitoring regimes; 2) modify established goals on the basis of plant or equipment performance; and 3) determine whether to rely on preventive maintenance in lieu of establishing goals and performance or condition monitoring. The rule prescribes no specific methodology to accomplish these activities; it only requires that licensees establish goals that are commensurate with safety.

- Regulatory Requirements Vary With SSC Performance: The rule also allows licensees to forego the monitoring requirements of Paragraph (a)(1) if the licensee can demonstrate that the preventive maintenance for an SSC is effective. Therefore, licensees that establish effective preventive maintenance programs can reduce the monitoring activities imposed by the rule. An effective preventive maintenance program can generally be defined as a program that reduces failures to an acceptable level while achieving the appropriate reliability and availability.

From an inspection and enforcement standpoint, the maintenance rule also has both prescriptive (or programmatic) and performance-based elements. The baseline inspection program is a programmatic inspection of licensees' activities to comply with the rule. In 1994 the NRC staff determined that it would be necessary to perform baseline inspections because the NRC staff could not rely solely on performance-based inspections until the NRC staff developed confidence that the programs licensees developed to implement and comply with the rule would accurately monitor maintenance performance, and that licensees would adjust their maintenance activities and programs where performance indicated changes were necessary.

In the long term, the NRC staff expects to focus on the results of the licensee's maintenance activities using IP 62707, "Maintenance Observation." Inspections conducted in accordance with IP 62707 address, in part, whether maintenance was effective in preventing failures, and where problems occur, the effectiveness of the licensee's corrective actions. Unless performance indicates that a potential programmatic problem may exist, the NRC staff does not expect to be involved in the licensee's programs to accomplish and monitor maintenance

(e.g., procedures, training). Therefore, the regulatory burden is expected to be lower for those licensees that have effective maintenance programs.

Risk-Informed Aspects of the Maintenance Rule

At the time the maintenance rule was issued it was considered a performance-based rule; the concept of "risk-informed" was not in general use. While the rule required that licensees establish goals commensurate with safety, the intention of the NRC at that time was not as mature as the current concept of risk-informed thinking. However, in the statements of consideration for the maintenance rule,[6] the NRC clearly encouraged licensees to use assumptions and results associated with probabilistic risk assessments (PRAs) and Individual Plant Evaluations (IPEs) when establishing the goals required by Paragraph (a)(1). The NRC also clearly expected licensees to consider risk when performing the Paragraph (a)(3) assessments of the impact on safety when removing equipment from service. While the use of PRA was not explicitly required, the NRC stated that the Paragraph (a)(3) assessments were expected to be refined on the basis of technological improvement and experience. As previously stated, this provision of Paragraph (a)(3) is not a requirement.

Furthermore, the endorsed method of implementing the maintenance rule in NUMARC 93-01 describes an approach that relies on the assumptions and results of the licensee's risk analyses.[7] When implementing the rule using this approach, licensees consider their risk analyses when categorizing the SSCs that are within the scope of the rule as having high or low safety significance, and when establishing performance criteria and goals for SSCs of high safety significance. Licensees are also encouraged to use risk analyses for the Paragraph (a)(3) safety assessments when removing equipment from service for preventive maintenance.

Therefore, although the maintenance rule was not initially described as a risk-informed rule, the industry's implementation of the rule has evolved to include some aspects that would be considered part of risk-informed regulation. Unlike other potential risk-informed applications (e.g., graded quality assurance, inservice testing) the general issues that have been raised regarding risk-informed regulation, such as quality of PRAs, pose less of a problem for the maintenance rule because the maintenance rule adds, rather than relaxes, regulatory requirements, the SSCs within the scope of the rule are established through deterministic means (PRAs provide only one input, and cannot be used to exclude an SSC from the scope of the rule), and the maintenance rule includes a feedback mechanism that is self-correcting if safety significance ranking errors are made due to poor quality PRAs. The use of PRA in the maintenance rule was described in SECY 95-265, "Response to August 9, 1995, Staff

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[6]56 FR 31306

[7]Licensees that implement the maintenance rule using NUMARC 93-01 are not required to take the PRA alternative described in that document. However, the PRA alternative is the only method described in detail in NUMARC 93-01, and all licensees that participated in the pilot program and have had baseline inspections used the PRA approach.

Requirements Memorandum Request to Analyze the Generic Applicability of the Risk Determination Process Used in Implementing the Maintenance Rule," dated November 1, 1995.

DISCUSSION:

From the effective date of the maintenance rule through February 14, 1997, the NRC staff completed 18 maintenance rule baseline inspections using IP 62706,[8] and completed Revision 2 to RG 1.160. The NRC staff has a number of additional activities to complete related to the maintenance rule.

Maintenance Rule Baseline Inspections Findings

Each maintenance rule inspection is site-specific. Although all the licensees inspected to date have implemented the rule using RG 1.160 and NUMARC 93-01, each licensee has developed a unique site-specific program. This presents a challenge to the inspectors in that they must fully understand each licensee's approach, and determine whether the licensee's program meets the requirements of the maintenance rule. For example, plants of similar design may have different: numbers of SSCs, numbers of SSCs in scope of the rule, number of SSCs of high safety significance, numbers of SSCs monitored in accordance with Paragraph (a)(1) versus (a)(2), and values of performance criteria and goals. The inspectors must evaluate each licensee's approach on its merits, as the specific values for each of the above factors is affected by the licensee's implementation method. This variation was expected, however, and is consistent with the NRC's intention to give licensees maximum flexibility in implementing the rule.

The NRC staff has been able to accomplish the inspections by dedicating sufficient resources to the inspection effort; providing extensive training for inspectors regarding the requirements of the maintenance rule and the guidance in RG 1.160, NUMARC 93-01, IP 62706 and IP 62707; and ensuring effective communication between the regions and the Office of Nuclear Reactor Regulation (NRR). The following paragraphs summarize the findings from the initial baseline inspections.

In general, the NRC staff finds that licensees have adequately implemented the requirements of the maintenance rule. However, in a few cases, despite the five year implementation period, the inspections identified that some licensees waited until the year prior to the effective date of the rule to aggressively pursue implementation. For those licensees, the baseline inspections identified weak programs and/or weak implementation of those programs.

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[8]The NRC staff has also completed three other non-baseline maintenance rule inspections. The results of those inspections are consistent with those identified during baseline inspections.

Even where licensees allowed adequate time to implement the maintenance rule, the baseline inspections identified two issues at most sites. First, many licensees have failed to demonstrate that the goals and performance criteria were established commensurate with safety. For example, the licensees allowed each SSC a standard number of MPFFs per cycle as a reliability performance criterion, without consideration of the number of demands on the SSC. In some cases, when compared to the number of demands, the number of MPFFs allowed would be indicative of much lower reliability than the licensee assumed in its risk analyses. The NRC staff position has been that licensees must demonstrate a sound technical basis for the values of the performance criteria and goals. The second common finding has been that many licensees did not develop *both* reliability and unavailability performance criteria or goals for SSCs of high safety significance. As part of the periodic evaluations required by Paragraph (a)(3), licensees are required to *balance* reliability *and* unavailability; this balance cannot be attained unless the licensee monitors *both* of these parameters.

The inspections have also identified scoping issues at several sites. While some examples were observed where safety-related SSCs were not included within the scope of the rule, in most cases findings related to scoping were limited to nonsafety-related SSCs and were relatively minor. For example: 1) a failure to include the cooling tower system in the scope even though the system's failure had resulted in a scram on one occasion and a near scram on another; and 2) failure to include communications and/or emergency lighting systems in scope even though industry operating experience has demonstrated their importance in mitigating accidents and transients and completing the activities required by emergency operating procedures.

The staff has observed that some licensees appear reluctant to identify failures as MPFFs. From a regulatory standpoint, the occurrence of an MPFF is not a violation. Rather, an MPFF indicates a potential problem; what is most important is that the licensee take effective corrective actions. This reluctance to identify MPFFs has resulted in some violations for failure to monitor the performance of SSCs within the scope of the rule.

The need for additional guidance regarding structural monitoring was identified before the effective date of the rule. Revision 2 to NUMARC 93-01 contains some additional guidance, however, the industry was expected to finalize the comprehensive guidance developed in NEI 96-03, "Guideline for Monitoring the Condition of Structures at Nuclear Power Plants." This document is intended to provide structural monitoring guidance for all regulatory applications and not just the maintenance rule. The NRC staff has provided comments to NEI on NEI 96-03, but NEI has not yet finalized NEI 96-03 to address the staff's comments. Therefore, the NRC staff has been unable to endorse NEI 96-03. The result of the unavailability of guidance on monitoring the condition of structures is that, in all but three inspections (which were found acceptable), the inspectors did not assess or were unable to conclude whether the licensee's program for monitoring structures complied with the rule. For these 15 sites the inspections identified structural monitoring as an inspection followup item, to be reevaluated after the structural monitoring guidance became available. Since NEI 96-03 has not yet been endorsed, the NRC staff has provided maintenance rule-specific structural monitoring guidance in RG 1.160, Revision 2.

Finally, licensees have, in general, adequately performed safety assessments when removing equipment from service for maintenance in accordance with Paragraph (a)(3) of the rule. However, some inspections have identified isolated cases of weak safety assessments for removing equipment from service for maintenance. Because this provision of the rule is not an explicit requirement in that the rule states that licenses "**should**" perform the safety assessments, the NRC staff has been unable to enforce this provision (although in most cases the licensees have accepted the NRC staff's comments and corrected their programs).

Maintenance Rule Baseline Inspection Enforcement

Of the 11 baseline inspections for which enforcement action is complete, nine of them have resulted in proposed enforcement actions (two inspections identified no violations). One inspection resulted in escalated enforcement, which resulted in one Severity Level III violation but no civil penalty. Eight inspections resulted in one or multiple Severity Level IV violations. For the remaining inspections the enforcement actions are under evaluation by the NRC staff.

Licensee Reactions to the Baseline Inspections

Most licensees have indicated that they believe the NRC staff is being consistent in the inspection and enforcement of the maintenance rule.

NEI and some licensees have asserted that the violations cited for inadequate reliability performance criteria or goals represent a new staff position and, consequently, the staff should not take enforcement action on this "generic" concern until additional guidance is issued. However, the NRC staff did not agree with this assertion, and in a letter to NEI dated October 22, 1996, reiterated the NRC staff's position that the need for a sound technical basis for reliability performance criteria is not a new staff position and that the guidance available is adequate. Nonetheless, the staff has added a clarification in RG 1.160, Revision 2, to eliminate any confusion regarding this issue.

NEI and some licensees expressed some concern that the baseline inspections are programmatic and not performance-based. The NRC staff agrees that the baseline inspections are more programmatic than performance-based. The NRC staff recognized early in the implementation period that it could not rely solely on performance-based inspection of the maintenance rule until the NRC staff had confidence that the programs licensees developed and implemented to comply with the rule would accurately monitor maintenance performance, and that licensees would adjust their maintenance programs where performance indicated changes were necessary.

In the long-term, the NRC staff expects that maintenance rule inspections will become more performance-based and less programmatic. After completing the baseline inspection program, the maintenance rule will primarily be inspected using IP 62707, which is performance-based with regard to the maintenance rule aspects and has been used by resident inspectors for their maintenance inspections since the effective date of the maintenance rule. The NRC staff will primarily use IP 62706 when licensee performance indicates that potential programmatic problems exist.

Industry expressed a concern prior to the effective date of the maintenance rule that the NRC staff would use the broad wording of the scoping criteria in Paragraph (b) of the rule to eventually include **all** SSCs within scope. NEI restated this concern in a public meeting on January 9, 1997. However, the only examples of inappropriate SSCs added to scope that NEI provided during the meeting were the communications and emergency lighting systems. As previously discussed, the NRC staff believes that industry operating experience has demonstrated that these systems are necessary to mitigate accidents and transients and to complete the activities in the EOPs, and provide a significant fraction of the mitigating function. Therefore, the NRC staff has generally concluded that these systems should be within the scope of the rule.

Revision 2 to RG 1.160

During the implementation period of the maintenance rule it became apparent that the guidance documents would require revision to reflect lessons learned. The need for an iterative process arises from the general requirements of the rule and the flexibility given licensees to implement them; that is, until full implementation can be observed, it is difficult to determine if the guidance has sufficient details to ensure compliance with requirements.

As previously described, the industry conducted a V&V program and the NRC staff conducted a pilot program to assess, in part, the adequacy of the inspection procedures and implementation guidance documents. Following those programs, NEI issued Revision 2 to NUMARC 93-01 (April 1996). The NRC staff then issued DG-1051 (the proposed RG 1.160, Revision 2) in August 1996, with a public comment period that ended on November 15, 1996. However, the NRC staff did not complete RG 1.160, Revision 2, until February 1997 because of the desire to incorporate lessons learned from the initial baseline inspections.

Revision 2 to RG 1.160 endorses and clarifies the guidance provided in NUMARC 93-01, Revision 2. It also incorporates clarifications that resulted from public comments regarding DG-1051, experience with the baseline inspections, and two public meetings held on October 15, 1996, and January 9, 1997. The following paragraphs discuss the most significant clarifications incorporated in Revision 2 to RG 1.160:

- Changes to the Rule: The maintenance rule has been amended twice since RG 1.160, Revision 1 was issued.[9] As noted previously, on August 28, 1996, the rule was amended to specifically address the SSCs within the scope of the rule for decommissioned plants. On December 11, 1996, as part of the final rule-making for "Reactor Site Criteria Including Seismic and Earthquake Engineering Criteria for Nuclear Power Plants," the NRC changed the definition of safety related SSCs in Paragraph (b)(1) of the maintenance rule to make it consistent with its use in other

[9]Revision 1 to the regulatory guide was issued in January 1995 to reflect an earlier rule change that extended the period of the Paragraph (a)(3) periodic assessments from at least once every 12 months to at least once per refueling cycle not to exceed 24 months between evaluations.

regulations. Neither of these rule changes is expected to impact operating reactor licensees.

- Safety Significance Categorization Process: This clarification notes that the NRC staff's endorsement of the safety significance categorization process described in NUMARC 93-01, Revision 2, is limited to the maintenance rule. It also notes that RG 1.160 is expected to be revised in the future, if needed, to reflect the proposed regulatory guide on the use of PRA in regulatory matters. Such a revision to RG 1.160 is desirable for reasons of regulatory consistency, and is also consistent with the NRC's intent (as presented in the statements of consideration for the maintenance rule) that licensees' approaches to the rule could change as a result of technological improvements and experience. Licensees will be encouraged to use this guidance when it is available.

- Scoping: Despite the fact that the scoping-related requirements defined in Paragraph (b) are prescriptive, experience indicated the need for four clarifications, of which the following two are significant:

  - Could Cause: This clarification provides guidance on how to identify the nonsafety-related SSCs that should be included within scope because their failure *could cause* a reactor scram or safety system actuation.

  - SSCs Relied Upon to Mitigate Accidents or Transients or Used in EOPs: This modification clarifies that this scoping criterion includes those SSCs that are used to directly address the accident or transient or are explicitly used in the EOPs, and provide a significant fraction of the mitigating function. In addition, this scoping criterion includes within scope those SSCs whose use is *necessary* to mitigate accidents or transients or to use the EOPs (even though the SSCs do not directly address the accidents or transients or may not be explicitly used in EOPs) and provide a significant fraction of the mitigating function (the NRC staff added this clarification after a number of licensees excluded communications and emergency lighting systems, as was previously discussed).

- MPFFs as a Reliability Indicator: As previously discussed, the staff has cited numerous licensees for failure to establish reliability performance criteria that are commensurate with safety because the licensees did not have a sound technical basis for the values of the performance criteria. Revision 2 to the RG clarifies how MPFFs can be used as an indicator of reliability.

- Structural Monitoring: During the pilot program, it became apparent that there was a need to improve the guidance in NUMARC 93-01 for structural monitoring (some additional guidance was provided in Revision 2). As previously noted, most inspections identified structural monitoring as an inspection followup item until additional guidance became available. The industry is developing comprehensive guidance in NEI 96-03, but the staff determined that it was important to provide

additional guidance to licensees quickly. Therefore, the NRC staff added guidance in RG 1.160, Revision 2.

- Normally Operating SSCs of Low Safety Significance: As previously noted, normally operating SSCs of low safety significance are generally monitored at the plant level. Experience during the pilot program and baseline inspections indicated the need for additional clarification in this area. RG 1.160, Revision 2, provides three clarifications regarding the treatment of normally operating SSCs of low safety significance; one of these clarifications is significant. Specifically, during the pilot site visits and baseline inspections, the NRC staff noted that some licensees were only monitoring the number of unplanned *automatic* scrams, and were not monitoring unplanned *manual* scrams even when the manual scram was initiated in anticipation of an automatic scram. Given that one of the principal reasons for developing a maintenance rule was the number of reactor scrams (*both* manual and automatic) caused by failures in the balance of plant, the NRC staff position has been that licensees should monitor *all* unplanned scrams in order to assess the effectiveness of their preventive maintenance for those SSCs monitored at the plant level.

Additional NRC Staff Activities Related to the Maintenance Rule

The remaining NRC staff activities related to the maintenance rule are as follows:

- Complete Baseline Inspections: The NRC staff's goal has been to complete a baseline inspection of every licensee's maintenance rule program by July 10, 1998. The regional offices are committed to achieving this goal.

- Issue an Information Notice: As part of its efforts to maintain effective communication with the industry and public regarding the maintenance rule, the NRC staff is developing an information notice to communicate the results and lessons learned from the initial baseline inspections thus far.

- Revise IP 62706: The baseline inspection procedure needs to be revised to reflect the changes to Revision 2 to RG 1.160 and NUMARC 93-01.

- Update and Make Maintenance Rule Home Page Publicly Accessible: As part of its efforts to maintain effective communication with the industry and the public regarding the maintenance rule, the NRC staff has developed a prototype "home page" for the world wide web. Once the home page is updated with the most recent information and prototype testing is completed, the NRC staff will make the home page publicly accessible. The intent of the home page is to provide a comprehensive resource of maintenance rule-related regulatory documents, guidance documents, inspection procedures, and inspection reports in a searchable format.

- Revise the Enforcement Guidance: The NRC staff has used an enforcement guidance memorandum (EGM-96-002) to determine the appropriate enforcement

action for maintenance rule inspection findings. This EGM needs to be revised to reflect lessons learned.

- Develop Continuing Training Program: To date, maintenance rule training has been provided by the Quality Assurance and Maintenance Branch (HQMB) in NRR, which has programmatic responsibility for the rule. In the future, however, the responsibility for training the NRC staff on the maintenance rule will be transferred to the Technical Training Division (TTD) of the Office for Analysis and Evaluation of Operational Data. The TTD has participated in the training program's development and is preparing to assume this responsibility.

LESSONS LEARNED:

The implementation and initial baseline inspections have provided the NRC staff with a number of lessons learned regarding what was effective and what could be improved. These lessons learned can be grouped into four categories: importance of communication, value of the pilot program, importance of training, and inspection and enforcement; as described in the following sections.

Importance of Communication

The development and implementation of the maintenance rule has involved extensive communication and interaction within the NRC staff (headquarters and the regional offices) and between the NRC staff and the industry and public. These interactions included numerous public meetings, industry workshops, and active solicitation of industry and public comments on proposed guidance documents and inspection procedures.

Communication between the industry and the NRC staff has been enhanced by keeping a core NRC staff stable and accessible during the implementation period. This improved communication because the NRC staff became well known to industry representatives.

The NRC staff also maintained extensive communication among the affected internal organizations. For example, the inspection procedures and enforcement guidance were developed by headquarters with regional office input. The training program provided to all maintenance rule inspectors improved communication through personal contact and development of a sense of community as a result of the shared experience of the training. A maintenance rule-specific enforcement panel was created to address enforcement actions; members of the panel include representatives from NRR, the Office of Enforcement (OE), and the appropriate regional office. In addition, representatives of the NRC staff held an internal workshop in December 1996; participants included NRR and all four regional offices. The working relationships developed through these activities aided the consistency of inspection and enforcement across the regions, which directly addressed the industry's concern that the NRC would be inconsistent when inspecting and enforcing the maintenance rule.

As previously noted, the NRC staff plans to continue to maintain open communication by issuing an information notice, revising IP 62706, developing a continuing training program, and providing public access to maintenance rule information over the internet.

Conclusion: *The maintenance rule provides a good example of the importance of communication among the NRC staff and between the NRC staff and the industry and public in the effective implementation, inspection and enforcement of a performance-based rule.*

Value of the Pilot Program

Early in the implementation period the NRC staff decided that a pilot program would yield substantial benefit with regard to the utility of the implementing guidance and inspection procedure for the maintenance rule. The pilot program provided an early test application of the guidance and IP from which a great deal was learned by both industry and the NRC staff. As an added benefit, these findings were not encumbered by enforcement actions since the rule had not yet gone into effect. The pilot program, lessons learned document (NUREG-1526), and public workshop of the results of the pilot program were completed more than one year before the effective date of the rule. This should have given licensees ample time to refine the implementation of their maintenance rule programs on the basis of the lessons-learned.

Conclusion: *The NRC staff's pilot program improved the implementation guidance and inspection procedure, and helped licensees and the NRC staff reach an understanding regarding what constitutes acceptable maintenance monitoring required by the rule.*

Importance of Training

As a new major regulatory initiative, the maintenance rule was made more complex both for licensees to implement and for the NRC staff to inspect and enforce because it involved a performance-based regulatory approach. This approach did not clearly define what was "acceptable," and the NRC staff had little experience with inspection and enforcement of such a rule. This required extensive training of the NRC staff assigned to participate in oversight of the maintenance rule.

As a result, HQMB developed a three-tier training program. The first tier comprised an overview course (one to two hours) developed for managers and those NRC staff who would only be marginally involved with the maintenance rule (e.g., most headquarters staff and management). The second tier comprised a one day course for NRC staff who would be directly involved in oversight of the maintenance rule, although they might not participate in the baseline inspection program (e.g., resident inspectors, some headquarters staff, and regional management). The third tier comprised a three day course for the NRC staff who would participate in or lead the maintenance rule baseline inspections (e.g., regional inspectors, some resident inspectors, and some headquarters staff). HQMB has given 36 training sessions. Over eight hundred members of the NRC staff have received at least one

of these training courses as follows: 134 received the three day course; 376 received the one day course; and 412 received the overview course.

Conclusion: *The inspection and enforcement of the maintenance rule has benefited from the training program.*

Inspection and Enforcement

The initial baseline inspections have demonstrated that inspection of the maintenance rule is challenging, but that the rule can be inspected and enforced in a consistent manner. It is also apparent that inspection and enforcement has been complicated because the maintenance rule includes one provision that is not a requirement.

A maintenance rule baseline inspection is challenging primarily because of the flexibility that the rule gives licensees. This flexibility results in a unique site-specific implementation of the rule at each site. The inspections therefore require additional resources so that each licensee's program can be fully understood and evaluated.

Although the maintenance rule does not explicitly require the use of PRA, all licensees inspected to date have used PRA methods. This required the inspection team to include an inspector with considerable PRA expertise (to date this expertise has primarily come from the senior reactor analysts and significant contractor support). The net result is that, at a minimum, a maintenance rule inspection team consists of a team leader, four inspectors (one of which has PRA expertise), and a staff support member from HQMB whose primary role is to promote consistent inspection and provide guidance on staff positions (the staff support member also frequently fulfills an inspector role). The inspections consist of a week for preparation, a week of onsite inspection, and a week for documentation.

Despite the site-specific approach of each licensee's implementation of the maintenance rule, the NRC staff believes that the maintenance rule is being inspected and enforced in a consistent manner across the regions. In general, the NRC staff has achieved consistency through the training program, joint participation by all four regions in the first baseline inspection, HQMB participation in all baseline inspections, and the maintenance rule-specific enforcement panel.

Another challenge in inspecting and enforcing the maintenance rule is that the rule includes a provision that is not a requirement. Specifically, Paragraph (a)(3) states that licensees **"should"** assess the impact on safety when removing plant equipment from service for preventive maintenance. In general, licensees have voluntarily complied because it is obvious that there is a nexus between safety and equipment out of service; had there not been such a clear relationship to safety, fewer licensees may have elected to implement a provision that is not a requirement. However, in the few cases where the NRC staff has observed either weak implementation or plant configurations for which the licensee did not adequately assess the configuration's safety impact, the staff was unable to enforce this provision of the rule. Under the current enforcement guidance, the NRC staff cannot enforce this part of Paragraph (a)(3) unless the failure to perform an adequate assessment causes an

event or contributes to the severity of or complicates recovery from an event. Even then, enforcement is limited to using the inadequate safety assessment as an escalating factor on other enforcement actions that are taken as a result of the event.

One way to resolve the enforcement problem created by the safety assessment provision of Paragraph (a)(3) would be a rule-making to change the "should" in Paragraph (a)(3) to "shall," which would make this part of the rule a requirement. However, the NRC staff does not believe that a rule change is necessary at this time because the NRC staff has only identified isolated instances of weak safety assessments to date and licensees are in effect treating this provision as a requirement. If the NRC staff finds more cases of weak safety assessments during other maintenance rule inspections, the NRC staff may recommend that the rule be changed.

Conclusions:

1. The NRC staff can consistently inspect and enforce a risk-informed, performance-based rule such as the maintenance rule.

*2. Because the provision in Paragraph (a)(3) that states that licensees "**should**" assess the impact on safety when removing equipment from service is not a requirement, this provision is unenforceable. At this time the NRC staff does not believe a rule change is necessary because licensees are in effect treating this provision as a requirement. However, the NRC staff may recommend a rule change if other maintenance rule inspections identify additional cases of weak safety assessments.*

INSIGHTS FOR OTHER RISK-INFORMED, PERFORMANCE-BASED REGULATIONS:

As a result of the initial baseline inspections of the maintenance rule, the NRC staff has identified the following insights for consideration in the development of other risk-informed, performance-based rules:

- Because of the flexibility given to licensees by performance-based rules, effective communication among the NRC staff and between NRC staff, industry and the public is essential to the successful implementation, inspection and enforcement of these rules.

- Consideration should be given to conducting a pilot program to test implementation and inspection of these rules.

- The NRC staff and licensees should anticipate several iterations of the implementation guidance and inspection procedures in order to benefit from lessons learned through the pilot program and initial inspections.

- A programmatic baseline inspection program may be necessary to provide confidence that the licensees have programs that effectively monitor performance, and that licensees adjust their activities and programs where performance indicates changes are necessary. The NRC staff should not take a performance-based approach to inspection unless such confidence has been obtained.

- NRC resource requirements for these rules are high, and should be acknowledged and committed to up front. Effective communication, development of guidance documents and inspection procedures, training, program oversight, and baseline inspections probably require more resources for performance-based rules than for prescriptive regulations in general.

- The rules must be written in a manner to only contain requirements. Other types of language in the rules, such as hortatory provisions, are unenforceable. Where practical, the rules should define the minimum performance standards (this was not practical in the case of the maintenance rule).

CONCLUSIONS:

On the basis of the NRC staff's findings to date, the implementation, inspection, and enforcement of the maintenance rule have been successful. Concerns have been identified, but overall, licensees inspected to date have adequately implemented the rule. The NRC staff has completed the activities that needed to be completed, and a schedule for the remainder of the activities related to the rule has been established. Moreover, the lessons learned from the implementation, inspection and enforcement of the maintenance rule should benefit other risk-informed, performance-based regulations.

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Executive Director
for Operations

Attachment: RG 1.160, Revision 2

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MONITORING THE EFFECTIVENESS OF MAINTENANCE AT NUCLEAR POWER PLANTS

A. INTRODUCTION

The NRC published the maintenance rule on July 10, 1991, as Section 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," of 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." The NRC's determination that a maintenance rule was needed arose from the conclusion that proper maintenance is essential to plant safety. As discussed in the regulatory analysis for this rule,[1] there is a clear link between effective maintenance and safety as it relates to such factors as the number of transients and challenges to safety systems and the associated need for operability, availability, and reliability of safety equipment. In addition, good maintenance is also important in providing assurance that failures of other than safety-related structures, systems, and components (SSCs) that could initiate or adversely affect a transient or accident are minimized. Minimizing challenges to safety systems is consistent with the NRC's defense-in-depth philosophy. Maintenance is also important to ensure that design assumptions and margins in the original design basis are maintained and are not unacceptably degraded. Therefore, nuclear power plant maintenance is clearly important in protecting public health and safety.

Paragraph (a)(1) of 10 CFR 50.65 requires that power reactor licensees monitor the performance or condition of SSCs against licensee-established goals in a manner sufficient to provide reasonable assurance that such SSCs are capable of fulfilling their intended functions. Such goals are to be

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[1]NRC Memorandum to All Commissioners from J. Taylor on "Maintenance Rulemaking," June 27, 1991. Copies are available for inspection or copying for a fee from the NRC Public Document Room at 2120 L Street, NW., Washington, DC; the PDR's mailing address is Mail Stop LL-6, Washington, DC 20555; phone (202)634-3273; fax (202)634-3343.

established commensurate with safety and, where practical, take into account industry-wide operating experience. When the performance or condition of an SSC does not meet established goals, appropriate corrective action must be taken. For a nuclear power plant for which the licensee has submitted the certifications specified in 10 CFR 50.82(a)(1) (i.e., plants undergoing decommissioning), Paragraph (a)(1) of 10 CFR 50.65 applies only to the extent that the licensee must monitor the performance or condition of all SSCs associated with storing, controlling, and maintaining spent fuel in a safe condition, in a manner sufficient to provide reasonable assurance that such SSCs are capable of fulfilling their intended functions.[2]

Paragraph (a)(2) of 10 CFR 50.65 states that monitoring as specified in Paragraph (a)(1) is not required where it has been demonstrated that the performance or condition of an SSC is being effectively controlled through the performance of appropriate preventive maintenance, such that the SSC remains capable of performing its intended function.

Paragraph (a)(3) of 10 CFR 50.65 requires that performance and condition monitoring activities and associated goals and preventive maintenance activities be evaluated at least every refueling cycle provided the interval between evaluations does not exceed 24 months. The evaluations must be conducted taking into account, where practical, industry-wide operating experience. Adjustments must be made where necessary to ensure that the objective of preventing failures of SSCs through maintenance is appropriately balanced against the objective of minimizing unavailability of SSCs because of monitoring or preventive maintenance. In performing monitoring and preventive maintenance activities, an assessment of the total plant equipment that is out of service should be taken into account to determine the overall effect on performance of safety functions.

Paragraph (b) of 10 CFR 50.65 states that the scope of the monitoring program specified in Paragraph (a)(1) is to include safety-related and nonsafety-related SSCs as follows.

(1) Safety-related structures, systems, or components that are relied upon to remain functional during and following design basis events to ensure the integrity of the reactor coolant pressure boundary,

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[2]The specific requirements for decommissioning plants became effective August 28, 1996. See 61 FR 39278, July 19, 1996, "Decommissioning of Nuclear Power Reactors."

the capability to shut down the reactor and maintain it in a safe shutdown condition, and the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposure comparable to the guidelines in 10 CFR 50.34(a)(1) or § 100.11 of this chapter, as applicable.[3]

(2) Nonsafety-related structures, systems, or components:

(i) That are relied upon to mitigate accidents or transients or are used in plant emergency operating procedures (EOPs); or

(ii) Whose failure could prevent safety-related structures, systems, and components from fulfilling their safety-related function; or

(iii) Whose failure could cause a reactor scram or actuation of a safety-related system.

Paragraph (c) of 10 CFR 50.65 states that the rule provisions are to be implemented by licensees no later than July 10, 1996.

This Regulatory Guide 1.160 is being revised to endorse Revision 2 of NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants"[4] (April 1996), which has been updated by the Nuclear Energy Institute. The regulatory guidance is intended to provide flexibility for a licensee to structure its maintenance program in accordance with the safety significance of those SSCs within the scope of the rule.

The information collections contained in this regulatory guide are covered by the requirements of 10 CFR Part 50, which were approved by the Office of Management and Budget, approval number 3150-0011. The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

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[3]This Paragraph (b)(1) of the maintenance rule was changed in the final rulemaking for "Reactor Site Criteria Including Seismic and Earthquake Engineering Criteria for Nuclear Power Plants," December 11, 1996. See 61 FR 65157.

[4]This document is available for inspection or copying for a fee in the NRC Public Document Room, 2120 L Street NW. , Washington, DC; the PDR's mailing address is Mail Stop LL-6, Washington, DC 20555; phone (202)634-3273; fax (202)634-3343.

B. DISCUSSION

OBJECTIVE

The objective of 10 CFR 50.65 (referred to hereafter as the maintenance rule or the rule) is to require monitoring of the overall continuing effectiveness of licensee maintenance programs to ensure that (1) safety-related and certain nonsafety-related SSCs are capable of performing their intended functions and (2) for nonsafety-related equipment, failures will not occur that prevent the fulfillment of safety-related functions, and failures resulting in scrams and unnecessary actuations of safety-related systems are minimized.

DEVELOPMENT OF INDUSTRY GUIDELINE, NUMARC 93-01

The nuclear industry developed a document, NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants" (May 1993),[3] that provides guidance to licensees regarding implementation of the maintenance rule. This document was prepared by NUMARC. A verification and validation (V&V) effort was conducted by NUMARC, with NRC staff observation, to test the guidance document on several representative systems. A number of changes were made to the NUMARC guidance document based on the results of the V&V effort. The NRC staff reviewed this document and found that it provided acceptable guidance to licensees. In June 1993, the NRC staff issued Regulatory Guide 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," which endorsed the May 1993 version of NUMARC 93-01. In January 1995, the NRC staff issued Revision 1 to Regulatory Guide 1.160 to reflect the amendment to 10 CFR 50.65(a)(3) that changed the requirement for performing the periodic evaluation from annually to once per refueling cycle, not to exceed 24 months between evaluations.

From September 1994 to March 1995, the NRC staff performed a series of nine pilot site visits to verify the usability and adequacy of the draft NRC maintenance rule inspection procedure and to determine the strengths and weaknesses of the implementation of the rule at each site that used the guidance provided in NUMARC 93-01. The findings are described in NUREG-1526, "Lessons Learned from Early Implementation of the Maintenance Rule at Nine

Nuclear Power Plants,"[5] (June 1995). The NRC staff concluded that the requirements of the rule could be met more consistently across the industry if some clarifying guidance was added to NUMARC 93-01 to address the findings noted in NUREG-1526. The NRC staff met with industry representatives in a series of public meetings to discuss proposed revisions to NUMARC 93-01 that would address the findings noted during the site visits. Revision 2 to NUMARC 93-01 (April 1996) resulted from these meetings.

PLANT, SYSTEM, TRAIN, AND COMPONENT MONITORING LEVELS

The extent of monitoring may vary from system to system depending on the system's importance to safety. Some monitoring at the component level may be necessary; however, it is envisioned that most of the monitoring could be done at the plant, system, or train level. SSCs with high safety significance and standby SSCs with low safety significance should be monitored at the system or train level. Except as noted in the Regulatory Position of this guide, normally operating SSCs with low safety significance may be monitored through plant-level performance criteria, including unplanned automatic scrams, safety system actuations, or unplanned capability loss factors. For SSCs monitored in accordance with 10 CFR 50.65(a)(1), additional parameter trending may be necessary to ensure that the problem that caused the SSC to be placed in the Paragraph (a)(1) category is being corrected.

USE OF EXISTING LICENSEE PROGRAMS

The NRC staff encourages licensees to use, to the maximum extent practicable, activities currently being conducted, such as technical specification surveillance testing, to satisfy monitoring requirements. Such activities could be integrated with, and provide the basis for, the requisite level of monitoring. Consistent with the underlying purposes of the rule,

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[5]Copies are available at current rates from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20402-9328 (telephone (202)512-2249); or from the National Technical Information Service by writing NTIS at 5285 Port Royal Road, Springfield, VA 22161. Copies are available for inspection or copying for a fee from the NRC Public Document Room at 2120 L Street NW., Washington, DC; the PDR's mailing address is Mail Stop LL-6, Washington, DC 20555; telephone (202)634-3273; fax (202)634-3343.

maximum flexibility should be offered to licensees in establishing and modifying their monitoring activities.

USE OF RELIABILITY-BASED PROGRAMS

Licensees are encouraged to consider the use of reliability-based methods for developing the preventive maintenance programs covered under 10 CFR 50.65(a)(2); however, the use of such methods is not required.

SAFETY SIGNIFICANCE CATEGORIES

The maintenance rule requires that goals be established commensurate with safety. In order to implement this requirement, NUMARC 93-01 established two safety significance categories, "risk-significant" and "non-risk-significant." The process for placing SSCs in either of these two categories is described in section 9.0 of NUMARC 93-01. The statements of consideration for the rule use the terms "more risk-significant" and "less risk-significant." NRC inspection procedure (IP) 62706[3] uses the terms "high safety significance" and "low safety significance." After discussions with industry representatives, the NRC staff has determined that the preferred terminology is "high safety significance" and "low safety significance." Some licensees may elect to define other safety significance categories or may elect to define more than two categories, which would be acceptable if these alternative categories are defined in the licensee's procedures and used in a consistent manner.

SAFETY SIGNIFICANCE RANKING METHODOLOGY

The NRC staff endorses the use of the SSC safety significance ranking methodology described in Revision 2 (April 1996) of NUMARC 93-01 as an acceptable method for meeting the requirements of the maintenance rule.[6]

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[6]The staff is developing guidance that addresses the acceptable criteria for the use of PRAs in risk-informed regulatory matters. The NRC staff anticipates that a future revision to this Regulatory Guide 1.160 would reference the guidance, when available, to make the NRC staff's guidance on the use of PRA in the maintenance rule consistent with the NRC staff's guidance in other areas of risk-informed regulation. The industry will be encouraged to use this guidance at that time.

However, because of some unique aspects of the maintenance rule, including the fact that standby SSCs of low safety significance are treated the same as SSCs of high safety significance, this endorsement for purposes of the maintenance rule should not be construed as an endorsement for other applications. These issues were discussed in SECY 95-265, "Response to August 9, 1995, Staff Requirements Memorandum Request to Analyze the Generic Applicability of the Risk Determination Process Used in Implementing the Maintenance Rule."[3]

APPLICABILITY OF APPENDIX B TO 10 CFR PART 50

With regard to the scope of the maintenance rule, as stated in Paragraph (b) of the rule, it is understood that balance of plant (BOP) SSCs may have been designed and built with normal industrial quality and may not meet the standards in Appendix B to 10 CFR Part 50. It is not the intent of the NRC staff to require licensees to generate paperwork to document the basis for the design, fabrication, and construction of BOP equipment (i.e., BOP equipment need not meet the requirements of Appendix B to 10 CFR Part 50).

Each licensee's maintenance efforts should minimize failures in both safety-related and BOP SSCs that affect safe operation of the plant. The effectiveness of maintenance programs should be maintained for the operational life of the facility.

SWITCHYARD MAINTENANCE ACTIVITIES

As noted in the Regulatory Position of this guide, there may be a need to address maintenance activities that occur in the switchyards that could directly affect plant operations. Plant management should be aware of and have the ability to control these activities.

EMERGENCY DIESEL GENERATORS

Industry- and NRC-sponsored probabilistic risk analyses (PRAs) have shown the safety significance of emergency ac power sources. The station blackout rule (10 CFR 50.63) required plant-specific coping analyses to ensure that a plant could withstand a total loss of ac power for a specified duration and to determine appropriate actions to mitigate the effects of a total loss of ac power. During the station blackout reviews, most licensees: (1) made a

commitment to implement an emergency diesel generator (EDG) reliability program in accordance with NRC regulatory guidance but reserved the option to later adopt the outcome of Generic Issue B-56 resolution, and (2) stated that they had or will implement an equivalent program. Subsequently, utilities docketed commitments to maintain their selected target reliability values (i.e., maintain the emergency diesel generator target reliability of 0.95 or 0.975). Those values could be used as a goal or as a performance criterion for emergency diesel generator reliability under the maintenance rule.

Emergency diesel generator unavailability values were also assumed in plant-specific individual plant examination (IPE) analyses. These values should be compared to the plant-specific emergency diesel generator unavailability data regularly monitored and reported as industry-wide plant performance information. These values could also be used as the basis for a goal or performance criterion under the maintenance rule. In addition, in accordance with Paragraph (a)(3) of the rule, licensees must periodically balance unavailability and reliability of the emergency diesel generators.

C. REGULATORY POSITION

1. NUMARC 93-01

Revision 2 of NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," provides methods that are acceptable to the NRC staff for complying with the provisions of 10 CFR 50.65 with the following provisions and clarifications.

1.1 Scope of the Rule

1.1.1 "Could Cause" Criterion

During the nine pilot site visits, the NRC staff recognized that some licensees interpreted the words in section 8.2.1.5 of NUMARC 93-01 to mean that only those SSCs that had actually caused a plant scram or safety system actuation needed to be included within the scope of the rule. The NRC staff's position is that the SSCs to be included under the criterion "could cause a reactor scram or actuation of a safety system" should not be limited to SSCs that "did cause" or "could likely cause." This position was discussed in NUREG-1526, "Lessons Learned from Early Implementation of the Maintenance Rule

at Nine Nuclear Power Plants" (June 1995).[4] Licensees should consider the following SSCs to be within the scope of the rule.

1. SSCs whose failure has caused a reactor scram or actuation of a safety-related system at their site.

2. SSCs whose failure has caused a reactor scram or actuation of a safety-related system at a site with a similar configuration.

3. SSCs identified in the licensee's analysis (e.g., FSAR, IPE) whose failure would cause a reactor scram or actuation of a safety-related system.

The only exception to items 2 and 3 above would be a licensee who has demonstrated by an analysis (e.g., FSAR, IPE) and by operational experience that the design or configuration of an SSC is fault-tolerant through redundancy or installed standby spares such that a reactor scram or actuation of a safety-related system is implausible. In these cases, the licensee may exclude the SSC from the scope of the rule.

1.1.2 SSCs Relied Upon To Mitigate Accidents or Transients or Used in Emergency Operating Procedures

Nonsafety-related SSCs that are relied upon to mitigate accidents or transients or that are used in emergency operating procedures (EOPs) are included in the scope of the rule by 10 CFR 50.65(b)(2)(i). NUMARC 93-01 states that only those SSCs that provide a significant fraction of the mitigating function need to be included in the scope of the rule. The NRC staff considers this to mean that SSCs that are directly used to address the accident or transient or explicitly used in the EOPs are within the scope of the rule, as are SSCs whose use is implied and that provide a significant fraction of the mitigating function. Examples of SSCs that should be considered include communications and emergency lighting systems, which are necessary to successfully mitigate accidents and transients and to use the EOPs, although they may not directly address the accident or transient, or not be explicitly mentioned in the EOPs.

1.1.3 Function Versus System

The rule provides criteria to determine which SSCs must be included within the scope of the rule. Alternatively, licensees may use a functional basis to determine which SSCs must be monitored within the scope of the rule. That is, the licensee may determine all the functions performed by the SSCs and include within the scope of the maintenance rule only those functions, and the associated SSCs that fulfill those functions, that meet the scoping criteria of the rule.

1.1.4 Systems with Multiple Design Functions

For systems that have multiple design functions, the NRC staff's position is that some design functions may be within the scope of the maintenance rule while others may be outside the scope of the rule. Failures of components that affect a design function that is within the scope of the maintenance rule would require corrective action and monitoring under the rule. For example, the components (piping, pumps, and valves) in the high-pressure coolant injection system (HPCI) that are needed to perform the design function (injection of high-pressure water into the reactor) would be included within the scope of the rule because this is a safety-related function of the system. However, the components that are only used for testing (e.g., test loop, sample valves, bypass valves) might be excluded from the scope of the rule unless they meet another scoping criterion (e.g., if they could cause failure of a safety-related SSC), because these components are not required for the coolant injection function of the HPCI.

1.2 Definition Of Maintenance

For the purposes of the maintenance rule, maintenance activities are as described in the "Final Commission Policy Statement on Maintenance of Nuclear Power Plants."[7] This definition is very broad and includes all activities associated with the planning, scheduling, accomplishment, post-maintenance testing, and return-to-service activities for surveillances and preventive and corrective maintenance. These activities are considered maintenance regardless of which organization performs the activity (e.g., maintenance, operations, contractors). This definition is referenced in NUMARC 93-01.

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[7]53 FR 9430, March 23, 1988.

Some licensees have questioned the guidance because in section 9.4.5 of NUMARC 93-01 an example of a failure that is not a maintenance-preventable functional failure (MPFF) is "failures due to operational errors...." The operational errors referred to in that example are those that are not associated with a maintenance activity.

An example of an operator action that would not be an MPFF would be improper closure of a valve while filling a tank that results in a pump trip followed by a reactor trip. An example of an operator action that would be an MPFF could be when an operator failed to reopen a suction valve for a pump following post-maintenance testing and the closed suction valve caused pump failure during a subsequent demand.

1.3 Timeliness

NUMARC 93-01 states that activities such as cause determinations and moving SSCs from the (a)(2) to the (a)(1) category must be performed in a "timely" manner. Some licensees have requested that the NRC staff provide a specific period that would be considered "timely." To be consistent with the intent of the maintenance rule to provide flexibility to licensees, the NRC staff does not consider it appropriate to provide a specific timeliness criterion. Licensees are to undertake and accomplish activities associated with the maintenance rule in a manner commensurate with the safety significance of the SSC and the complexity of the issue being addressed.

1.4 MPFFs as an Indicator of Reliability

NUMARC 93-01 states that performance criteria for SSCs of high safety significance should be established to assure that reliability and availability assumptions used in the plant-specific safety analysis are maintained or adjusted. NUMARC 93-01 further allows the use of MPFFs as an indicator of reliability. The maintenance rule requires that the performance of SSCs be monitored commensurate with safety; however, the maintenance rule does not require that the assumptions in the safety analysis be validated. Licensees who choose to use their safety analyses as described in NUMARC 93-01 must be able to demonstrate how the number of MPFFs allowed per evaluation period is consistent with the assumptions in the risk analysis. For standby SSCs, this

would require, at a minimum, a reasonable estimate of the number of demands during that time period.

If a licensee desires to establish a reliability performance criterion that is not consistent with the assumptions used in the risk analysis, adequate technical justification for the performance criterion must be provided. For some SSCs, an MPFF performance criterion may be too small to be effectively monitored and trended as required by the rule. In these cases, the licensee should establish performance or condition monitoring criteria that can be monitored and trended so that the licensee can demonstrate that maintenance is effective.

1.5 Monitoring Structures

The maintenance rule does not treat structures differently from systems and components. Experience with the rule and NUMARC 93-01 during the pilot site visits and the initial period following the effective date of the rule indicated that specific guidance for monitoring the effectiveness of maintenance for structures was needed, as structures present a different situation than do systems and components. The primary difficulty in implementing the rule for structures using NUMARC 93-01 was in establishing appropriate criteria for performance and monitoring structures under Paragraph (a)(1) instead of Paragraph (a)(2).

The effectiveness of maintenance can be monitored by using performance criteria or goals, or by condition monitoring. While it is acceptable to use performance criteria or goals, most licensee have found it more practical to use condition monitoring for structures. With certain exceptions (e.g., primary containment), structures do not have unavailability, and rarely have demands placed on their safety significant functions (e.g., maintain integrity under all relevant design basis events), which makes reliability monitoring impractical.

An acceptable structural monitoring program for the purposes of the maintenance rule should have the following attributes.

- Consistent with the NUMARC 93-01 approach for systems and components, most structures would be monitored in accordance with Paragraph (a)(2), provided there is not significant degradation of the structure.

- The condition of all structures within the scope of the rule would be assessed periodically. The appropriate frequency of the assessments would be commensurate with the safety significance of the structure and its condition.

- Licensees would evaluate the results of the assessments to determine the extent and rate of any degradation of the structures. Deficiencies would be corrected in a timely manner commensurate with their safety significance, their complexity, and other regulatory requirements.

- A structure would be monitored in accordance with Paragraph (a)(1) if either (1) degradation is to the extent that the structure may not meet its design basis or (2) the structure has degraded to the extent that, if the degradation were allowed to continue uncorrected until the next normally scheduled assessment, the structure may not meet its design basis. The structure would continue to be monitored in accordance with Paragraph (a)(1) until the degradation and its cause have been corrected.

- For structures monitored in accordance with Paragraph (a)(1), there would be additional degradation-specific condition monitoring and increased frequency of assessments until the licensee's corrective actions are complete and the licensee is assured that the structure can fulfill its intended functions and will not degrade to the point that it cannot fulfill its design basis.

Consistent with the intent of the rule, licensees should use their existing structural monitoring programs (e.g., those required by other regulations or codes) to the maximum extent practical.

1.6 Definition of Standby

In NUMARC 93-01, standby SSCs of low safety significance must have SSC-specific performance criteria or goals, similar to SSCs of high safety significance. NUMARC 93-01 provides a definition of standby. Some licensees have improperly interpreted this definition as meaning that SSCs that are energized are normally operating. As stated in NUMARC 93-01, if the SSC only

performs its intended function when initiated by either an automatic or manual demand signal, the SSC is in standby.

Normally operating SSCs are those whose failure would be readily apparent (e.g., a pump failure results in loss of flow that causes a trip). Standby SSCs are those whose failure would not become apparent until the next demand, actuation, or surveillance. Only those SSCs of low safety significance, whose failure would be readily apparent (because they are normally operating), should be monitored by plant-level criteria.

SSCs may have both normally operating and standby functions. In order to adequately monitor the effectiveness of maintenance for the SSCs associated with standby functions, licensees should develop SSC-specific performance criteria or goals, or condition monitoring.

1.7 Normally Operating SSCs of Low Safety Significance

1.7.1 Cause Determinations

For all SSCs that are being monitored using plant-level performance criteria (i.e., normally operating SSCs of low safety significance), the NRC staff's position is that a cause determination is required whenever any of these performance criteria are exceeded (failed) in order to determine which SSC caused the criterion to be exceeded or whether the failure was a repetitive MPFF. As part of the cause determination, it would also be necessary to determine whether the SSC was within the scope of the maintenance rule and, if so, whether corrective action and monitoring (tracking, trending, goal setting) under 10 CFR 50.65(a)(1) should be performed.

1.7.2 Unplanned Manual Scrams

In order to monitor the effectiveness of maintenance for those SSCs monitored by plant-level criteria, NUMARC 93-01 recommends that only those scrams that are automatically initiated be counted. The NRC staff's position is that all unanticipated scrams be considered, including those scrams that are manually initiated in anticipation of an automatic scram. The purpose of this is not to discourage manual trips but rather to ensure that operators do not mask a maintenance performance issue. If ineffective maintenance is forcing plant shutdowns, whether the trip is initiated automatically or manually should not affect how licensees address the maintenance performance issue under the maintenance rule.

1.7.3 Establishing SSC-Specific Performance Criteria

The maintenance rule requires that licensees monitor the effectiveness of maintenance for all SSCs within the scope of the rule. NUMARC 93-01 allows licensees to monitor SSCs of low safety significance with plant-level criteria. NUMARC 93-01 notes that some normally operating SSCs of low safety significance cannot be practically monitored by plant-level criteria. Licensees must ensure that the plant-level criteria established do effectively monitor the maintenance performance of the normally operating SSCs of low safety significance, or they should establish SSC-specific performance criteria or goals or use condition monitoring.

For example, a licensee determined that the rod position indication system and the spent fuel pool pit cooling system were within the scope of the maintenance rule because they were safety-related at the licensee's site. None of the three plant-level performance criteria described in NUMARC 93-01 (unplanned automatic scrams, unplanned capability loss factor, or unplanned safety system actuations) would monitor the effectiveness of maintenance on these systems. Therefore, additional plant-level performance criteria or system-specific performance criteria must be established.

1.8 Clarification of MPFFs Related to Design Deficiencies

The third paragraph of Section 9.4.5 of NUMARC 93-01 provides guidance on the licensee's options following a failure and on whether, as a result of the licensee's corrective actions, subsequent failures would be considered MPFFs. In particular, this paragraph addresses failures caused by design deficiencies. Ideally, licensees would make design modifications to eliminate the poorly designed equipment. However, if the licensee determines that such an approach is not cost effective (e.g., the cost of modification is prohibitive), the licensee has two options:

(1) Replace or repair the failed equipment and make adjustments to the preventive maintenance program as necessary to prevent recurrence of the failure. Subsequent failures of the same type that are caused by inadequate corrective or preventive maintenance would be MPFFs, and could be repetitive MPFFs.

(2) Perform an evaluation that demonstrates that the equipment can be run to failure (as described in Section 9.3.3 of NUMARC 93-01). If the

equipment can be run to failure, the licensee can replace or repair the failed equipment, but adjustments to the preventive maintenance program are not necessary and subsequent failures would not be MPFFs.

1.9 SSCs Considered Under 10 CFR 50.65(a)(1)

Paragraph (a)(1) of the maintenance rule requires that goal setting and monitoring be established for all SSCs within the scope of the rule except for those SSCs whose performance or condition is adequately controlled through the performance of appropriate preventive maintenance as described in Paragraph (a)(2) of the rule. In NUMARC 93-01, all SSCs are initially placed under Paragraph (a)(2) and are only moved under Paragraph (a)(1) if experience indicates that the performance or condition is not adequately controlled through preventive maintenance as evidenced by the failure to meet a performance criterion or by experiencing a repetitive MPFF. Therefore, the Paragraph (a)(1) category could be used as a tool to focus attention on those SSCs that need to be monitored more closely. It is possible that no (or very few) SSCs would be handled under the requirements of Paragraph (a)(1). However, the rule does not require this approach. Licensees could also take the approach that all (or most) SSCs would be handled under Paragraph (a)(1) of the rule and none (or very few) would be considered under Paragraph (a)(2) of the rule. Licensees may take either approach.

During the pilot site visits, licensees questioned whether a large number of SSCs monitored under Paragraph (a)(1) would be used by the NRC as an indicator of poor maintenance performance. The NRC staff assured the licensees that NRC management would not use the number of SSCs monitored under Paragraph (a)(1) as an indicator of maintenance performance nor would it be used in determining the systematic assessment of licensee performance (SALP) grade in the maintenance area. The number of SSCs monitored under Paragraph (a)(1) can vary greatly because of factors that have nothing to do with the quality of the licensee's maintenance activities. For example, two identical plants with equally effective maintenance programs could have different numbers of SSCs monitored under Paragraph (a)(1) because of differences in the way system boundaries were defined (a system with three trains may be defined as one system at one plant while the same system may be defined as three separate systems at an identical plant) or because of differences in the way performance criteria were defined at the two plants (a licensee who takes a

very conservative approach to monitoring against the performance criteria would have more SSCs in the (a)(1) category). The NRC staff also cautioned licensee managers that they should not view the number of SSCs in the (a)(1) category as an indicator of performance since that attitude might inhibit the licensees' staff from monitoring an SSC under Paragraph (a)(1) when a performance criterion has been exceeded or a repetitive MPFF has occurred. If there is some doubt about whether a particular SSC should be monitored under Paragraph (a)(1) or Paragraph (a)(2), the conservative approach would be to monitor the SSC under Paragraph (a)(1).

1.10 Use of Other Methods

Licensees may use methods other than those provided in Revision 2 of NUMARC 93-01 to meet the requirements of the maintenance rule, but the NRC will determine the acceptability of other methods on a case-by-case basis.

2. OTHER DOCUMENTS REFERENCED IN NUMARC 93-01

NUMARC 93-01 references other documents, but NRC's endorsement of NUMARC 93-01, should not be considered an endorsement of the referenced documents.

3. INCLUSION OF ELECTRICAL DISTRIBUTION EQUIPMENT

The monitoring efforts under the maintenance rule, as defined in 10 CFR 50.65(b), encompass those SSCs that directly and significantly affect plant operations, regardless of what organization actually performs the maintenance activities. Maintenance activities that occur in the switchyard can directly affect plant operations; as a result, electrical distribution equipment out to the first inter-tie with the offsite distribution system (i.e., equipment in the switchyard) should be considered for inclusion as defined in 10 CFR 50.65(b).

D. IMPLEMENTATION

The purpose of this section is to provide information to applicants and licensees regarding the NRC staff's plans for using this regulatory guide.

Except in those cases in which an applicant or licensee proposes an acceptable alternative method for complying with specified portions of the NRC's regulations, the methods described in this guide will be used in the evaluation of the effectiveness of maintenance activities of licensees who are required to comply with 10 CFR 50.65. The guide will also be used to evaluate the effectiveness of emergency diesel generator maintenance activities associated with compliance with 10 CFR 50.63.

REGULATORY AND BACKFIT ANALYSES

Separate regulatory and backfit analyses were not prepared for this Revision 2 of Regulatory Guide 1.160. The regulatory analysis and the backfit analysis that were prepared when this guide was first issued as a draft, DG-1020, in November 1992, are still applicable. The backfit analysis prepared for DG-1020 concluded that no backfit was associated with the regulatory guide because it was only providing guidance to implement the existing requirements of the maintenance rule. The Commission determined, on the basis of the backfit analysis performed for the maintenance rule, "... that backfitting of the requirements in the maintenance rule will provide a substantial increase in the level of protection of public health and safety beyond that currently provided by the Commission's regulations, and that the costs of implementing the rule are justified in view of this increased protection."[8] The regulatory analysis and backfit analysis for DG-1020 are available, in the file for Regulatory Guide 1.160, for inspection or copying for a fee in the Commission's Public Document Room, 2120 L Street NW., Washington, DC; the PDR's mailing address is Mail Stop LL-6, Washington, DC 20555: phone (202)634-3273; fax (202)634-3343.

[8]56 FR 31320