PDR PEER SEEN

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NUCLEAR REGULATORY COMMISSION

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

OFFICE OF THE SECRETARY

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MEETING WITH ACRS ON RISK INFORMING PART 50

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PUBLIC MEETING

Nuclear Regulatory Commission
One White Flint North
Building 1, Room 1F-16
11555 Rockville Pike
Rockville, Maryland
Thursday, March 2, 1999

The Commission met in open session, pursuant to notice, at 9:29 a.m., the Honorable RICHARD A. MESERVE, Chairman of the Commission, presiding.

COMMISSIONERS PRESENT:

RICHARD A. MESERVE, Chairman of the Commission
GRETA J. DICUS, Member of the Commission
NILS J. DIAZ, Member of the Commission
EDWARD McGAFFIGAN, JR., Member of the Commission
JEFFREY S. MERRIFIELD, Member of the Commission

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STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:

KAREN D. CYR, General Counsel

ANNETTE L. VIETTI-COOK, Assistant Secretary

JOHN SEIBER

GRAHAM WALLIS

ROBERT UHRIG

WILLIAM SHACK

JOHN BARTON

THOMAS KRESS

DANA POWERS

GEORGE A. APOSTOLAKIS

MARIO BONACA

ROBERT SEALE

P R O C E E D I N G S

[9:29 a.m.]

CHAIRMAN MESERVE: Good morning. I would like to welcome you all to our session this morning with the Advisory Committee on Reactor Safeguards. As I think all of you know, we had a meeting with you last November. I remember it well because it was my very first Commission meeting. At that occasion we had the opportunity -- because of the substance as well, I should add. We had a discussion at that meeting about the various NRC initiatives to risk-inform our approach to our regulatory activities.

After that meeting, we did present a number of specific questions to the ACRS to consider, about risk-informing our regulations, and, also, some questions about our oversight program. Our session today will deal with both of those matters.

So I am pleased to welcome Dr. Powers and his colleagues to discuss these matters with us. Let me suggest that in order to allow us to proceed efficiently, what we would like to do is to go through all of the briefings with regard to risk-informing 10 CFR Part 50, and we will then open to questions, because they are linked with each other.

It is very important to the Commission that we have ample time for questions, that the interaction back and forth is extraordinarily valuable to us, and so we would

urge you to proceed through the charts, which, of course, we have had an opportunity to review before the session this morning, with dispatch so as to enable us to have ample time for interaction.

After we complete that, we will then turn to the presentation on the oversight.

If that is acceptable, let me turn to my colleagues and see if any of them have any opening comments? And, if not, Dr. Powers, you may proceed.

DR. POWERS: Thank you, Dick. This morning we are going to begin on discussions on almost a philosophical note as we discuss the technical strategies that can be considered as we move toward risk-informing the reactor regionals. Following that immediate discussion, Dr. Kress will review for you some of the social and technical impediments that we thing exist to the greater use of risk information in reactor regulations.

Professor Apostolakis will discuss the roles of importance measures in the risk-informed regulatory system, and some of the limitations that we think exist on these important measures that get derived from probabilistic risk assessments. I think at that point you want to interrupt the presentations and allow for discussions of collective topics.

Once we have completed those discussions, we will

move toward a more applied and less theoretical aspect of the whole issue of risk-informing the regulations and consider the performance indicators that are to be used in the new plant oversight and assessment process.

You catch us here at a point where looking at the performance indicators is still very much a work in progress. I have included in your package a quote from John Ahern's panel on the ACRS effectiveness, and I tell you that you have caught us at a point where we are still working with the difficulties, the dilemmas, the uncertainties and the contrasting opinions. We certainly haven't reached a consensus on these performance indicators.

Mr. Barton is going to try to describe for you areas where there is a general agreement within the ACRS, and areas where, to put it politely, discussions will have to continue. And, in fact, they are continuing. As soon as we are done here, we will be meeting again with the staff to discuss the performance indicators.

A theme that I think will emerge throughout our discussions here is the question of what types of analytic capabilities the NRC is going to have to have if it is going to sustain a risk-informed regulatory system. In that regard, it is unfortunate we are not going to have time to delve into the questions of the significance determination process the staff has constructed for the new oversight and

performance process. It is my own feeling that when we get to the significance determination process, we will see most clearly the kinds of analytic support that it would be desirable for the staff to have available as it carries out a risk-informed regulatory system.

With that introduction, I propose to move directly to the topic of a technical road map for risk-informing 10 CFR Part 50. Let me begin by saying that for as long as I can remember, the ACRS has been enthusiastic about the idea of bringing greater use of risk information into the regulatory process. My association with the committee probably extends over 24 years, as both a supplicant and a member, and throughout that period I saw the ACRS asking for more quantification, more use of risk in defining the regulatory process.

This current incarnation of the ACRS is no less enthusiastic about the use of risk information and regulatory regulation. Quite frankly, we may be more enthusiastic about that. Many of us have matured technically along with the abilities to do probabilistic risk assessment. Many of us have actually been part of the maturation process.

What I remember well is about two years ago Commissioner Diaz visited with the ACRS and he said to us, he challenged us, he said, "Why can't we just go ahead and

risk-inform the entirely of the reactor regulations as a holistic body?" My reaction to that was, "Wow." Now I know why Commissioners get the big bucks. This is the kind of bold thinking and leadership that you would like to see coming from the Commission. And today maybe we are in the process where we can start discussing some of the approaches that will be taken in doing this.

But I am going to have to admit to you that defining a technical road map for risk-informing 10 CFR Part 50 just has not been a priority activity for the ACRS over the last year. In the last year we have been quite busy handling license renewal and some of the other initiatives that the Commission has undertaken in response to Congress. Staff, on the other hand, has moved aggressively and developed a three option approach that the Commission has approved.

Quite frankly, the staff has a problem here. There is no guidance for them available. Risk-informing the regulations is a pioneering activity that I place akin to first of a kind engineering -- not much to tell you how to go about doing it. We can expect that there will be blind ends and stumbles along the way, because it is so new. ACRS has tried to be supportive of the staff's effort, and at the Commission's behest, we have tried to identify potential pitfalls and potential barriers to risk-informed regulation.

On the next slide I show you some of those, I think you are familiar with those. We have written you reports on those. Dr. Kress will elaborate on some of those in his presentation.

The staff has advanced a approach. There is no question other approaches could have been advanced. At the one extreme, one could imagine an approach that says the regulations are risk-informed. People were definitely thinking about risk when they came up with the regulations. They were thinking about risk in perhaps less quantitative terms than we do now, but risk nevertheless, and we don't need to change the regulations, we need to change the Regulatory Guides that implement those regulations.

At the other extreme is what I call the clean sheet and the holistic approach. I think that is what Commissioner Diaz had in mind when he came over and challenged the ACRS, and I think that is the approach that the ACRS would be most enthusiastic about.

We see two possibilities for doing a clean sheet or holistic approach. One of the possibilities would be to say let's design the regulations for an arbitrary reactor and not think about the reactors we have in mind, but have some regulations that would be applicable to any reactor.

The other approach is to say, no, we have some existing reactors, we have some 3,000 man reactor years of

operating experience, let's build upon that. It is just too big of a step to try to develop regulations for an arbitrary reactor.

I think the staff and the ACRS are more comfortable in thinking about a holistic approach and thinking about it in connection with the existing reactors.

As I have indicated, developing a road map, a technical road map to the risk-informing of the regulations just has not been a priority activity. We have not attempted to develop a report to you on that subject. And so in preparation for this discussion, I have gone through the minutes of ACRS meetings and our past letters, and my memory of our past discussions to try to distill out for you some key elements of philosophy that I think the ACRS would have written in a letter if they had reported to you on this.

I note that many of the discussions that the ACRS has had on risk-informing the reactor regulations have concentrated on the issues of focusing the resources of both the regulatory body and the licensees on the areas of greatest risk. On the other hand, when I look at what the staff has brought before us, they frequently speak of the issues of burden reduction. That language, "burden reduction," never seems to appear in the internal discussions at the ACRS. I only point this out as an item

of interest because I found the discrepancies striking. I suspect that these don't reflect a difference in attitude, but rather a difference in language.

The area where the ACRS has been consistently concerned is in the area of coherence of the regulations. I find concern about coherency of the regulation in ACRS reports extending back at least 15 years. What I also understand is that coherency in the regulations means a lot of things to a lot of people. The one consistent aspect of coherency in the regulations, I have tried to depict on this slide, a diagrammatic slide, and that is a hierarchy where regulations flow directly from the enabling act, the Atomic Energy Act.

The Commission has established risk-informed safety goals. If we could also have with that a definition of adequate protection that is called for in the Atomic Energy Act that also has the language of risk in it, we would be well on the well on the way to establishing what we have called the three region approach that was pioneered in the definition of Reg. Guide 1.174, that is, in the spectrum of activities that could be undertaken, there are those that are clearly unacceptable. There is a region of activities where one would have regulatory attention perhaps graded by the magnitude of risk associated within this allowable regime. And, finally, you would have activities that pose

so little risk that they would be -- they could proceed with no prior approval of the regulatory body.

This definition of three regions of the spectrum of activities might not be enough to assure safety. One could easily imagine, and at least in a hypothetical situation, that one could satisfy the risk requirement simply by focusing all this attention on mitigation of accident consequences. It is our suspicion that one could never reach the safety goals by focusing just on mitigation of accident consequences without also considering prevention or intercession. But one might be able to meet the minimum acceptable, provide adequate protection by focusing just on mitigation of accident consequences.

Such a highly unbalanced approach towards satisfying the regulations might not be satisfactory. It might be that a balance was sought to assure safety. That we feel is one of the two incarnations of defense-in-depth.

Defense-in-depth is a balance between accident initiators, accident intervention and accident mitigation. We see defense-in-depth as a policy, it is one that would not disappear as risk information becomes more reliable and more available.

The second incarnation of defense-in-depth is more focused on compensation for uncertainty and our capabilities to assess risk.

Once one has defined the three regions of activity space and how regulations are applied, then risk information comes in. The ACRS is consistent in its belief that regulation should be where there is risk. And I have listed down some of the areas that have been identified in risk under various modes of operations, full power and shutdown operations, fire initiators and seismic. I simply comment that we see the staff treating now fire in a unique way, rather than as part of the overall initiators that can affect plants, and it is a curiosity to us.

Staff has elected not to pursue this top-down approach, however, we have become aware that the Department of Energy is sponsoring an effort at risk-informing the regulations following a top-down process. Their focus is geared on a future generation of reactors, what they call the Generation 4 reactors, and the ACRS members are following this effort by the Department of Energy.

Staff is attacking the process of risk-informing the regulations in what I have called a piece-wise approach. I don't infer any pejorative to that piece-wise, it is the way they have attacked it. And when you attack the risk-informing of the regulations in a piece-wise fashion, you face some challenges. The most obvious of those challenges, the one that comes most to mind is if you risk-inform regulation, you are liable to find yourself in

conflict with another regulation.

I think we are all very familiar with this from the graded quality assurance where we had successfully risk-informed a graded quality assurance process, but it is not possible to apply because it conflicts with another set of regulations.

Another challenge one faces has to do with the language of the regulations. They were written oftentimes in an era when our ability to define and measure risk was much more qualitative than it is now. And today we have a great deal more precision when we speak of risk. This conflict that arises, I call the 10 CFR 50.59 phenomenon because I think we encountered it first there. But A Appendix A provides us a good example.

I quote here some languages out Appendix A. Appendix A is, of course, the general design criteria. If we look perhaps at GDC4, it has to do with environmental effects and accidents, we see it has language that says the "probability of fluid system piping rupture is extremely low." Now, extremely low at one time was something where it was small enough to be negligible. Today we would interpret this as so small that it falls outside the cut sets used in our probabilistic risk assessment. This is probably much lower than the architects of this language had in mind when they wrote the general design criteria.

If you look at GDC12, it has to do with power oscillations, it says "not possible." This is very difficult language for engineers to use because there is always some possibility. Perhaps it is as low as the possibility of meteorites striking your home, but there is always some possibility. And so when you say "not possible," you are going to create a language that is going to conflict with other regulations.

And I have quoted several others, "extremely low probability." Without some quantification, that is going to be interpreted as falling out the cut sets in a probabilistic risk assessment, again, probably well below the probabilities that were in mind of those who originated it.

What I conclude from this is, because the general design criteria have corresponding regulations in the general body of regulations, it would be surprising to me if the regulations could be made risk-informed without also risk-informing the general design criteria. In fact, if you don't do it, you are going to run into the same problem that we encountered with graded quality assurance. You are going to have well risk-informed one regulation, and it is not going to make one whit of difference on the licensee's or the regulator's course of action because he is going to be constrained by the general design criteria.

With that, of course, having come to that conclusion on one appendix, one asks, what about the other appendix, the famous Appendix B that deals with quality assurance? My view is Appendix B is a codification of the best practices for quality insurance. We have found that it is really not possible to quantify the risk worth of these quality assurance requirements.

The quality assurance requirements are widely viewed as burdensome, and they may be even a distraction of focus. But I think we have discovered that a graded approach is possible, that it is possible to go into the systems, the components, and the structures within a reactor and assign to them a risk worth or a risk significance, and to grade the quality assurance according to that risk worth or risk significance.

My conclusion is that we probably can risk-inform the rest of the regulations without paying attention to Appendix B, but I hasten to note that there is a value in risk-informing Appendix B, a visibility, because it, like Appendix K, risk-informing those two appendices would be a very visible and very desirable demonstration of the Commission's commitment to moving toward risk-informed regulation.

I wanted to conclude by bringing other challenging areas I think the staff is going to encounter as they

proceed on their efforts to risk-inform the regulation. One area that the ACRS continues to struggle with is the area of performance-based regulations. If one establishes performance standards, those standards must come from something. If they come from risk, of course, then we would have risk-based regulations.

If they don't come from risk assessments, where do they come from? And will these other sources cause the performance standards to degenerate into prescriptive regulations that we already have?

Another issue is what to do with design basis accidents. Quite frankly, it is not clear to me whether these are useful entities in a risk-informed regulatory world. They may well be vestiges of an era when design and construction were the predominant issues faced by the industry and by the regulatory body. That is different from the current era where operations and maintenance are the focus of attention.

On the other hand, design basis accidents do have a value, they provide a design to standard that makes it easier for designs. I wonder if this design tool needs to be codified in the regulations themselves.

The final challenge that I think is going to come up repeatedly is the regulator is going to feel a need to have some understanding of the probabilistic risk assessment

tools that licensees use. Having an understanding could easily lead to the imposition of requirements and regulations that would have the tendency to ossify the methods that exist today and pose a barrier to the continued development and refinement, and improvement of risk assessment methods. This is a topic the ACRS is especially concerned about, and I think you have seen in some of our letters in discussing PRA standards.

At that point, I have outlined for you the kinds of thinking we would have on the technical road map to risk-informing the regulations. Now, I will turn to Dr. Kress to discuss with you some of the impediments and the barriers and possible pitfalls that we see in the greater use of risk in the regulatory process.

Dr. Kress.

DR. KRESS: Thank you, Dr. Powers.

We were requested to give some examples of what we considered impediments. Before I do that, I want to make it clear that we don't want this to be interpreted to mean that these impediments of such nature and degree that the Commission cannot proceed with risk-informing the regulations. What it really means is these are things that have to be recognized and perhaps accommodated with a bit more conservative risk-informing of the regulations or a bit more conservative in the decision-making process when one

comes to interpret the regulations in terms of plant-specific issues. So these are impediments, but we don't think they are roadblocks that stop the process.

We also noted in one of our reports that such impediments tend to have two different classifications, two different characteristics. We chose to label those, one, cultural and institutional, the other one technical.

The cultural and institutional ones are characterized by attributes, such things as attitudes; impressions; organizational type barriers, like this is the way we have always done it and we continue to do it; resource limits and things like that. The common theme with those is they are people problems.

And as I review those, why those things exist, that if we do the job right of actually technically defensible process of risk-informing regulations, those will just cure themselves in time. That people will begin to recognize the benefits and the good parts of risk-informing regulations and these attitudes and things will change. So we chose not to focus on this type of impediment, although there are a lot of those around.

Instead, the other type, the technical impediments relate to what we consider technical shortcomings in risk assessment and its application. We don't believe these will just go away by themselves. Some overt action on the part

of the Commission will be required to fix these.

What we did was list a number of these that we think are the more important ones. What I plan to do is touch a little on each of these except the Item 4, which is the use of importance measures. George Apostolakis will talk in some detail to that one.

The first one on our list was PRA inadequacies and incompleteness. We do feel that there are some deficiencies in PRAs and these are the ones that we think are the more significant ones. As Chairman Powers mentioned, that fires are treated in sort of a unique way, and they are not really part of the PRA. We do not have good phenomenological models for how fires progress and spread, and the damage they do to equipment and instrumentation. Nor do we have such models for the smoke associated with them. So we think that is an area that PRAs are very weak in.

It is generally recognized by most PRA practitioners that the human performance element in PRAs is the weakest part, particularly in errors of commission or when one thinks about unproceduralized activities that might come about. These are just not well treated in PRAs at all.

Organizational and safety culture factors are often thought to be a large contributor of risk to safety, but we just have no way of treating those at all PRAs. They are just not part of PRA. Unless they reflected in

equipment performance and things like that, they are just not treated directly.

The second bullet, it is our opinion that most PRAs are actually incapable of assessing the risk contributions from low-power and shutdown conditions. And this is because -- and when risk-informing the regulations, what one needs is a projection of the average lifetime risk due to these conditions. And the nature of low-power and shutdown risk is that they are dynamic, they are always changing in time. And the PRAs are not dynamic, they are not built to handle that sort of situation. So that that is a problem we see that exists in how you assess the risk in low-power and shutdown conditions.

Now, that is to differentiate itself from the risk management activities of the licensees and the industry. They have good ways to manage the risk if they have a planned shutdown and know what the configurations are going to be and how to control those. That is a different situation and that is not what we are talking about.

And we think we need to be vigilant in looking at the reliability database because it has tended to focus in the past on what we would call safety significant systems and components. Well, what we are finding out is that doesn't capture all the things that are really safety important, so that we need to be sure that the database

includes other systems, as well as passive components,, which we probably haven't developed a database for much at all.

The second one has to do with risk-acceptance criteria. This is addressing the slide that Dr. Powers had on the three region approach. If you do have such an approach in risk-informing the regulations, you need some sort of quantitative description of what these boundaries are, the two boundaries, the upper and lower one.

The lower boundary is probably what I would call the safety goals. How safe is safe enough? Below which you don't need to pay much regulatory attention. It is the upper boundary that is disturbing. It is the one above which you are unacceptable. And these boundaries, in our risk language, are boundaries of CDF and LERF, for example. And this upper boundary needs to be quantified we think. It would be an additional quantification that would go into the definition of adequate protection in addition to the definition that you already have.

And when one does this quantification in terms of CDF and LERF, we shouldn't forget that there are other regulatory objectives, and I have listed some of those possible ones, societal risk, land interdiction, worker exposure. Those are all things we deal with the regulations as they are now. It is not clear to us that LERF, for example, as it is presently incarnated, deals appropriately

with those. It may have to be defined differently. You may have to have different limits for it if you are going to deal with these other regulatory objectives. The idea is we just shouldn't forget about those when we risk-inform the regulations and some thought should be given to them.

One way to be conservative in your regulations and risk-acceptance criteria is to use defense-in-depth. We happen to like very much the White Paper's definition of defense-in-depth in terms of successive compensatory measures to prevent and to mitigate. What we see as a problem is when the staff gets ready to implement that definition, they really need some criteria or guidance on just how many compensatory measures are necessary and how good do these have to be. They will have to make those decisions.

And we have written at least one letter on the subject where we are addressing, or at least exploring putting limits like this on defense-in-depth, and we will have another one coming out shortly from the joint subcommittee with the ACNW which also addresses that subject. And I won't dwell on it now, but we think we are making some progress on how to put limits on it.

And, finally, the thing that comes up all the time is the variation in PRA quality and scope. We recognize that there is a great deal of difference in the scope and

quality of the IPEs, and we are very pleased that the agency is involved in an activity to develop standards with the ASME and the ANS, and we think this activity can go a long way towards solving this particular difficulty. We are looking forward to reviewing the next incarnation of these standards when they get ready to come to us again.

Our concern, one of our concerns has been is at least the opinion of one member of the ACRS that quality of a PRA is measured by its uncertainty. If the uncertainty is done correctly, that is a measure, a metric you can use to say how good is this PRA. And, so, we will want to see, when the ASME and ANS and staff comes to us with the standards, how they are treating uncertainties, how they intend to deal with them in the standards.

And, in addition to that, we think once uncertainties are appropriately dealt with in a PRA, the staff itself needs guidance on how to consistently use these uncertainties in their decision-making process.

So those are the two areas that we think are things we will tend to focus on. With that, I will turn it back to you, Dr. Powers.

DR. POWERS: Professor Apostolakis will now discuss importance measures.

DR. APOSTOLAKIS: The first slide gives us an opportunity to look at the issue of importance measures in a

broader context. If we look at the two boxes at the bottom called "expert panel deliberation" and "risk-informed decision," we can say that the way decisions were being made before PRA was developed were exactly this way. The decisions were based on the judgment of people or groups of people and they were to some extent risk-informed, as Dr. Powers said earlier, but that risk was unquantified, that was not a risk assessment the way we understand it now as a PRA.

And I believe that today when we say risk-informed regulation, we really mean a regulatory action that is utilizing some insight, some results from a PRA, not this just unquantified risk-informed decision that we used to make and that we used to have.

Now, this has become more clear and concrete by adding the two boxes on the left at the bottom of the figure where, especially after the publication of Regulatory Guide 1.174, it became very clear, very formal, that when one considers a number of decision options, one has to assess the impact of each option on two metrics, the core damage frequency and the large early release frequency, and then based on these results will be forwarded again to the expert panel, which will make the ultimate decision by taking into account other considerations as appropriate. So this now a truly risk-informed decision-making process as we understand

it.

Then we realize that, unfortunately, we cannot always assess the impact on CDF and LERF. There are several important situations where this cannot be done, and this includes the special treatment requirements. We simply don't have models that will tell us how the CDF will be affected if we relax certainly quality assurance requirements, for example. We can do sensitivity studies and "what if" studies, but we really don't have them in the sense that, say, 1.174 requires.

Then we go to the top box, and we come up with a better -- with a different idea, not better, a different idea. We realize that we can develop categories of systems, structures and components that tell us how risk significant these SSCs are. And we do this by using some information from the PRA, most often importance measures, to define these categories.

And then, as you see, the two arrows, we go straight to the expert panel. We are giving them now information regarding the risk significance of the SSCs and, of course, the decision options, and they will have to make a decision that will be, again, risk-informed, but it will not have the benefit of the information or possible information regarding the impact of these decision options on CDF and LERF

Now, this diagram I think makes it very clear that one has to talk about the various methods for categorizing the components, like importance measures, which I am supposed to do today, but also other things like the impact on CDF, delta CDF and so on. In the context of this integrated decision-making process, one cannot just look at importance measures as a mathematical quantity and start saying, you know, they are good, they are not good. It is the integrated process that counts.

This is very good because it lifts a lot of the burden from the PRA analyst. We don't have to be perfect now, which is very good.

DR. POWERS: But I thought you were.

[Laughter.]

DR. APOSTOLAKIS: The generic analyst. On the other hand, we are beginning to see now something that also came up in the context of importance measures, and I think we will see more of it. There is this trend -- not trend, but maybe point of view that, well, since you have the expert panel there, you don't really have to do a very good job on the left, on categorizing the SSCs or assessing the impact on CDF and LERF, because the expert panel will take care of it. Your methods can be imperfect, the expert panel will see that and the decision will be the correct one.

Well, the big question before us I think will be,

how far can you push this argument? In fact, sometimes you hear that non-PRA methods can be used in risk-informed regulation. Well, that takes us back 30 years ago when risk was not quantified. So, in this context, we have to look at importance measures.

Now, there is another issue here, that I think rigor in our analytical methods is important. That doesn't mean that the method has to be exact, it can be an approximate method, but at least we have to demonstrate that we understand the limitations, all the approximations have been listed clearly. And I think there are important stakeholder groups out there that are usually I don't think included in the term when we say stakeholders, and these are the technical communities out there which have to be satisfied that the methods we are using are, in fact, appropriate.

So, let's come now to the way these categories of SSCs are developed using importance measures. And these importance measures most commonly used are the Fussell-Vesely and risk achievement worth,

Several people have commented in the literature, including our own staff, on the limitations of these methods. One limitation that appears to be universally accepted as an important one is that the SSCs are categorized individually and not as groups, yet the decision

options affect groups of components. You will never decide to relax the QA requirements on a specific SSC, you will probably do it for a class. And we will come back to this issue a little bit later.

These measures are global measures. In other words, they are based on the totality of information that is in the PRA. Now, what happens many times is that we have to analyze a particular risk. The models may not be very good and so on, so we are conservative when we do that, and it is fine. That is what we should do when we analyze this particular type of risk. However, if that is added to the PRA, and then you calculate the global measure, that measure is distorted by the fact that you were conservative in this particular assessment. Okay. And to what degree and so on, we don't know. It depends, obviously, on what we are assessing.

But even with the absence of these anomalies, with full scope, good quality PRA, there are limitations to importance measures, and we listed a number of them in one of our letters a few months ago.

Now, what I am going to do next is show that there is a certain degree of arbitrariness. Again, this word, I don't want it to be taken as a criticism of what is happening, it is just that it is a fact that these methods are evolving right now. People are coming up with different

ideas how to handle these things, and I think that clearly demonstrates that we need to understand them better.

NUMARC 93-01 recommended, some time ago, that systems, structures and components that have a risk reduction worth measure, which is related to Fussell-Vesely, greater than 1.05 or risk achievement worth greater than 2 would be risk significant.

Now, again, this is an integrated process. They go on and tell you that you also have to look at the top 90 percent of minimal cut sets, gain more insights and so on, so it is really unfair to just talk about the numbers. Okay.

But then we go out to the practice, current practice, and we see that people are doing different things. And the next slide shows how South Texas, for example, is handling these things. Now, what is important to the present discussion is the righthand side column. Here we see a much finer categorization. They just don't go with RAW greater than 2 and Fussell-Vesely greater than 00.005.

For example, we see the red boxes where they will apply the full quality assurance requirements, and it says this is defined by a number of combinations. If RAW is greater than 2 and Fussell-Vesely greater than .005, or if RAW by itself is greater than a hundred, or if Fussell-Vesely by itself is greater than .1. And,

similarly, we see the medium category, low and then the others, there are five categories.

Now, if you go and look at other practices by other utilities, you find that they are going also to a finer categorization without necessarily using the same numbers that this particular utility is using. It is not a question of right or wrong here -- it is not a question of right or wrong, but it does at least convince me that we need to understand a little better what these things are, and maybe have better insights and give guidance to people. But they are certainly not doing what NUMARC 93-01 recommended.

And then in our meeting of February 4, we had another licensee who came in with an entirely different approach, or at least it appeared to be that way, and this is Consumers Energy. They come with what they call top event prevention analysis. And, of course, they claim that it is better than the standard importance measures.

Now, what is that? Well, they are not looking at the probabilities of the accident sequences and so on, they are looking at the sequences themselves. And they are saying, well, we define what we call prevention sets. We will make sure that no accident sequence can occur by going to all the accident sequences and taking two events from each. And they say, we will make sure that this new set

that we develop, we will maintain appropriately, we will do everything we can so that these things will not fail, therefore, no accident sequence can occur, or actually the probability will be very low.

And then they bring into the process some probability evaluations, too. Of course, their manipulations here are very huge. I mean one application on check valves, for example, they came up with 55,000 such sequences, what they call prevention sets, each one consisting of several hundred events, but they have the computer tools to do it, and they did it. And some of the results you see in the next slide where they are also showing the risk achievement worth on the vertical access and the Fussell-Vesely measure on the horizontal access, comparing their results to those that one would have obtained by using the standard techniques of importance measures.

Now, they claim that the major advantage of what they are doing is that it addresses what I said earlier, that systems, structures and components in this new method now are categorized individually. You are looking at the whole context of accident sequences. And there are check valves, some of the check valves that you see in the lower lefthand side quadrant, that become important under certain conditions where other things have failed. In the standard

Fussell-Vesely and risk achievement worth approach, you are looking at one component and you assume that all others have their nominal failure characteristics. Whereas, now, you may have other failures as well, in which case, this component now may become important.

Is this better? We don't know. I am not going to argue that it is better, I am still trying to understand it myself. The staff, as far as I could tell last February, or most of them anyway, it was the first time that they saw this.

So I think this discussion on the South Texas project and NUMARC and Consumers Energy clearly demonstrates that the methods for categorizing the systems, structures or components are still evolving.

So what are the recommendations then that the committee has come up with? Yes, we agree that mathematical methods involving, in this case, importance measures have to be evaluated in the context of the integrated decision-making process. There is no question about it. But we believe that we also have to clearly understand the limitations of each approach and make recommendations as to which approach is best for what application. And, also, all these limitations and so on should be provided to the expert panel so that the expert panel will have a better appreciation of what kind of information they are getting

from the risk assessment or from the analysts.

Now, if we go back to the figure, the very first figure, you see I have no arrow going down to the impact on CDF and LERF. The committee feels -- I mean this is the way things are now, the committee feels that even when we have to resort to the risk significant categories and we proceed with those, it would still be very useful to try to evaluate the impact on CDF and LERF of whatever decision we are considering. We admit that this is not easy to do with the current models. There may be a way in the future, but I don't think we should just, well, we don't think that we should just settle on this approach that bypasses completely the assessment of the impact of the decision options on CDF and LERF.

And on a happy note, back to you, Mr. Chairman.

DR. POWERS: We should allow some time for the Commission to ask what questions they want. This constitutes a body.

CHAIRMAN MESERVE: Good. Thank you very much. I very much appreciate it. A very informative briefing.

Dr. Powers, I would like to first address a question to you, and it is a rather fundamental one, I think. That you had indicated, as I understood you, that the ACRS, if it had its preference, would adopt a what they call holistic or a clean sheet approach, which as I

understood that to mean is that we throw out all of Part 50 and we start all over and focus on existing reactors. And I just sort of -- and it seems to me that that is disconnected from every other presentation I have heard this morning, which is that we have all these inadequacies of PRAs. We don't understand exactly the role of defense-in-depth. We are not exactly sure of the role of performance-based regulation. We have these problems, George has indicated, with importance measures, and there is a lot of things are evolving.

I really wonder that is a feasible thing to do given the fact that some of the underpinnings that you would want to have for a truly risk-informed approach really are something that are still a work in progress, and given that isn't really the most practical approach, what we are doing, which is what you have characterized as a piece-wise approach, we learn as we are going, do what we can.

DR. POWERS: I think you catch us in a mode of a peer reviewer. We are looking at a superb body of work that exists and asked to review it and, of course, the review only focuses on the bad things and neglects to say, gee, what great strides have made? And they are monumental. They are impressive.

Could one sit down and take a holistic approach? I think the ACRS says yes. And that despite these

impediments, despite these questions of exactly how you proceed, you could make tremendous progress. On the other hand, I don't want to very critical of the staff's approach. They, too, have taken an approach, one they want to pursue. It seems to be feasible. I mean we, after all, have sent you a letter that says, gee, this looks like a fine way to proceed here.

I think we are interested in looking at the holistic approach as a comparison to where they stand, to where they go, and what kinds of things, because, in the end, I think you want a body of regulations that looks like you came from a holistic approach.

The challenges that are ahead of us can't be underestimated, but I don't think any of the speakers have said these are debilitating. I think that Dr. Kress indicated some things that have to be done, and Professor Apostolakis indicated some things where there are alternatives coming before us because we are unleashing the imagination of the licensee community to figure out ways to do things. And we have to accommodate those different approaches toward achieving the same end.

Well, I think I will stop there.

CHAIRMAN MESERVE: Let me just say, I would be very concerned if we were to try to just start all over with a clean sheet. I mean we have a job to do and we have a job

to do now. We have an immense project which will take an enormously long to do, with all kinds of uncertainty as we approach it. And I just think we, as a practical matter, have no choice but to do what we are doing.

DR. POWERS: I can certainly be sympathetic to that, but I think one has to recognize that when you proceed that way you have a tendency to say, gee, I have got a regulation here on offsite power for liability, as an example, and I am always going to have that regulation. I may put some risk words in it, but, in fact, the holistic approach might find that there was no need to have that there. The danger is that you will retain in the regulatory body aspects of the current regulation that a holistic view would say probably weren't necessary. That is the danger you are facing.

CHAIRMAN MESERVE: Well, I appreciate it, and you have pointed out there is the danger about inconsistencies and so forth. And we are very conscious of that and, obviously, we try to fix those as we are going forward and with your help.

DR. POWERS: Another challenge you are going to face, and this one is going to be more difficult, I think, is that a dispassionate view of the risk structure, that you might well say there is a need for another regulation, one that there is no counterpart in the existing body of

regulations. I think it is much more difficult to inject a new regulation into an existing system than it is to take one out, or to preserve one. I think that is a challenge.

I don't know I have any good examples of that right now, but, clearly, they do exist, because, I mean, certainly the ATWS rule and certainly the station blackout rule were products of risk information, and it would not surprise me if others would come along like that. You want to make sure that you don't create barriers in the piece-wise approach toward injecting regulations when they are necessary.

CHAIRMAN MESERVE: We recently received a letter from the NEI. I don't know whether you have seen it, but it was -- they made an effort to give us an array of the priorities that they thought we should hold in terms of approaching the regulatory problems and risk-informing the regulations. I recognize this is somewhat outside the scope of your presentations, but I am curious as to whether you have looked at that letter and have any views on how we should approach the prioritization.

DR. POWERS: I am familiar with the letter in its draft from, but I will admit that was sometime -- it was several months ago since I looked at it. My view on it was that the prioritization was based on magnitude of licensee effort, and it was less clear to me how it was tied to the

risk significance of the items. Maybe that is all I would really like to say about that.

CHAIRMAN MESERVE: Yes, we may seek some further views from you on that point.

Dr. Kress, I have just one question for you. On your Slide 29, you point out some of the PRA inadequacies and incompleteness, and you make the point, which I am sure is true, that one of the difficulties is that the reliability database for non-safety-related systems is weak. I mean one of the aspects of our risk-informed effort was to enable us to look at non-safety-related systems that turn out to have high safety significance.

That bullet seems to suggest that we are on -- maybe it is too extreme to say -- but sort of a fool's errand and that we are not going to be able to detect those.

DR. KRESS: I didn't mean to have it interpreted that way. There is a database on those. We do, the plants do keep records of how often those things fail and they have those records. They are just not centralized in what I would call the PRA community's database. They need to be assessed and brought into the same level of review and appreciation that the safety system and components have. So it will take an effort to go out and get this data that exists out there.

CHAIRMAN MESERVE: It does exist.

DR. KRESS: Yes. In fact, INPO has a great deal of information on that. But George might want to comment on this, too.

DR. APOSTOLAKIS: Yes. I think that it is literally for passive components. For those I don't think we have anything.

DR. KRESS: Yes, we don't have anything on passive.

DR. APOSTOLAKIS: For the others, I agree with Dr. Kress.

CHAIRMAN MESERVE: Okay. Let me give some of my colleagues an opportunity. Commissioner Dicus.

COMMISSIONER DICUS: Let me follow up another aspect of the Chairman's first question regarding holistic approach. We are aware that some of the licensees will not use a risk-informed regulation for a variety of reasons, generally because it is resource-intensive to go that route and they are probably not going to stay in operation long enough to do it. So when you are talking about the value of going to a holistic approach, you still recognize, even if we did that, we have another set of regulations for that set of licensees.

DR. POWERS: We have always -- it has always been in our mind that there would be, at least for some substantial period of time, two sets of regulations, the

existing ones and the risk-informed ones.

COMMISSIONER DICUS: Okay.

DR. POWERS: I mean that, quite frankly, that has more to do with lawyers than it does to do with us.

COMMISSIONER DICUS: Understood. On the slide that you had on pitfalls and barriers, the second bullet, there is a comment -- incompleteness as one of the pitfalls or barriers. Incompleteness -- I think Slide 6 -- and the analytic capabilities to support a risk-informed regulatory system. I am curious about whose analytic capabilities you are referring to, the NRC's, the industry's, or both?

DR. POWERS: I personally have questions about many of our capabilities. I think the capabilities for doing risk assessments during power operations has undergone the kind of technical development of good science, that is, there has been intensive peer review, many discussions, many papers written. Conflicting approaches have been debated and we are coming down to a set of practices for doing risk assessment under power operations that can be standardized, that is, we can have an ASME standard in that area.

I think when you come to other areas, it is a little more questionable. One of my current concerns is the area of risk assessment from fire initiators. It is an aspect of probabilistic risk assessment that has not undergone much development since it was first initiated

perhaps 15 -- 17 years ago.

DR. APOSTOLAKIS: 1979.

DR. POWERS: By one of my esteemed colleagues. And it hasn't had the kind of development that has been accorded risk assessments for power operations. They have not been as intensively debated.

We do know that we have phenomenological difficulties in that area, particularly, sets of papers were presented in a conference held by the International Atomic Energy Agency, a very good list of What is wrong with the methods that I use for fire risk assessment? It is a confessional by the risk analysts.

And they have identified a number of areas where I think substantial conservatisms are still built into the process. And one gets very nervous about using risk analysis techniques with bounding and conservative phenomenological models in them. And I think we see controversies developing between the staff and the licensees with respect to these conservatisms.

That is just one example, and it is as a community. It is not regulator versus licensee. This is a weakness that exists in this. Our entire treatment of fire has been, as I call it, the stepchild. It clearly is an internal initiator, but it is already treated in the external events PRAs. It has not had the kind of

phenomenological research that has been done for severe reactor accidents, for instance, or aerosol transport. We know a lot about radioactive aerosol transport. We don't know so much about smoke transport.

So, my concern in this bullet is as a community and not an individual. Now, there are probably other individual areas where I think we are going to have to look closely and say, what kind of technical support is it necessary for the operational arms of the NRC to have available to them?

And that brings up an issue that I think you are going to have to confront on a policy basis, and that is, on these technical areas, where is it you want the NRC staff to do independent assessments? And where is that you think it is satisfactory for them to review the submission of licensees? That will dictate what kinds of technical capabilities and tools, analysis tools they have to have once we have a good understanding of that. Right now there are no criteria.

COMMISSIONER DICUS: Okay. One final quick question, it goes to your comment or this so-called wish list that the industry has sent us of where to start. You made the comment that you didn't think it was particularly based on risk, but rather on effort. Can you expand a bit on that?

DR. POWERS: I may speak out of poor memory, but my recollection was that I think the list reflected careful attention to the areas where the industry thought an enormous expenditure of effort was taking place, perhaps with little risk significance. That is my memory. And, quite frankly, it has been long enough that I could be in some error.

COMMISSIONER DICUS: Okay.

DR. POWERS: But that is my memory.

COMMISSIONER DICUS: Okay. Thank you, Mr. Chairman.

CHAIRMAN MESERVE: Commissioner Diaz.

DR. POWERS: Of course, he is the godfather of the risk-informing of Part 50.

COMMISSIONER DIAZ: Not really, I refuse to have that title. It has all kinds of bad connotations.

[Laughter.]

DR. POWERS: I am sorry, sir.

COMMISSIONER DICUS: He was willing to do it himself, take a year off.

COMMISSIONER DIAZ: I would love to do that. I might still do that.

COMMISSIONER MERRIFIELD: Of course, Commissioner, you always know on the Hill we always got nervous when people complimented us that much.

COMMISSIONER DIAZ: I am very worried. You know, my sensitivity has been raised.

Let me start by saying that I have been three-and-a-half years and I would really like to compliment the ACRS for a very clear presentation. I think what you have done today is, in a very simple manner, expressed what are the issues that need to be faced. In fact, I was even able to understand Professor Apostolakis.

[Laughter.]

COMMISSIONER DIAZ: Which, at my present reduced brain power due to the flue, it is a credit to the way that he expressed things.

COMMISSIONER DICUS: Slide Number 1.

COMMISSIONER DIAZ: Right. The first thing that I come out of this is that I have so many questions that I believe are important that I would publicly tell you that I would like to get a re-engagement with you in a little room, because I have, practically on every point I have something, and I don't think this is the right place to do it. But I am going to take a couple of cracks at a couple of issues, including the holistic approach, of course.

First, you know, let me go to one of the first statements of Dr. Powers, which I think addresses on of the things that we are really having to grapple with. It is, you know, the second part of the presentation is going to be

more applied and less theoretical, and that might go to the heart of some of the problems that we are having. There is a very applied feeling here that needs to have a high degree of acceptability to both the licensees and the NRC to be able to progress into the areas which are more theoretical. It is a reinforcing function, and we all need to realize how these two things interact.

I have seen in the last almost two years, from the first time that NEI came and said let's go ahead and change Appendix A, and they have all this book, to the last letter, kind of a reduction of the approach. And that reduction of the approach comes up from the human interactions. You know, if somebody says, I cannot do this, then the other guy says, well, I think you can, but let me take the best position on it. And that is the main advantage of not doing it holistically, but taking a holistic approach to it.

And it brings out the difference between risk-informed regulation and deterministic regulation. If you bring a body of regulations to become risk-informed, you are not limiting to the present state of the art. You are actually embodying into that set of regulations the capability to improve as things are improved. They are no longer set values, but it is the capability to analyze, you know, and implement measures to reduce risk. And that is the real value of risk-informing our regulations, is that it

is not static, that it is dynamic in itself. That it is not constrained, that it doesn't put you into a corner. That it frees you to do what is best as things are developed. And that is really where the things are. That was my first question.

COMMISSIONER McGAFFIGAN: That sounded like a statement.

COMMISSIONER DIAZ: That was a statement, I didn't realize.

[Laughter.]

DR. POWERS: But I think you raise a good point and something that maybe speaks to the Chairman's question, because it may well be that we can proceed along a step-wise -- I think my wording "piece-wise" has too much of a pejorative nature to it -- step-wise process until we grow comfortable with what we are doing, and then it is possible to move to a more holistic step. And I think you can have the best of both worlds there.

COMMISSIONER DIAZ: I think you are absolutely right, if we gain confidence with it. But if we abandon from the beginning the idea that there could be a holistic approach that can come to be effective at any one time, then we are already reducing our capabilities. Do you have any comments on that?

DR. POWERS: I think that is why it was worthwhile

for me to try to go back and distill out and do this exercise of, what is it we would have done if we had undertaken this ourselves? Now, understand, the ACRS is four square behind the staff's three option approach, and I understand the Commission is as well. But if we tried to do it, I think Commissioner Diaz is absolutely right, we need to think what is the capability that we want to have eventually and not lose sight of that as we go through looking at 50.44 and then 50.46, and then 50.48.

DR. APOSTOLAKIS: That's correct.

DR. POWERS: It is very easy to get into a trap that you lose sight of what you are trying to achieve as you try to work these, oh, so frustrating communications between one aspect of the regulation and the other.

COMMISSIONER DIAZ: There is one aspect of the holistic versus the step-wise approach, which is addressing really those parts of the regulations that are the crux, that really have connections to most everything else. And I think you highlighted very clearly Appendix A and B. I think that somehow we are concerned that when we address these two major fundamental safety components, okay, of our regulatory body, that we might be going too far or too fast.

I had a document that came from Europe, it was a fascinating document. Some people independently analyzed Part 50, and they concluded that the two most relevant and

fundamental components of Part 50 were Appendix A and Appendix B.

DR. POWERS: If you undertake to read Part 50, you are well advised to read Appendix A first, and then, as you go through Part 50, you have a better understanding of why the other what I would call technical elements are in there. What that translates into is if you change those technical elements, you haven't gained anything. You are still constrained by the general design criteria because they speak exactly to the same issue that is spoken to in regulatory report.

For instance, the staff is very interested in 50.44, but there is a general design criteria that asks for exactly the same thing. And you get into what I call the graded quality assurance problem. Yes, I have graded, I have put risk into this, but I haven't done anything to the licensee because he says I am still controlled over here.

COMMISSIONER DIAZ: I sincerely believe that somehow leaving Appendix A as an incomplete piece of work has done a disservice to this body. If it had been, you know, at certain time increments, really brought up to date, we might have really got something that we would not be in this dilemma.

Let me -- this is, you know, I say there is a limited amount of time, I am looking at my clock in here.

Let me go back to the issue of acceptability. The issue of putting resources where it should be, and how can we do the most good.

I am convinced that there is a tremendous body of work that needs to be done to increase the reliability of the tools that we use. I think sometimes, theoretically, we overemphasize the issue of uncertainty reduction versus reliability of the data, and that, Dr. Apostolakis and I will need to get into a dark room and has that out.

But if you look at your Slide 29, this issue of acceptability versus what is really, you know, important and relevant in the short-term probably comes to mind. You look at the things you correctly address as being inadequate, you know, fire, human performance, organizational and safety culture factors. And then you look at your second bullet, which is probably the only thing that I very much disagree with is, you know, making low-power and shutdown a front runner.

And the reason that I don't agree with that is not because I don't believe that we should not quantify it. I agree that we should. It is that reducing the uncertainty in that area, when we have uncertainties that are in the other areas that, to me, are more important fundamentally, you know, shutting down for full power and coming down to low-power, which is where I think the real high risk is.

Then we start having this, you know, what comes first? What do we do first? And I think that the identification of where risk are, rather than the quantification of the uncertainty in the calculation, is far more important in this area than anything else. Would you care to comment on that?

DR. APOSTOLAKIS: Did you just say, Commissioner, that you think that the transition risk is very important, is that what you said?

COMMISSIONER DIAZ: I think that identification of where the transition risk is, and approximately how much it is, is extremely important rather than trying to reduce the uncertainty in the calculation of how much it is.

DR. APOSTOLAKIS: Oh, yes.

DR. POWERS: I think there is a great community of agreement here. We are in violent agreement, sir.

COMMISSIONER DIAZ: Okay. That is the case then.

DR. POWERS: I think that there is technical support for your point of view. That when we look at the risk assessment done for Sizewell, we find that these transition risks play a fairly important role. When we look at the risks during full shutdown, where we may be working with the vessel open, the containment open, that we understand the difficulties the risk assessment tools have in confronting unproceduralized actions, which would be so

easy to do under those considerations. So we question their accuracy there.

We question the accuracy of not focusing on these transition states because they look like there is potential for not only human error but equipment failure, especially as the plants get older. So I think there is a raging agreement here on that.

Now, on the other hand, let me assure you that it is possible to overemphasize uncertainties, because uncertainties here are things that physicists and engineers are unfamiliar with, uncertainties that are equal to, and sometimes larger than the magnitude of the quantity in question. But the question is now how big the uncertainties are, but how do they affect the decision-making process? And I can assure you that that is a lesson that I am reminded of regularly by Professor Apostolakis. When I make errors in that, he insists that I come up and take his probability course.

COMMISSIONER DIAZ: All right. Thank you very much.

CHAIRMAN MESERVE: Commissioner McGaffigan.

COMMISSIONER McGAFFIGAN: I guess I am going to start off by trying to figure out whether I did under Dr. Apostolakis. The Consumers Energy slide that you used --

DR. APOSTOLAKIS: Which one?

COMMISSIONER McGAFFIGAN: The Consumers Energy presentation to the ACRS.

DR. APOSTOLAKIS: Okay. Yes.

COMMISSIONER McGAFFIGAN: Are the ones, twos, fours next to the boxes what their importance measure is and they are comparing it in this chart to the normal table of importance measures? In other words, is Number 1 down in the lower right quadrant what they think is the most risk significant based on their importance measures, yet it is showing up in a region that would not be treated by South Texas as important, or it would be medium important in South Texas?

DR. APOSTOLAKIS: Yes. The intent of this was to show what kind of results one would get by applying the --

COMMISSIONER McGAFFIGAN: Their importance measures compared to the others.

DR. APOSTOLAKIS: Yes. Right.

COMMISSIONER McGAFFIGAN: So what the slide leads me -- I mean I see 1 down in the lower right quadrant, I see 44, 45 up in this area where you know, you would apparently think things are important, have high quality assurance. I see low numbers, 11, 10, 19, down in the lower left area where, you know, you would want a low -- you would want a basic quality assurance program or whatever.

So my question that this raises, are we ready --

is 50.69, which I know, you know, Dr. Powers keeps saying, you know, you endorse the staff approach, but are we really ready for 50.69 or what is -- you know, if there is this much variation in the ability to quantify it, you know, and depending on the methodology used, you end up with something either being important and needing high quality quality assurance or something not, have you done any sensitivity analysis to how often this is going to occur?

DR. APOSTOLAKIS: No, people have not done this. This is the first time that we ourselves saw such a comparison. But there is an important point here, though. When I first saw this methodology, I thought it was drastically different, dramatically different from what other people are doing. The more I think about it, the more I think that it is closer to what other people are doing.

For example, if you were to calculate the risk achievement worth in Fussell-Vesely for all the check valves, not just the ones above the limits that NUMARC has given us, you would have identified these other things down here. And South Texas will tell you, we will apply good engineering practice to those.

COMMISSIONER McGAFFIGAN: Okay.

DR. APOSTOLAKIS: So the question in my own mind is whether this is really a truly different approach.

COMMISSIONER McGAFFIGAN: Okay.

DR. APOSTOLAKIS: So, all I said was that things are evolving.

COMMISSIONER McGAFFIGAN: Just the bare slide by itself, compared to the previous slides, starts raising questions.

DR. APOSTOLAKIS: Exactly.

COMMISSIONER McGAFFIGAN: Dr. Kress, I guess it was -- on my slides it says Slide 30, but it is the slide entitled "Need for Risk-Acceptance Criteria." You say in that slide that the limits would differ from those in Reg. Guide 1.174 for adequate protection. How would they differ? I saw the same in your letter, they would differ. Would they be higher, would it be 10 to the minus 3 CDF, as opposed to the 10 to the minus 4? Where would -- give me a guess.

DR. KRESS: I can give you some speculation. 1.174 really has only one set in there, that is the 10 to the minus 4 and 10 to the minus 5. They don't have numbers for an upper boundary.

COMMISSIONER McGAFFIGAN: Right.

DR. KRESS: If I look at the IPE results and the IPEEE results, and look at what has been achieved by the various plants for CDF and LERF, and if I make allowances for the fact that the IPEs and the IPEEEs reflect things that the licensees do that are not actually required by the

regulations, they go beyond the regulations, so that this tends to lower their numbers. But if I make allowances for that, I would have guessed that if I were to build a plant just to meet the regulations and do none of the other enhancements, just to build the regulations, I could build a plant and be at about a level of a factor of 10 above the CDF and LERF that is in the 1.174.

And, you know, I don't know exactly where you would call an adequate protection level in terms of those two, but it is not at the level of the safety goals.

COMMISSIONER McGAFFIGAN: Dr. Apostolakis wants to comment.

DR. APOSTOLAKIS: I think an important point here is also that instead of just talking about what is adequate protection, to actually see how people act. And in my experience, the staff and the industry act immediately when they identify a contributor that is on the order of 10 to the minus 3 or higher to core damage. So where exactly is the line, we don't know. But, you know, the famous words "increased management attention" that they use in 1.174, well, if you want to see increased management attention, tell them you found a contributor of 3 -- 10 times to the minus.

COMMISSIONER McGAFFIGAN: Well, I don't want to -- again, maybe I will follow on in private like Dr. Diaz on

some of these issues. The whole notion of setting a safety goal in terms of CDF and LERF, I will go back to Dr. Kress, we have talked repeatedly in the past about delta CDFs and delta LERFs having some meaning, but the absolute quantities, given all the problems with PRAs and whatever that you talk about not being that useful, so if we ever did go and establish whatever the number is as the upper bound, 10 to the minus 3, 2 times 10 to the minus 3, whatever it is, would we have -- would it be useful? I mean do we really believe the sum total numbers that come out of these PRAs? And would it be --

DR. POWERS: It would be pretty hard to calculate.

COMMISSIONER McGAFFIGAN: Yes, it would be pretty darn had to calculate given, you know, that you say it doesn't cover FAR, it doesn't human performance, it doesn't do this, do that.

DR. KRESS: I, personally, believe that establishing such numbers would be extremely useful in dealing with crafting the regulations in such a way that you have the coherence we need.

I do believe that that bright lines like a specific number are hard to deal with, and one has to incorporate uncertainties and there have to be fuzzy lines. And you can't get away from defense-in-depth and true regulatory judgment. I think those things are important.

So I think having a number which represents a value you would like to achieve if you had perfect PRAs, or if you had perfectly quantified uncertainties, so that you know what the uncertainty is in the number, is of value. And how you deal with it in the regulatory process is, I think, something else.

COMMISSIONER McGAFFIGAN: It would be more a hortatory statement than something that we would then try to mathematically reflect in the regulation.

DR. KRESS: I think in practice it would end up being something you would actually act on, the actual numbers. You would actually act on them.

COMMISSIONER McGAFFIGAN: You would act on, if anybody were above 10 to the minus 3, if there were a number, we would do something about it.

DR. KRESS: You would do something, yes, Exactly.

COMMISSIONER McGAFFIGAN: But Dr. Apostolakis' intervention was we would so something if they are above 10 to the minus 4, in practice.

DR. APOSTOLAKIS: Three.

DR. KRESS: Well, I think above 10 to the minus 4, you use a lot more regulatory judgment, and you know, things like --

COMMISSIONER McGAFFIGAN: Right. Okay.

DR. POWERS: Quite frankly, we have plants that

are above 10 to the minus 4 and they are fine.

COMMISSIONER McGAFFIGAN: Right.

DR. APOSTOLAKIS: They are licensed.

COMMISSIONER McGAFFIGAN: Just to now consume too much time, I will go back to Dr. Powers. Your chart Number 11 talks about DOE sponsoring an effort on risk-informing the reactor regulations following a top-down process. I look at that and I wonder whether that will have any credibility at all, and whether it is at all connected with us. I mean you have a promotional agency sort of saying, you know, I don't know what the product of this effort is, but they say, you know, Dear NRC, here are the regulations we respectfully request you think about applying to a future generation of reactors. Sincerely, Bill Richardson, or something.

DR. POWERS: I think you would have to ask the Department of Energy what they intend to do with it. We are simply aware of the effort being undertaken, and that they profess that they are going to use this top-down holistic type process. And I think it is interesting.

COMMISSIONER McGAFFIGAN: It is interesting, but shouldn't -- I mean my notion is, if we are going to think about future reactor regulation and having effort in that, I know DOE has money and we don't, but it strikes me that if somebody were funding this in a way that would have

credibility in the long run, it would be better for us to be doing it than them.

DR. APOSTOLAKIS: I have a comment about it. This is not a Department of Energy effort. It is sponsored by the Department of Energy, but it is really part of the NERI program, the Nuclear Energy Research Initiative. You know, a group of organizations submitted a proposal, it was approved. That does mean that this is DOE's position or will be DOE's position. It is just a research project, so let's not give it more importance than it has. And I doubt very much you will get a letter from the secretary.

COMMISSIONER McGAFFIGAN: Okay. Thank you.

CHAIRMAN MESERVE: Commissioner Merrifield.

COMMISSIONER MERRIFIELD: I would like to join Commissioner Diaz in completing the presentation. I thought -- like he said, I think it was very clear and certainty very helpful so far.

I am struck, and I think all of my fellow Commissioners have talked going to the issue of Part 50 and whether we went with a holistic approach, just took a blank sheet, or whether we went along what we are not calling the step-wise fashion, which we have decided to undertake.

And I was reminded of an analogy, and that was of the difference between an artist and a house painter. And it strikes me, and, again, I don't mean this in a pejorative

sense either, it strikes me that the ACRS has the ability to step back and think big picture, out of the box, in a theoretical way, and present to the Commission some of the possibilities that are available to us. And the Commission, like the house painter, has to work with what we have. And what that is are limited budgets, limited staff resources, a need to response to stakeholder concerns, a need to respond to the concerns of Congress that we move forward and expeditiously to reform the way in which we do our regulations, to improve the safety, but at the same time reduce unnecessary burden.

And so this conversation very much I think falls in line with that. That if we had the luxury of time and resources, certainly, doing this in a holistic manner and moving forward in that way, from a blank sheet, would probably be a great outcome. But, given what we have on our plate, that may not be possible for us, and, indeed, I think that is why the approach that we have taken makes sense.

To underscore this and to package it, I will repeat, and I think I have gotten this right, the last words that Dr. Powers said on this, ACRS is four square behind the staff's approach to Part 50. And I think that is certainly where I would want to leave that particular comment.

DR. POWERS: And it is absolutely true. We have just had a briefing from the staff working on the Option 3.

They probably can attest to you they got a health and in-depth interrogation. But I think there is a genuine enthusiasm for what they are undertaking. I think there is even greater enthusiasm for the special efforts under Option 2.

COMMISSIONER MERRIFIELD: In that regard, let me ask you just a couple of quick questions. They relate to Slide 6. You mentioned the incompleteness in our analytical capabilities to support a risk-informed regulatory system. How would you characterize the staff's response to this assertion? And what do you think if being done to make these capabilities complete?

DR. POWERS: I believe that the way to assess the staff's response toward the assertions of incompleteness is to look in two places. What have they done on the PRA implementation plan? And what have they done in their research programs? And I guess we get mixed messages there, that we see a PRA implementation plan that is fairly anachronistic. Its major elements were written before Commissioner Diaz gave his sermon on the second floor of the White Flint Building, and it doesn't have laid out for it yet the kinds of analytic tool development that may be identified as they go through the step-wise process.

In the research programs we see elements that I think speak to many of the current deficiencies. Certainly

the research program includes a human performance program plan and I don't know whether the Commission recalls, but after many discussions with the ACRS, the staff brought forth a plan in the human performance program that the poor speaker was embarrassed by the Committee standing up applauding virtually as they went through that, those plans.

Similarly, in the area of incorporating digital I&C, the staff is coming forward with plans in that area. The staff has formulated a plan for looking at shutdown risk. Staff has some efforts underway in fire protection and the development of the risk tools in that area.

What we don't see is a coherency in these activities that say, and here is how good it has to be, here is what we want to accomplish. Here is what we are going to do with this. Is this is a tool that is used by researchers? Is this a tool used by the NRR, at headquarters, or is this a tool that we want in common use by the line organizations out meeting directly with the licensees? That is the part we see missing right now when we look at these, at the development of these programs.

But I believe, correct me if I am wrong, that there are elements of the research program, as at least it has been proposed, that address every one of the deficiencies that we have called out here today, and have addressed the issue of uncertainty analysis.

COMMISSIONER MERRIFIELD: Just to follow up,, do you think it is understandable, given the fact that we are still in the early stages of this effort, that that would -- it is not unexpected that there would be that particular difficulty? I mean I am not trying to rationalize it, but it seemed to me that that is not to be unexpected.

DR. POWERS: I guess I don't want to speculate right now. I think there is distinction drawn between the research organization and the line organizations as far as their familiarity with these things.

The other problem, of course, is that we have got limited resources and we have to put it into the most important areas, and some of these deficiencies just are not going to get addressed when you have a limitation of resources.

COMMISSIONER McGAFFIGAN: Okay. Let me keep going quickly, because I don't want to take up too much time. Dr. Kress, on Slide 32, you had two issues you had raised at the bottom. Will the standards include guidance on the appropriate determination of uncertainties? And does the NRC plan to develop guidance on how to consistently use uncertainties in the decision-making process.

Obviously you talked a bit about the ANS effort that is currently underway. Do you have the sense that staff understands these two issues and that they are

addressing them?

DR. KRESS: Yes, I think the staff thoroughly understands these two issues. Now, I don't see much effort in this guidance on how to consistently incorporate uncertainties in the decision-making process, but they understand it has to be done. There is some vagueness about how they intend to use uncertainties. But they are aware of the issue.

COMMISSIONER MERRIFIELD: A final question for Dr. Apostolakis. On Slide 39, I was wondering if you could help me better understand the context of your third and fourth observations. Now, given your presentation, I draw from the discussion that the limitations and arbitrariness you talk about, there is some degree of inevitability to that. What I would better like to understand is what does this inevitability mean in terms of our ability to risk-inform Part 50?

DR. APOSTOLAKIS: I don't think that this a major roadblock. I think so, I think all we have to do is identify the limitations that we recommend later be identified and understand better why there is this apparent arbitrariness in the application of the methods, and write the Regulatory Guides appropriately. And, frankly, the Consumers Energy people are very anxious to see something in the guide about their approach, I mean they have said so in

public to us. So I don't think this is a major --

COMMISSIONER MERRIFIELD: So you have confidence in staff's ability?

DR. APOSTOLAKIS: Oh, I think, yes. Yes.

COMMISSIONER MERRIFIELD: Great. Thank you.

DR. APOSTOLAKIS: No problem at all.

COMMISSIONER MERRIFIELD: Mr. Chairman.

CHAIRMAN MESERVE: Thank you very much. I very much appreciate what was really a very helpful presentation on, obviously, an enormously important initiative for us and for our licensees.

I would like to suggest that we now turn to the final presentation having to do with performance indicators.

DR. POWERS: We will go from the theoretical to the applied very quickly here. And Mr. Barton will walk us through this area, which I can assure you is foremost on our plates right now, and I remind you that that this is still a work in progress for us.

MR. BARTON: Thank you, Dana. It is good to be back in the real world.

[Laughter.]

MR. BARTON: The committee received the other day the SECY paper 049, which we have had a chance to look at in a cursory matter. We will be meeting with the staff this afternoon to discuss the details of that paper. But a

cursory review of the document shows that several of the committee's questions and concerns that we have had on this process are being addressed by the staff. For example, the initial implementation, rolling out for one year, continuing to adjust the process during that year and doing a self-assessment at the end of the year process, at the end of that initial implementation process does answer several concerns that we have had. Also, the handling of adverse trends indicated by the substantial cross-cutting issues is something that we were concerned about and see that the staff is addressing that in the SECY.

Just to review the overall objectives of the process, the process was intended to improve the objectivity, improve scrutability, and to risk-inform the regulatory process so that resources are focused on aspects of performance that are important to safe operations.

On the next slide there are areas that the ACRS is in full agreement with. In principle, the new inspection assessment approach is better than the process it replaces. I think we agree that the new oversight process makes assessments and actions more objective, understandable, predictable to both public and the industry.

The objective of the process is to assure the plant performance is at an acceptable level. We have had numerous discussions with the staff on the objectives that

the agency desires from this new process, and I think we feel if the agency is satisfied with the overall objectives that the staff has laid out, then the process that they have put in place will meet those objectives.

However, we must recognize that there are some potential downsides. One of them is the possibility of losing an early warning signal that something is amiss with licensee's performance, especially if one concentrates on just the performance indicators.

Less regulatory burden could lead to bad decision-making. And we don't see that there is incentives for licensees to continue to improve performance. Now, the SALP process, for all the faults it had, did present that challenge. If you look at the new process, and the results of the pilot program and the indicators that the licensees have submitted for 1999, they are essentially all green, and it is difficult to cross the threshold from green to white to yellow.

The new process consists of performance indicators and baseline inspections performed by the NRC. I think we are in agreement that the glue that holds together this new process is the inspection program. The residents must feel comfortable with the inspection program and with using the significance determination process. We feel they must be provided with the proper resources to adequately perform the

inspection program and a look at the SDP has the potential to bog down inspectors and take away from inspection time. I mean these are the some of the concerns that the new process appears to have.

The next slide. A pilot program should have been longer. We addressed that, I am not going to spend more time on that topic.

Performance indicators and their thresholds should recognize plant- or design-specific characteristics. And the current PIs, as we understand, don't seem to accomplish this, and they weren't designed to do so. But without some of these factors in the PIs, we question how much value the PIs are going to have to the staff in the new process.

Performance indicators focus on equipment and only indirectly reflect human performance and shutdown operations. Some plant risks in certain shutdown configurations is as high as during operating periods. We think the staff needs to develop PIs for shutdown conditions.

The staff should also continue to seek additional indicators and review existing indicators for threshold adjustments. And I think you need to really reflect on where the thresholds are and make appropriate adjustments.

There is no demonstration of safety equivalence for thresholds of different performing indicators. For

example, it is hard to figure out if you have the same, significance in white/yellow and emergency preparedness area, as opposed to a white or yellow in initiating events cornerstone.

Now, the next two slides cover areas of continuing discussion both amongst members of the ACRS and with the staff. Current PIs, the values are not plant-specific and, thus, may be too high for some plants and too low for others. We feel you are unable to identify trends in a timely manner and values are disincentives to improve plant performance and degraded -- degradation in performance can be rapid and really not picked up when one focuses on the PIs.

The values we feel that establish the PIs are basically where the industry is operating and has operated in the past. And the industry is really monitoring performance at a much lower level than the thresholds that are depicted in the PIs in the current process.

I can give you a recent observation where the PIs were submitted for 1999 for a licensee that had all green PIs and one white PI in security, which since turned to a green since we changed the threshold in security since staff has changed that. However, this licensee is monitoring its performance against all the PIs on a monthly basis. In the January 2000 PIs for the licensee there are two yellows.

When entering discussion and talking to the licensee about, how can you have all green for '99, and all of a sudden in one month this year, you have two yellows? Well, the answer is we are really monitoring our performance at a threshold much lower than the PIs and intend never to show performance other than green by the way we are monitoring performance. So is that bad? No, we don't think so. But it doesn't seem to do anything to help the assessment process or there is no incentive to improve plant performance, and that speaks of the need for different thresholds or plant-specific type indicators. Also, you worry about complacency setting in when it seems that performance is going to be green on all indicators.

The values that were chosen were arbitrary chosen, 95 percentile. We understand why the staff chose that. And one of the suggestions by an ACRS member, and something that is still under discussion is to use values based on grouping of plants or individual plants.

The selection of performance indicators, based on data that licensees were wiling to provide. No clear correlation or interrelationship between performance indicators and the baseline inspection program. I don't think you will find any PIs that are driving inspectors in a certain area.

Types of performance indicators such as human

performance are missing. I think human performance is just an example of other indicators the staff may want to consider as we roll out this process over the next year. And some of these have been discussed and discounted, but maybe we need to look at them again.

Backlogs, which also could be an indication of a leading indicator, since all the indicators now are really not -- we don't see any of them as leading indicators.

Industrial safety, reactivity events, safety system actuations, and we have had discussions with the staff on that, but that could be a leading indicator also. So I think there is an opportunity to look at additional indicators over this next period.

Performance indicators, not leading, we just talked about that, and some members believe that we should have some leading indicators in this process.

The next slide, the next two slides classify examples of questionable indicators. These are -- we could have taken others as examples also. And the reason I just picked these is, if you look at the barrier integrity cornerstone, many licensees are looking at performance and monitoring performance much lower and they have administrative limits that require them to take action even before you trip the threshold in the current PI. And, also, we may want to consider what may be more meaningful in this

cornerstone, is to look at unidentified reactor coolant leakage as opposed to identify it.

An additional performance indicator for low-power and shutdown operations should also be considered. We believe the staff is looking at this and we will be discussing that with them later this week, or this afternoon I think it is.

Now, the next slide, emergency preparedness cornerstone. Licensees only get one chance to make a proper classification notification of a protection action recommendation in a real event. And if you look at that, the performance in the current process, and you look at what occurred during the pilot program, you will find that there misclassifications -- now, these are during drills and practice, but yet there were misclassifications of events and examples of untimely notifications, but yet the indicator is green. So that is one to say, well, you only get one chance in a real event, but if you can have three or four hits against that indicator and still be green, one questions, you know, is the indicator -- is the threshold right, is the indicator tough enough to ensure that licensees are maintaining excellent performance?

And, in closing, let me say that the committee I think is in agreement with proceeding with the initial implementation of the process as described in the SECY, and

ACRS individual members have strong feelings about performance indicators because the PIs need to be a key part of the new process. We currently have a diverse opinion on what the final PIs should look like, and we are continuing our deliberations on PIs with the staff. We recognize the importance of having a proper set of PIs and that the thresholds be meaningful.

CHAIRMAN MESERVE: Good. Thank you very much. Perhaps we will allow some questions.

MR. BARTON: Sure.

CHAIRMAN MESERVE: Let me just make initially a comment and emphasize a point that you had mentioned, is that it is very clear that this program is in its infancy. As you know from the SECY paper, there are a variety of issues that we are continuing the address. The nature of the performance indicators are subject to change. They are only one component of the program. Of course, baseline inspections are obviously important as well.

So this is very much a work in progress now, and I think that you have indicated you are going to continue your deliberations on it, and that would be very welcome, because I am sure what we start off with, our initial implementation is something that we are dedicated to continue to monitor and to change as necessary, so that all of these issues that you have raised are ones that are very much on our minds.

So that I don't want to have anyone in the audience in particular to think that that oversight program is cast in concrete and that your comments are not issues with which the Commission is very much concerned and intends to address as we move forward.

DR. POWERS: I think it is our understanding, based on some preliminary information or information we just got, that, in fact, the implementation is a little different that it is an implementation in experiment -- in a continuing experiment more than a cut-and-dried thing, and I think that is something that we have always been concerned about the duration of the piloting effort and the fact that it didn't go through a complete fueling cycle. So implementation in the form of an ongoing experiment seems much more comfortable to us.

CHAIRMAN MESERVE: I would like to just ask one question of you. You made the comment that with the performance indicators that we are losing an early warning signal and that there are no incentives for a licensee to continue to improve performance. I think that is a question of thresholds as much as anything else.

MR. BARTON: Exactly, that is the issue.

CHAIRMAN MESERVE: It is not so much that the performance indicators are flawed.

MR. BARTON: No, that is true. It is not the

numbers or what has been chosen, it is just a threshold issue, I think is the real danger and is what I would base my comments on.

CHAIRMAN MESERVE: And I think beyond that, there still are incentives in looking at the real numbers. They still give a signal and that there are trends, that even if something is green, there is an observable there that may not rise to the level in which the NRC feels it is necessary to yet intervene, but as I think you indicated, licensees are monitoring these very same kinds of things and are prepared to intervene at earlier stages, as appropriate.

MR. BARTON: I think the thing you have to careful of is when you look at the indicator and threshold, and what is it going to take to trip the threshold, and if you look at inspection findings that may be tied to that indicator, and you go through the SDP, you may also find that the inspection findings are all green as well, because of the threshold of the inspection findings, when you go through the process.

So I think you really need to look at that and say, does this program really, you know, glue together properly? And does the SDP and the inspection piece of it kind of confirm what is going on in PIs, or is it giving you an indication of licensee performance regardless of what the PI is doing, because you may not trip the threshold, but yet

you may be having inspection findings? I think you really need to look at that together.

CHAIRMAN MESERVE: Okay. Let me turn to my colleagues. Commissioner Dicus.

COMMISSIONER DICUS: Thank you. You listed several issues and concerns which I think we have heard before, and I have heard them expressed by others as well. Is there one or two, or three that you consider to be the most significant that we really should address prior to implementation?

MR. BARTON: With respect to indicators or --

COMMISSIONER DICUS: Indicators or thresholds or whatever of all of the concerns you have listed?

MR. BARTON: I think that the SECY is addressing the major concerns that we have got. The staff has also identified issues from the pilot program that they have prioritized as to which ones need attention prior to rolling this out for initial implementation, and we had that discussion with the staff last month. I think we agreed that the prioritization is correct.

COMMISSIONER DICUS: Okay. The second issue that has come up, and this is in the area of cross-cutting issues that surface. There has been an assumption made that the oversight process itself, that these cross-cutting issues, and there are several of them, would actually show up in the

cornerstones through other means, and we will be able to capture them. Do you have a view on that assumption?

MR. BARTON: I think we would agree with the staff that they will be captured, unless there is --

DR. POWERS: I think it is an area of continuing dialogue.

COMMISSIONER DICUS: So do I.

DR. POWERS: I think, in all fairness, when the staff appeared before us before, they said, gee, we have got these cross-cutting issues and we have got to do something about it, and they really gave us only some preliminary thinking at that time, and that was fair because the take-home message to us really was that they were going to work the cross-cutting issues. And I think we agreed, yes, you definitely have to work the cross-cutting issues because they are not trivial.

COMMISSIONER DICUS: And they may not show up in the cornerstones?

DR. POWERS: It was unclear to us that, short of Talmudic scholarship, whether one could actually find them within the cornerstones.

COMMISSIONER DICUS: All right. And one final thing, it really bothered me on this one slide, Slide 51, I think it is, and this is this, under the values not plant-specific, et cetera, unable to identify trends. Do

you want to elaborate a little on more that, because that is troublesome?

MR. BARTON: Well, the point there was that where you have established thresholds, that it is difficult, if you are just looking at PIs, to establish, say, a decreasing trend in performance until it may be too late.

COMMISSIONER DICUS: Okay. And just one final comment, I agree, as we all have, that we recognize this, of course, is a work in progress, and it is going to have to be modified. We are a learning organization. I know I will get a rise out of Dr. --

COMMISSIONER DIAZ: We are not becoming, we are.

COMMISSIONER DICUS: We are a learning organization. It is a work in progress. You wanted to say something.

DR. APOSTOLAKIS: I really have to comment on something. You asked the first question, what do you think are the most important issues, and I have on in my own mind, which we are discussing among ourselves that is important, and I think it is underlies a lot of these problems. I think the objective of the oversight process has not been clearly defined. Are we trying to convince ourselves that the risk profile of Plant X is the way we think it is? Or are we looking at the population of plants and making a judgment that the performance of each one is acceptable?

They are very different approaches leading to different thresholds, different handling of the performance indicators. Now, there are people who disagree with me of my colleagues here, so this is something we are discussing. But in my mind, unless we settle that, there will be a lot of other issues that will come under different guises.

COMMISSIONER DICUS: Thank you.

COMMISSIONER DIAZ: I think I have been very nice with you today.

MR. BARTON: You have been till now anyhow.

[Laughter.]

COMMISSIONER DIAZ: So I am going to change. I am going to look at your Slide 48 and really disagree with the statement that this new process consists of performance indicators and baseline inspections. I think that if that is what it looks out there, and then I think there is something wrong. I think fundamentally there is one more feature that is a practical ongoing feature of this process, which is vital to it, which is the process of data collection and incorporation into the corrective action program. And that is, to me, a substantial, you know, and fundamental part of the process.

And if we are just looking at whites or greens, we are missing it. And if we don't have a good correlation with baseline inspections, we are missing it. But, really,

from the beginning, this process started with the premise that we are going to have data gathering that was going to be open, transparent. It is going to be better, it is going to be online, it is going to be state of the art. It is going to be able to be scrutinized. And things were going into the corrective action program. That is a fundamental part of this process.

MR. BARTON: Yes, it is.

COMMISSIONER DIAZ: That is not, you know, as glamorous as a performance indicator, it doesn't have colors. But it is in this part of the process where the strength of it actually will be. That is where it will be developed. Because it will not only be in the absolute values of what is happening in the corrective action part, it is going to be in the differentiation or in the deltas between components that goes in there.

And so I would really, you know, sincerely hold that not only ACRS, but everybody realize there are three major components of this, not two.

MR. BARTON: I wasn't trying to put light to the fact that the key is the corrective action program, but I think it tied in to my bullet on baseline inspections, because a lot of the issues identified, both by licensees and by the residents, are going to go into the corrective action program. And how effective that is by each licensee

is the key. You know, how to prioritize timely correction and, also, was the root cause right, did they really solve the problem?

And I think one of the things that -- are we really looking at that? Maybe that is an indicator, maybe that is a leading indicator is the effectiveness of the corrective action program. Maybe that is something we ought to be looking at, because right now it is not that visible, although I know inspectors are going to be looking at that, but is it really that visible? Are we really focusing on the effectiveness of the corrective action program?

COMMISSIONER DIAZ: Well, I agree, however, I do want to insist that lost in the glamour of the colors, there is something of tremendous strength and value that is the basis for how all of this started, and it was that data gathering, data analysis, incorporation into corrective action. And that provides the program multiple dimensions that are not obvious when you look at performance indicators or baseline inspection.

Having said that, let me go back to something that really concerned me, and that is your Slide 52 or 51, areas of continuous -- let me see. Madame Secretary, it would be worthwhile to ask the centers to put big number of pages in the things so people blind like me can see. 52, bullet Number 2. No clear correlation or interrelationship between

performance indicators and the baseline inspection program.

I think that is a major issue. I think that needs to be strengthened. But I would like to get your comments on it, some additional comments of why you believe this is special.

MR. BARTON: Well, I think the reason for that is, to date, we don't see a correlation, we don't see where PIs have driven inspections. It is really, you have got the baseline inspection program and its finding, you know, what have we seen in the pilot program? Not significant findings, as I recall. So it is down there finding the low threshold violations, but when you try to look at those as to compare, and you look at the performance indicators, I don't see a real correlation between the inspection findings that you have seen and how it impacts what is going on in the performance indicators. That is --

COMMISSIONER DIAZ: Is something under development, is that something that you think the Commission should ask the staff? Is it not clear to you? Probably not clear to me.

MR. BARTON: Well, I think that is something we will discuss with the staff.

COMMISSIONER DIAZ: Okay.

DR. POWERS: I think the staff has been looking at a clearer correlation between augmented inspections and

performance indicators and not baseline inspection and, performance indicators up till now.

MR. BARTON: Right.

COMMISSIONER DIAZ: Thank you.

DR. POWERS: If I could -- I am not going to let you get away that easily.

COMMISSIONER DIAZ: Oh.

[Laughter.]

DR. POWERS: You bring up correctly the corrective action program. Have you given thought to the kinds of metrics that the corrective action program ought to be communicating to us? You and I have been in the business of inspecting other facilities and we ask questions nearly always when we go to a facility. Gee, what is your maintenance backlog? What is the lifetime of individual issues in that backlog? We have metrics in our mind and we use those in, at least in my case, a very qualitative sense. Is it big, is it small? Are things old or young?

Do you think those kinds of metrics are useful for characterizing the corrective action program, or should we just let this corrective action program be the grail that absorbs all the wisdom?

COMMISSIONER DIAZ: I think the data processing, the way that it is set, have in it the factors to make those things happen because it will be impossible for licensees to

maintain, you know, this open process without getting all of those points in there.

DR. POWERS: Yes.

COMMISSIONER DIAZ: And I believe that eventually, as we progress to it, we will get a better understanding of what are all those things that should be required. I think they are inherent to the process. They will not be able to survive without --

DR. POWERS: It has to be done that way, and we will get the metrics that we need.

DR. APOSTOLAKIS: Isn't the corrective action program one of the cross-cutting issues?

COMMISSIONER DIAZ: If it not, --

DR. APOSTOLAKIS: Yes.

COMMISSIONER DIAZ: It is.

DR. APOSTOLAKIS: Which means we don't do anything about it. Because if it is no good, we are going --

DR. POWERS: We haven't done anything anybody it.

COMMISSIONER DIAZ: It means we are not putting it -- it is an indispensable component. We are not doing anything about it, but it will be done, it is a natural process. It is a natural process, George.

DR. APOSTOLAKIS: Evolution.

COMMISSIONER DIAZ: Okay.

COMMISSIONER McGAFFIGAN: Just to follow on to

that, my understanding is the corrective action program under the baseline inspection program is a fairly inspected area, because it is just like design areas that don't normally -- aren't going to be indicated by indicators are going to be relatively heavily inspected, and I would hope that is the case.

MR. BARTON: Well, it has to be. It has to be an integral part of the inspection program. Because if you are going to rely on licensee self-identifying, or inspectors identifying an issue, and it is going to go in the corrective action program, so, therefore, you are not going to cite it, the inspectors have got to follow up that process that the licensees are applying to the issue.

COMMISSIONER McGAFFIGAN: And like Commissioner Diaz, I think that is a strength of this new program. My theme is going to be not having the perfect, the enemy of the good enough, I want to bring you back to SALP. I mean I look at these charts here and our old oversight process, not just SALP. SALP was the assessment piece of the old oversight process. Did it identify things in advance? I mean Maine Yankee I think had fault 1.5, Crystal River was about 1.5, D.C. Cook was 1.5. You know, and we get surprised.

So why -- was SALP any good in terms of identifying things in advance, or the old process?

DR. POWERS: Well, I think the biggest critique that was laid down on the SALP process by Arthur Andersen was that it was not predictive.

COMMISSIONER McGAFFIGAN: Right.

DR. POWERS: And I think the point that it is attractive is that the SALP was rather good at encouraging improvements in performance. And we saw that routinely.

COMMISSIONER McGAFFIGAN: But to different thresholds. Didn't it? I mean you would have -- I mean one of the problems you had with SALP is that you had one plant being held to one standard in one region and not necessarily -- a plant with identical indicators somewhere else not getting held to the same standard.

DR. POWERS: Understand in no sense are we defending the old process. In fact, the one area that I can say the committee has a universal agreement is that this is a better process than what we had before.

COMMISSIONER McGAFFIGAN: Okay. So we start with -- that is a good place to start. I mean I think it is a major improvement potentially, I agree. And I always understood the staff recommendation that this was -- that the first, you were going to go for six or nine months. Then we were going to go for a year, and it was going to be a continuing experiment. I mean I am glad that that is fully understood now, but that was always, I think, our

understanding as to what, you know, full implementation meant. Full implementation meant full experimental implementation subject to improvement as we go.

MR. BARTON: I think our issue was that if they had run it longer the first time, we would have been able to correct some of the things that we are now going to have to correct during this initial implementation program for all the plants, that we could have done that with the pilots, and that was our --

COMMISSIONER McGAFFIGAN: But the problem with that, in all honesty, is that you have 13 plants in the plant, 90 plants in limbo, and this brings all 103 into the pilot, and we are going to learn at all 103. I think we will get a larger database. I think there was a tradeoff there, and I think it was a rational decision in all honesty, because we really had suspended SALP and there are no PIs. We were trying to do an annual meeting at these plants to discuss something. What is the -- the PPR? The PPR. That was basically all we had for the 90 was a plant progress report which was sort of watered down mini-SALP.

So the question is -- there was a tradeoff there, I believe.

DR. POWERS: I kind of like PPRs.

COMMISSIONER McGAFFIGAN: You like PPRs.

DR. POWERS: They give you a good insight on the

plant. I learned a lot from those.

DR. BONACA: I would like to just make a statement on a personal basis. I mean one of the issues is that we were asked a question regarding the technical adequacy of the performance indicators, and I had trouble with that because it is very hard to decouple the performance indicators from the process. I personally believe the process is a much -- is a high improvement on what we had before.

But then when I look at the performance indicators and I have to address them on a technical basis, then I have trouble, because, again, that is an integral part of it. And if I look at the individually without the consideration that they should be, in fact, looked at together with the program in general, then I begin to pick on specific issues including the thresholds.

COMMISSIONER McGAFFIGAN: Well, we may not have given you a broad enough mandate in that case, because, you know, I agree with you, this is a significant improvement, and it is a work in progress, and it will be even better a year from now.

The significance determination process, have you all -- I mean it isn't one, it is several, right, there is different significance determination processes for some of the softer areas? Are we in the significance -- and this is

not the question, I guess, but are we -- are you comfortable with the implied thresholds and the significance determination process?

DR. POWERS: I think we have major questions on the significance determination process. And, in fairness, we have been supplied some written material by the staff and only the briefest of comments to the effect that, yes, we are doing a significance determination process. That is area we still need to go into with the staff. But the written material has provoked a lot of questions. And it is fair to say that there are areas that are soft and will always be soft. And there are areas that are hard and everybody accepts they are hard. There is some divine middle ground where I think creative ways have been adopted to get around some of the deficiencies and there are available tools now. And that is the area where I personally have a lot of difficulties.

COMMISSIONER McGAFFIGAN: One of the things that was said to us at the start of the pilot program was if you took all 103 plants, you know, this was likely to turn out, there would be a hundred-or-so findings a year that would have to enter the significance determination process and 10 would turn out, you know, approximately as being something that would move a performance indicator into white or yellow, or, God forbid, red.

And we didn't have -- I think, like you said, earlier, the database, you have, you know, 13 plants for nine months, you know, your probability is you will get -- we might have got one that would get through the process. We didn't, I guess. Over the next year we will.

It strikes me that having you follow the significance determination process application over the coming year, as we deal with real cases, you know, would be useful, and then you could -- then we can determine after a year's effort whether we have got the thresholds right in the SDP so that we are getting these 10 big findings, or 15 or whatever proves to be a year out of it, and they truly are significant, and we are not missing, you know, the next 15 that should have been, in your view, captured by the SDP -- I should say processes, because it is multiple processes.

DR. POWERS: And done in three phases.

COMMISSIONER McGAFFIGAN: Right. The last question on the trending, I don't totally understand the stuff about, you know, the disincentive to improve plant performance. It strikes me that people still will want to be high green as opposed to low green. And you will have the exact number, it may result in a green, but it strikes me that, as you say, these administrative limits and all that, and INPO, I mean insurance and all that drives you towards -- because many of these indicators are WANO

indicators as well, as I understand it. That all drives you towards wanting to be high green.

So there are incentives. Maybe they are not entirely in our system, maybe they are imposed by the licensee. Maybe they come from the INPO space. But it strikes me that there are insurance costs, et cetera, continuing incentives to want to be high green. And if I go back to the infamous SALP process, we did have plants who were quite comfortable limping along in SALP 2.5 space forever. Never got on the watchlist. In fact, I can think of one, it was SALP 2.5 forever, for, you know, 15 years or so, 2.5, 2.25, 2.75, but never got watchlist and never -- and they weren't incentivized. You know, SALP might incentivize if you wanted to. But why is it different? Why, if the numbers are --

MR. BARTON: I just go from my performance experience and know that I had a lot of pressure when I ran a power plant to become a SALP I, and if I look today at where most of the licensees are, and most of them are in green, with most of their indicators in green, and a lot of them in the high green, and I say, okay, I am doing fine at this threshold, and as long as I continue at this threshold, I am fine.

So, what is the bad side of that? Well, if you don't improve, you are going to start sliding backwards.

But there is no carrot out there to get.

COMMISSIONER DIAZ: Money.

COMMISSIONER McGAFFIGAN: In our system, there isn't. In the INPO system, there is, because if you are not INPO I, your insurance costs are higher, right? I don't know how big that is. Is that a few hundred thousand dollars a year? It is not trivial.

MR. BARTON: I don't remember.

COMMISSIONER McGAFFIGAN: Okay.

DR. APOSTOLAKIS: I think there is a much more fundamental issue here. It is not a matter of setting the limited threshold at 95th percentile or 90th. What is the agency trying to do with the oversight process? It comes back to what I said earlier. Do you want to know that the risk profile of Plant X is today the same as it was a year ago, or are you looking at it as industry-wide? The rest is just trivial applications. Unless we --

DR. POWERS: How true, Professor.

DR. APOSTOLAKIS: Let me give you the other side.

COMMISSIONER McGAFFIGAN: Make sure that they are following that they are following the rules and regulations of the NRC and that --

DR. APOSTOLAKIS: But these rules and regulations, the plant was licensed as an individual plant, not as part of a population of a hundred plants. So that implied a

certain profile. Look at the IPE insights report, each profile is different. And all of a sudden, they want to say, oh, look at the whole population, take the 95th percentile and everything is fine. That is not -- I think that has to be settled.

And then what do you with the poor five fellows who are above the limit? What do you do with those? You are declaring that they are already yellow, red.

DR. POWERS: Well, I think the problem is when you across the threshold, through no fault of your own, it is a peculiarity of your design and when your design was submitted for approval, it included compensatory measures so that any perceived deficiency there was corrected. Now, you create a threshold, the poor guy is across it and he can never get back, because it is part of his design and he is not getting the appropriate credit for other features of his plant that are not reflected.

DR. APOSTOLAKIS: Exactly. Exactly. It is a unique profile.

COMMISSIONER DIAZ: There is a value to statistics, right?

DR. APOSTOLAKIS: Oh, as a general statement, Commissioner, there is great value.

[Laughter.]

COMMISSIONER DIAZ: Since I have this flu, you

know, my mind is not working well. And there is a value to having a population being defined, right?

DR. APOSTOLAKIS: The statistics in this case should be applied to each plant. Because I think what Dr. Powers says is a key issue here. You may be very high on one indicator, but you have other compensatory measures that will appear in the PRA. But if you are dealing only with that performance indicator, you are in trouble.

COMMISSIONER DIAZ: I agree.

DR. APOSTOLAKIS: So this is a key issue in my view.

DR. KRESS: And there is a clear difference of opinion.

COMMISSIONER McGAFFIGAN: My question, is this a clear theoretical issue or is this a clear practical issue? But that is --

DR. POWERS: I think we already have examples of approximately five cases of where you are going to have a plant that is going to have a white indicator, even though -- I mean he can do nothing about it, not unless he wants to rebuild his pressurizer or something like that.

DR. KRESS: That is one of the contentious areas, that he can do nothing about it. There are some of us that think he can.

COMMISSIONER DIAZ: Okay.

CHAIRMAN MESERVE: Commissioner Merrifield.

COMMISSIONER MERRIFIELD: I might return to my analogy about the artist versus the house painter. I start as a baseline that we have agreement -- had agreement, continue to have agreement between a couple of data points, one of them being NEI and its membership, and the other being the Union of Concerned Scientists. Both of those groups, which don't agree very often, agreed the SALP program was not a very good mechanism for determining how safe these plants were. Both of those groups also agree that this new program is an improved mechanism for evaluating the safety of these plants.

Now, a lot of the discussion today has been on the performance indicators, and there are some valid concerns that the committee raises, and, indeed, those are the very same kind of concerns that members of this Commission on this side of the table have raised at various points during the course of the last year.

There is overall recognition that this is a work in progress. In a perfect world perhaps, if we could have stopped time in its place, we could have worked hard and come up with a perfect set of indicators and a perfect way of rolling those out. This is indeed not a perfect world, and what the Commission was faced with was a need to, as quickly as possible, fix a system that was not adequate, and

respond to our stakeholders and try to do the best we can.

We will need to continue to work with ACRS and the staff to make sure that we can improve those performance indicators. And I, and I think the other Commissioners agree with me, are under no preconception that these performance indicators will stay precisely the way they are. They will evolve, we will add new indicators. We will perhaps get rid of some of the current indicators, and we will change the thresholds, and we will appropriately balance the significance determination factors.

One thing that can't be lost in all of this is an important component, and that important component, I believe, is our inspectors. I have had the opportunity to go out and visit a lot of plants this year, and the issue of this new inspection and enforcement process is probably the most important thing I discuss with our inspectors and with our licensees. And there are a couple of observations that I would make.

First of all, I think is some -- there has been some fear, and I think our regional administrators are doing a good job of trying to alleviate this, and that is that -- the fear was that we are going to so limit our inspectors in terms of what they can look at, that they wouldn't be able to share with the licensees their concerns, the things that they see, that backsliding or the problems that perhaps

weren't picked up by the indicators coming forward.

As a result of my discussions, I believe we can do a better job of encouraging our inspectors to understand that, indeed, if they see problems that don't necessarily fit on the matrix inspections, that those are still issues that we expect, as a Commission, for them to raise with the licensees. We hire them as inspectors because they are bright, because they are able to find these issues, and we want them to act in that particular manner.

Similarly, in the discussions with the licensees to an individual, you know, the head, whether it is a senior VP, president and CEO, all of them have said, I want to know about those. I don't want to be limited to simply the baseline inspection. If there are concerns that your inspectors see at my plant, I want to know about it.

To a man, as well, they have also said, the performance indicators are not a baseline for our performance. As you mentioned, all of them, virtually all the plants I visited, have a whole other set of indicators which are far more stringent than the ones that we have, and that is what they are managing themselves towards, not our baseline. And the reason for that, as has been explained to me by some of the industry folks, is that things have changed in this industry. The economic pressures to make sure that these plants are operating appropriately is a

driving force towards a greater level of safety, because if they backslide in these facilities, a shutdown could indeed be the end of that plant.

And I think there is a greater understanding of that in a deregulated market among the plant owners at this time.

Now, is that to say that at some point down the line we are not going to have a plant out there that may be trying to cut close to the margin? Well, that may very well be. We may have that, and, indeed, we may have additional plant shutdowns. But I think -- I don't believe -- I don't believe, at least given all the conversations I have had, and they have been many this year, that folks are going to be managing themselves merely towards just staying at the low part of green.

MR. BARTON: I think you made a good point with respect to the inspectors rolling this new process. The one concern I would have is that the agency, regional administrators, down through the whole ranks in the regions, be careful that the SDP does not bog down the inspectors and take away from their time in the plant, which -- and there is a possibility that could happen.

And, also, frustration on the part of inspectors by finding issues, identifying them as violations, applying the SDP and finding out it is only green, and I think that

is another caution I would throw out, because if I keep doing that, and I keep finding green, I eventually say, you know, what is the purpose of what I am finding, it doesn't mean anything. I think you need to be conscious that that -- that there is a potential there for that to happen.

COMMISSIONER MERRIFIELD: And for that very reason, we will continue to monitor this as we go forward and continue to assess and improve it as we work in the future.

I don't have a question, I would just repeat as I did in the last -- after the last panel, I will quote Dana Powers again, there is universal agreement from the ACRS that this is a better process. And after all these questions we have had on this panel, I think that is the appropriate place for us to end.

Thank you, Mr. Chairman.

CHAIRMAN MESERVE: Commissioner Diaz, do you have an additional comment?

COMMISSIONER DIAZ: Yes. I will try to make it as quick as possible. I am just trying to maybe whet the appetites of statisticians and PRA people, and go back to my statement on the data processing, the data gathering, the data process and the corrective action. Years from now, that information will contain all the statistically significant data. Then when correlated in the corrective

action program and cross-correlated with the results of the corrective action program will give you the information that you need to determine when trends are changing.

DR. APOSTOLAKIS: I agree.

CHAIRMAN MESERVE: Wow. On that fine note, we definitely should end this.

[Laughter.]

CHAIRMAN MESERVE: I would like to thank all of you for some very helpful presentations this morning. This has very helpful data for us. We also very much welcome your continued involvement in areas that are of enormous significance to the Commission and in which your assistance is very much appreciated.

With that, we are adjourned.

[Whereupon, at 11:59 a.m., the briefing was concluded.]

CERTIFICATE

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

TITLE OF MEETING: ADVISORY COMMITTEE ON REACTOR SAFEGUARDS MEETING WITH THE COMMISSIONERS PUBLIC MEETING

PLACE OF MEETING: Rockville, Maryland

DATE OF MEETING: Thursday, March 2, 1999

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: Martha Brazil

Reporter: Jon Hundley

UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D.C. 20555-0001

February 24, 2000

MEMORANDUM TO: Annette L. Vietti-Cook
Secretary

FROM: John T. Larkins, Executive Director
Advisory Committee on Reactor Safeguards

SUBJECT: ACRS MEETING WITH THE NRC COMMISSIONERS - MARCH 2, 2000

The ACRS is scheduled to meet with the NRC Commissioners on March 2, 2000, between 9:30 and 12:00 noon, to discuss the following items. Presentation materials related to these items are attached.

TOPICS	PRESENTER	PRESENTATION TIME
I. Introduction	Dr. R. Meserve, NRC Chairman	9:30 - 9:35 a.m.
1. Overview to Risk-Informing 10 CFR Part 50 (pp. 1-25)	Dr. D. Powers, ACRS Chairman	9:35 - 11:00 a.m.
– Key areas to focus on and potential pitfalls in risk-informing 10 CFR Part 50	Dr. D. Powers	
– Value of risk-informing Appendices A and B to Part 50	Dr. D. Powers	
– Impediments to the increased use of risk-informed regulation (pp. 26-36)	Dr. T. Kress	
– Importance measures (pp.37-45)	Dr. G. Apostolakis	

2. Technical Adequacy of Performance Indicators (pp. 46-61) – Use of performance indicators in the new reactor oversight process – Limitations on the use of performance indicators – Setting thresholds for performance indicators	Mr. J. Barton	11:00 - 11:40 a.m.
Closing Remarks	Dr. D. Powers, ACRS Chairman	11:40 - 11:45 a.m.
II. General Discussion and Adjournment	NRC Chairman/ Commission	11:45 - 12:00 noon

Attachment: As stated

cc: ACRS members
ACRS staff

MEETING OF THE

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

WITH THE

U.S. NUCLEAR REGULATORY COMMISSION

OVERVIEW
DR. DANA POWERS, ACRS CHAIRMAN

MARCH 2, 2000

TOPICS

- Technical road map for risk-informing 10 CFR Part 50 — D.A. Powers
- Impediments to increased use of risk-informing regulations — T.S. Kress
- Importance measures — G.A. Apostolakis
- Technical adequacy of performance indicators in the new NRC oversight process — J.J. Barton
  - Significance determination process

Panel on ACRS Effectiveness:

> ". . . the freedom the ACRS has to lay out difficulties, dilemmas, uncertainties, contrasting opinions, priorities, and tradeoff in stark and accessible terms is now more important for the ACRS to achieve than is consensus."

ACRS MEETING WITH THE NRC COMMISSIONERS

MARCH 2, 2000

TECHNICAL ROAD MAP FOR RISK-INFORMING 10 CFR PART 50

DR. DANA POWERS
ACRS

- Historically, ACRS has been enthusiastic about greater use of risk information in the regulatory process.

- The current ACRS is no less supportive.

- Defining a "technical road map" for risk-informing 10 CFR Part 50 has been a priority activity for the ACRS.

  Not

  - Staff has defined three options which were approved by the Commission.

  - ACRS supported the approach proposed by the staff.

  - At Commission's request, ACRS has identified potential pitfalls/barriers to risk-informed regulation.

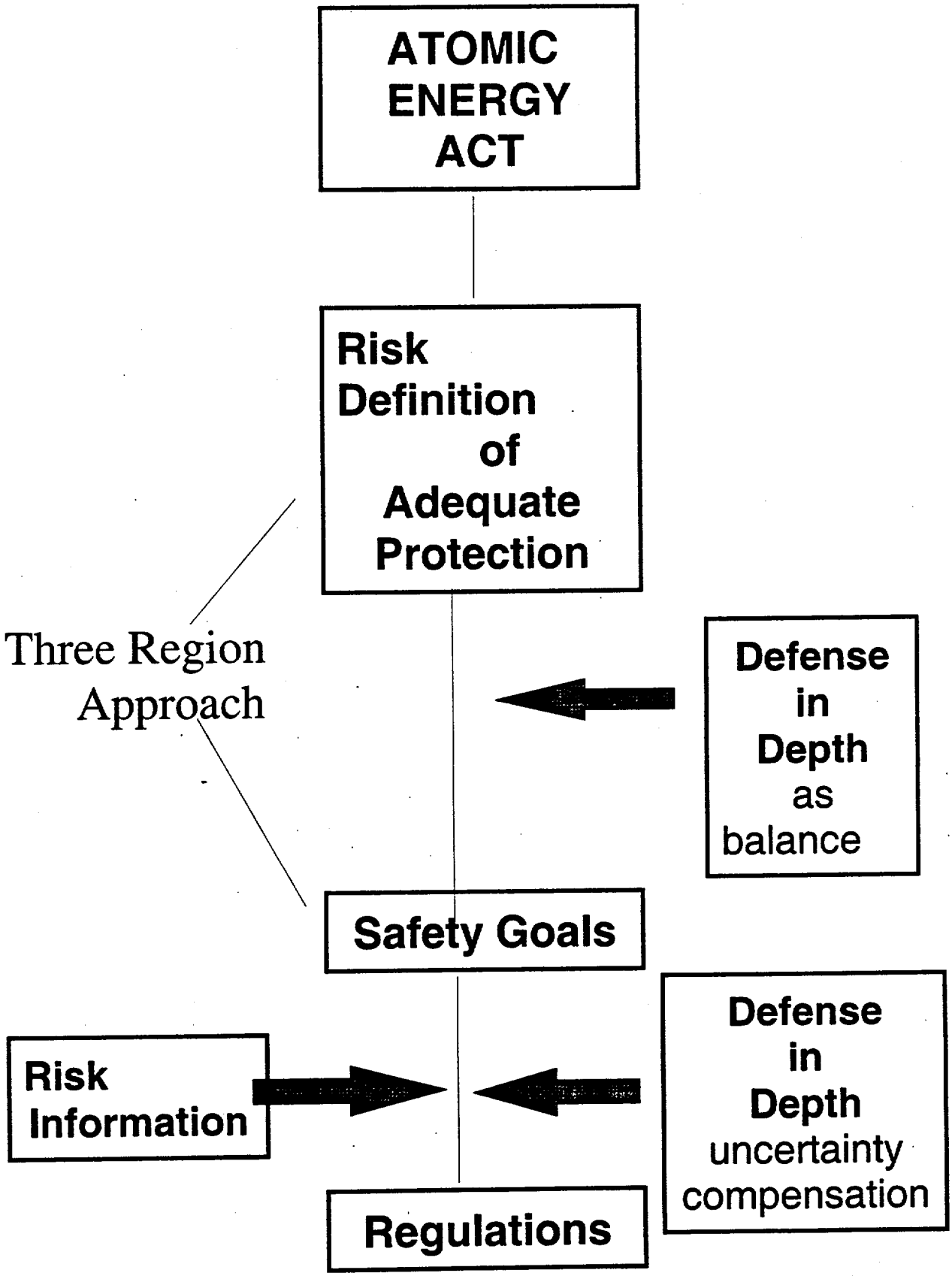
PITFALLS AND BARRIERS

- Need for plant-specific risk-acceptance criteria
- Incompleteness in the analytic capabilities to support a risk-informed regulatory system
- Need to consider uncertainties in criteria
- Needed evolution in the role of defense in depth
- Risk communications
- Limitations on the utility of importance measures

- Other approaches to risk-informing reactor regulations could have been adopted.
    - Risk-inform the regulatory guides and leave the regulations alone.
    - The "clean sheet" and holistic approach.
        - an arbitrary reactor
        - existing reactors

- ACRS discussions of risk-informing the reactor regulations have concentrated on the issues of focusing licensee and regulatory resources on topics of real risk. Less attention has been devoted to the issues of burden reduction.

- ACRS has been concerned about the coherence of the regulations.


ATOMIC ENERGY ACT
Risk Definition of Adequate Protection
Three Region Approach
Defense in Depth as balance
Safety Goals
Risk Information
Defense in Depth uncertainty compensation
Regulations

REGULATE WHERE THERE IS RISK

- Full-power operations
  - Station blackout
  - ATWS
  - Bypass
  - Steam generator tube rupture, etc.
- Low-power & shutdown operations
- Fire initiators
- Seismic

- The Department of Energy is sponsoring an effort at risk-informing the reactor regulations following a top-down process. This effort is geared toward future reactors, but ACRS members are following this effort.

CHALLENGES FACED IN THE PIECEWISE RISK-INFORMING OF THE REGULATIONS

- Conflicts with other regulations that have not been risk-informed.
  - Graded quality assurance
- Absolute language incompatible with modern views of risk, probability and uncertainty:
  - 10 CFR 50.59 phenomenon
  - Appendix A is a good example

FROM APPENDIX A, GENERAL DESIGN CRITERIA

GDC3 ". . .*Minimize* the adverse effects of fires . . ."

GDC4 ". . .excluded . . . *probability* of fluid system piping rupture is *extremely low* . . ."

GDC5 ". . . shown that sharing will not *significantly* impair . . ."

GDC12 " . . exceeding . . . fuel design limits are *not possible* or can be reliably and readily detected and suppressed."

GDC14 ". . . reactor coolant pressure boundary . . . an *extremely low probability* of abnormal leakage."

MORE FROM APPENDIX A

GDC17 "Provisions shall be included to *minimize the probability* of losing electric power . . ."

GDC21 "The protection system shall be designed for *high functional reliability* . . ."

GDC30 ". . . tested to the *highest quality standards* practical."

GDC31 ". . . the *probability* of rapidly propagating fracture is *minimized*."

GDC41 ". . . *assure* that containment integrity is maintained."

GDC53 . . . requirements to *minimize the probability* or *consequences* of an accidental rupture . . .

- It would be surprising if the regulations could be risk-informed without also risk-informing the General Design Criteria.

APPENDIX B, QUALITY ASSURANCE CRITERIA FOR NUCLEAR POWER PLANTS

- Codification of "best practices" for quality assurance.
- Analytic evaluation of the risk worth of the quality assurance has not been possible.
- Widely viewed as:
  - Burdensome
  - Distraction of focus
- A graded approach is possible, but
  - Conflicts with other regulations
  - Puts a premium on the quality and scope of PRA

- It appears that it may be possible to risk-inform the other regulations without addressing Appendix B and the issue of quality assurance. But, as with Appendix K, risk-informing Appendix B is both desirable and would certainly be demonstrated evidence of the Commission's commitment to regulation based on risk information.

OTHER CHALLENGING AREAS

- Performance-based regulations
  - Are they really risk-based, or
  - Will they degenerate in application into prescriptive regulations?

- Design-basis accidents
  - Are they useful in risk-informed regulation?
  - Vestiges of an era when design and construction were the predominant issues whereas today the issues are operation and maintenance.
  - Do provide a "design to" standard?

- Understanding the licensees' PRAs without ossifying the development of PRA methods

UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D.C. 20555-0001

October 12, 1999

The Honorable Greta Joy Dicus
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Chairman Dicus:

SUBJECT: PROPOSED PLANS FOR DEVELOPING RISK-INFORMED REVISIONS TO 10 CFR PART 50, "DOMESTIC LICENSING OF PRODUCTION AND UTILIZATION FACILITIES"

During the 466th meeting of the Advisory Committee on Reactor Safeguards, September 30-October 2, 1999, we met with representatives of the NRC staff and Nuclear Energy Institute to discuss proposed plans for developing risk-informed revisions to 10 CFR Part 50. We also met with a representative of Public Citizen, Critical Mass Energy Project, to discuss these matters and a recent report issued by Public Citizen. Our Subcommittees on Reliability and Probabilistic Risk Assessment and on Regulatory Policies and Practices met on July 13 and September 24, 1999, to discuss these matters. We had the benefit of the documents referenced.

Conclusions and Recommendations

1. We agree with the staff's proposal to develop a new regulatory section 10 CFR 50.69 and associated Appendix T to implement Option 2 (changing the special treatment rules in 10 CFR Part 50) of SECY-98-300.

2. We agree that the current terminology of safety-related structures, systems, and components (SSCs) should be preserved and that additional terminology referring to the safety significance of SSCs should be considered. We recommend that the staff explore the potential benefits of defining more than two categories of safety significance.

3. The determination of the safety significance of SSCs relies heavily on the use of importance measures. These measures are strongly affected by the scope and quality of the probabilistic risk assessment (PRA). For example, incomplete assessments of risk contributions from low-power and shutdown operations, fires, and human performance will distort the importance measures.

4. Even with a full-scope, high-quality PRA, the importance measures have limitations. The guidance to be provided in the proposed Appendix T for the categorization of SSCs should clarify the proper roles of (a) importance measures, (b) sensitivity and uncertainty analysis, (c) baseline core damage frequency (CDF) and large, early release frequency (LERF), and (d) the changes in CDF and LERF (i.e., ΔCDF and ΔLERF).

5. It is essential that the implementation of Option 2 be scrutable and auditable. The staff should have access to the risk assessments and technical bases documents (e.g., inputs to and deliberations of the expert panel) that licensees use to justify requests.

6. The guidance to be provided in the proposed Appendix T for the expert panel should include insights gained from the implementation of recommendation 4 above. The staff should include guidance for conducting expert panel sessions and training of the panel members on the use of importance measures.

7. We agree with the staff's plan for implementing Option 3 (changing specific requirements in the body of 10 CFR Part 50 and associated regulations) of SECY-98-300. Policy issues regarding the role of defense in depth in a risk-informed regulatory system should be resolved before the plan is fully implemented.

Discussion

In a Staff Requirements Memorandum dated June 8, 1999, the Commission directed the staff to make risk-informed changes to the scope of SSCs covered by regulations that provide special treatment requirements (e.g., quality assurance, environmental qualification, technical specifications, 10 CFR 50.59, ASME Code, 10 CFR 50.72, and 10 CFR 50.73). 10 CFR 50.2 defines safety-related SSCs as those SSCs that "are relied upon to remain functional during and following design basis events to assure: (1) The integrity of the reactor coolant boundary; (2) The capability to shut down the reactor and maintain it in a safe shutdown condition; or (3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures...."

To date, the determination of whether an SSC is safety related has been based largely on deterministic analyses that include engineering judgment. Advances in PRAs have made it possible to quantify the degree to which SSCs are relied upon to ensure that the requirements in 10 CFR 50.2 are met. For example, using a combination of deterministic and PRA insights, the South Texas Project Nuclear Operating Company has concluded that many SSCs currently categorized as safety-related contribute very little to CDF and LERF, while a few SSCs currently categorized as nonsafety-related are significant from a risk perspective.

The staff proposes to develop a new rule, 10 CFR 50.69, and an associated Appendix T. The new rule will explicitly allow the use of a new risk-informed scope. Appendix T will provide the criteria for the new categorization process. We agree with this approach.

The current "safety-related" and "nonsafety-related" categories will be retained. Two new categories that consider risk information, i.e., high safety significance and low safety significance, will be developed. Appendix T will provide criteria for the new categorization process. The staff proposes to use a 2x2 matrix where SSCs are to be placed in one of the four categories according to safety significance and safety-related status. Introducing these new categories while preserving the safety-related and nonsafety-related terminology should help to avoid the confusion that could result from a redefinition of the safety-related concept. We agree that such an approach is preferable to redefining "safety-related" and "important to safety."

At this early stage, the staff has not decided what special treatment the SSCs in each of the four categories of the 2x2 matrix will receive. The staff has indicated that this decision may require a finer treatment of safety significance than the two groups to be proposed in Appendix T. The South Texas Project Nuclear Operating Company has chosen to consider four groups for safety significance instead of the two that will be proposed for Appendix T. They are: 1) high safety/risk significant (HSS), 2) medium safety/risk significant (MSS), 3) low safety/risk significant (LSS), and 4) non-risk significant (NRS). LSS and NRS SSCs support ancillary functions (e.g., vents and drains) for safety-related systems, but do not affect the primary functions of these systems. LSS SSCs may be included in the PRA while NRS SSCs are not.

We believe that the staff should further evaluate the various options for partitioning the range of safety significance before it settles on a grouping that it considers optimum.

Appendix T will include requirements for categorizing SSCs using PRA. We offer the following comments and suggestions for inclusion in the development of Appendix T:

1. The screening criteria are based primarily on two importance measures: Fussell-Vesely (FV) and Risk Achievement Worth (RAW). The criteria are: FV > 0.005 and RAW > 2 based on either CDF or LERF. It is important to fully understand what information these measures convey as well as their limitations. Detailed discussions on these matters are available in References 9, 12, and 13.

   As an example, consider a very simple case in which the risk metric, e.g., the CDF due to internal events, is a function of a single accident sequence. We have

   $$CDF^{IE} = fq = 10^{-4} \text{ per reactor-year} \qquad (1)$$

   where
   f: frequency of the initiating event (say, 10^{-2} per reactor-year)
   q: unavailability of the protection system (say, 10^{-2} per demand)

   The importance measures for the system are

   $$FV = \frac{fq}{fq} = 1 \qquad (2)$$

$$RAW = \frac{CDF^{IE,+}}{CDF^{IE}} = \frac{f}{fq} = \frac{1}{q} = 100 \quad (3)$$

where $CDF^{IE,+}$ is the new value of CDF with the protection system assumed unavailable.

Suppose that several protection systems are added, each of unavailability q_j. The new importance measures for the system are

$$FV' = \frac{fq \prod q_j}{fq \prod q_j} = 1 \quad (4)$$

$$RAW' = \frac{f\prod q_j}{fq\prod q_j} = \frac{1}{q} = 100 \quad (5)$$

Even though several protection systems have been added thereby reducing reliance on the original system and reducing the overall risk, the importance measures have not changed. We believe that this insensitivity should be better understood and communicated to the expert panel and that insights from this discussion need to be incorporated into the rule or the associated guidance documents.

2. Suppose that the CDF estimate of Equation (1) is expanded to include the contribution from external events. We assume that this contribution is 10^{-3} per reactor-year, i.e., it dominates the risk due to internal events, as is often the case with the seismic contribution. The new CDF is

$$CDF = CDF^{IE} + CDF^{EE} = 10^{-4} + 10^{-3} = 1.1 \times 10^{-3} \text{ per reactor-year} \quad (6)$$

A calculation of the new importance measures provides:

$$FV'' = \frac{10^{-4}}{1.1 \times 10^{-3}} = 0.09 \quad (7)$$

$$RAW'' = \frac{10^{-2} + 10^{-3}}{1.1 \times 10^{-3}} = 10 \quad (8)$$

As expected, the importance measures of the protection system have been reduced drastically. The question is whether including the dominant seismic contribution results in meaningful importance measures, especially within the context of the proposed new

reactor oversight process where the frequency of initiating events and the unavailability of the protection systems are cornerstones of the assessment process.

In a PRA, the additional terms in the equation may be the products of analyses that are not as rigorous as those for the terms in which a particular system appears. For example, some terms may contain probabilities of recovery actions or damage caused by "external" events, such as fires and tornadoes. The current assessment of risk contributions from low-power and shutdown operations, fires, and human performance is incomplete. Because the PRA technology for such assessments is not as well developed as that for "internal" events, the analyses may contain many overly conservative assumptions, thus artificially increasing these contributions. Inconsistencies in the analysis of the various contributions to risk distort the importance measures.

It is evident that the absolute value of the baseline risk metric is a critical element in these evaluations and that the importance measures contain only relative information with respect to a given risk metric.

The change in risk depends on this absolute value also, i.e., ΔCDF at two plants with different baseline CDFs, will be different for the same change in the unavailability of a component whose importance measures have the same value at these plants. Reference 9 states that "if we are interested in controlling the change in risk in an absolute sense, it does not make sense to have a universally fixed value of FV as a criterion for risk significance," and "it is clear that it does not make much sense to define a universal criterion based on RAW."

3. The calculation of RAW in Equation (3) requires the estimation of $CDF^{IE,*}$, i.e., the CDF assuming that the protection system is unavailable. This assessment may be much more involved than simply setting the unavailability of the system equal to unity. The assumption of a system being unavailable may affect several terms in the PRA. For example, in a two-train redundant system, the PRA contains terms representing the "random" independent failure of the two trains, the probability of a common-cause failure, and the probability that coupled human errors after test and maintenance may disable both trains. All of these terms are affected by the assumption of one train being unavailable. Recovery actions may also be affected (see Reference 11).

   We question whether these considerations are adequately taken into account when RAW is calculated for hundreds of components.

4. The current practice of calculating FV and RAW is to use the mean epistemic values of the parameters in the ratios appearing in Equations (2) and (3). The more rigorous way is to first find the ratios and then to average them over the epistemic distributions of the parameters (Reference 10). The current practice is an approximation that is usually reasonable, unless the epistemic uncertainties of the parameters are very large (Reference 9). The section on sensitivity analysis in the proposed Appendix T should reflect this observation.

2.

The preceding paragraphs are not intended to discourage the use of importance measures. Although our example is a simple one, it does illustrate that FV and RAW values must be carefully calculated and interpreted. We do believe that a good understanding of the limitations of importance measures is essential to their proper use.

The issues discussed above, as well as the detailed investigations in the cited references, suggest that the members of the expert panel that determines the categorization of SSCs need to be aware of these limitations and constraints. We believe that there is a need to ensure that members of expert panels have formal training in the properties of importance measures. Similar training sessions are provided in other contexts, e.g., before quantitative judgments are elicited from engineers and scientists who are not familiar with the cognitive issues associated with the elicitation of expert opinion.

Option 3 of SECY-98-300 deals with changes in specific requirements in 10 CFR Part 50, including general design criteria. The staff's high-level plan for implementing this option and associated study is acceptable. We note, however, that defense in depth plays a critical role in this plan.

The PRA Policy Statement of 1995 and subsequent agency documents such as Regulatory Guide 1.174 for risk-informed changes to the licensing basis place defense in depth at the level of a principle whereby PRA should be used in "a manner that supports the NRC's traditional defense-in-depth philosophy." As noted in our May 19, 1999 report, this may create conflicts between risk-informed insights and defense in depth. Since the staff's plan includes defense-in-depth considerations in several key areas, e.g., the identification of candidate requirements to be revised and the determination of the revisions, it is very important for the Commission to clarify the proper role of defense in depth.

We look forward to working with the staff to resolve the significant technical issues associated with the implementation of Options 2 and 3 of SECY-98-300.

Sincerely,

Dana A. Powers

Dana A. Powers
Chairman

References:

1. Memorandum dated September 16, 1999, from David B. Mattews, Office of Nuclear Reactor Regulation, to John T. Larkins, Executive Director, Advisory Committee on Reactor Safeguards, Subject: ACRS Preliminary Review of the Draft SECY Paper for Risk-Informing Special Treatment Regulations.
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2

3. Memorandum dated June 8, 1999, from Annette Vietti-Cook, Secretary, NRC, to William D. Travers, Executive Director for Operations, Subject: Staff Requirements - SECY-98-300 - Options for Risk-Informed Revisions to 10 CFR Part 50 - "Domestic Licensing of Production and Utilization Facilities."
4. Letter dated December 14, 1998, from R. L. Seale, Chairman, ACRS, to William D. Travers, Executive Director for Operations, NRC, Subject: Proposed Commission Paper Concerning Options for Risk-Informed Revisions to 10 CFR Part 50 - "Domestic Licensing of Production and Utilization Facilities."
5. Report dated May 19, 1999, from Dana A. Powers, Chairman, Advisory Committee on Reactor Safeguards, to Shirley Ann Jackson, Chairman, U.S. Nuclear Regulatory Commission, Subject: The Role of Defense in Depth in a Risk-Informed Regulatory System.
6. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," July 1998.
7. Letter dated July 13, 1999, from J.J. Sheppard, South Texas Nuclear Operating Company, to U.S. Nuclear Regulatory Commission, Subject: Request for Exemption to Exclude Certain Components from the Scope of Special Treatment Requirements Required by Regulations.
8. Title 10: Code of Federal Regulations, Part 50, Domestic Licensing of Production and Utilization Facilities, Section 50.2, Definitions.
9. M.C. Cheok, G.W. Parry, and R.R. Sherry, "Use of importance measures in risk-informed regulatory applications," *Reliability Engineering and System Safety* 60, 213-226, 1998.
10. G. Apostolakis, "The distinction between aleatory and epistemic uncertainties is important: An example from the inclusion of aging effects into PSA," American Nuclear Society Conference, PSA '99, Washington, DC, August 22-25, 1999.
11. C.L. Smith, "Calculating conditional core damage probabilities for nuclear plant operations," *Reliability Engineering and System Safety* 59, 299-307, 1998.
12. W.E. Vesely, "Reservations on 'ASME Risk-Based Inservice Inspection and Testing: An Outlook to the Future,'" *Risk Analysis* 18, 423-425, 1998.
13. W.E. Vesely, "Supplemental viewpoints on the use of importance measures in risk-informed regulatory applications," *Reliability Engineering and System Safety* 60, 257-259, 1998.
14. Report entitled, "Amnesty Irrational -- How the Nuclear Regulatory Commission Fails to Hold Nuclear Reactors Accountable for Violations of Its Own Safety Regulations," by James P. Riccio, Public Citizen, August 1999.
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ACRS MEETING WITH THE NRC COMMISSIONERS

MARCH 2, 2000

IMPEDIMENTS TO THE INCREASED USE OF RISK-INFORMED REGULATION

DR. THOMAS KRESS
ACRS

- In February 14, 2000 ACRS report, we grouped impediments into two categories:
  - Cultural/Institutional
  - Technical
- Cultural/Institutional impediments are characterized by attributes such as:
  - Attitudes
  - Impressions
  - Institutional or organizational barriers
  - Resource limits, etc.

IF WE RISK-INFORM THE REGULATIONS IN A TECHNICALLY DEFENSIBLE MANNER AND APPLY THESE CONSISTENTLY, THE CULTURAL/INSTITUTIONAL IMPEDIMENTS WILL FADE AWAY WITH TIME.

- Technical impediments relate to technical shortcomings of risk assessment and application. The more significant technical impediments are:

1. PRA inadequacies and incompleteness in some areas

2. Need for risk-acceptance criteria

3. Lack of guidance on application of defense in depth

4. Lack of guidance on the significance and appropriate use of importance measures (discussion by G. Apostolakis)

5. Variation of PRA quality and scope/need for standards

TECHNICAL IMPEDIMENTS WILL REQUIRE SIGNIFICANT EFFORT AND RESEARCH FOR RESOLUTION.

PRA INADEQUACIES AND INCOMPLETENESS

- Most current PRAs are inadequate for assessing risk contributions from:
  - Fires
  - Human performance
  - Organizational and safety culture factors
- Most PRAs are incapable of assessing the risk contribution from low-power and shutdown operations.
- The reliability database is weak for passive components and nonsafety-related systems and components.

NEED FOR RISK-ACCEPTANCE CRITERIA

- Safety Goals vs. Adequate Protection
  - Generally recognized that Safety Goals are not surrogates for adequate protection.
  - Necessary to have risk-acceptance criteria.
  - Limits on core damage frequency (CDF) and large, early release frequency (LERF) for adequate protection would differ from those in Regulatory Guide 1.174.
  - Consideration of three-region approach.
- Additional regulatory objectives include:
  - Societal risk
  - Land interdiction
  - Worker exposure
  - "Small" releases

DEFENSE IN DEPTH

Commission White Paper definition (SECY-98-144):

> Defense in depth is an element of NRC's Safety Philosophy that employs successive compensatory measures to prevent accidents or mitigate damage if a malfunction, accident, or naturally caused event occurs at a nuclear facility.

Issue: How many compensatory measures are necessary and how good do these need to be?

A PHILOSOPHY AND GUIDANCE ARE NEEDED.

VARIATION OF PRA QUALITY AND SCOPE/ NEED FOR STANDARDS

- It is important that the scope and quality of the PRA be appropriate for the application.
- NRC requested ASME/ANS to develop PRA Standards.
- PRA quality is measured by its quantified uncertainty distribution (epistemic and aleatory).

Issues: Will the Standards include guidance on the appropriate determination of uncertainties?

Does the NRC plan to develop guidance on how to consistently use uncertainties in the decision-making process?

UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D.C. 20555-0001

February 14, 2000

The Honorable Richard A. Meserve
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Chairman Meserve:

SUBJECT: IMPEDIMENTS TO THE INCREASED USE OF RISK-INFORMED REGULATION

The ACRS has long advocated the transition to a risk-informed regulatory system. Over the last several years, we have discussed potential impediments along the path toward risk-informed regulation.

This report responds to the Commission's request in the December 17, 1999 Staff Requirements Memorandum that the ACRS provide examples of impediments to the increased use of risk-informed regulation, an evaluation of the significance of these impediments, and, as appropriate, proposed solutions to identified problems. In our review, we had the benefit of the documents referenced.

There can be a variety of views on what is meant by risk-informed regulation. One view, for example, could be that we start over and redo the whole body of regulations making them risk informed without having a reactor type or design in mind. We believe that this should be considered on a non-urgent long time frame.

Another view could be that there exists a body of regulations and a population of light water reactor plants whose designs have resulted from meeting these regulations. As a result, risk-informed regulation would mean using risk insights gained from performing probabilistic risk assessments (PRAs) on the existing plants to modify the regulations holistically or in selected areas to make the regulations coherent, ensure that all requirements are necessary, and provide a focus on the more risk-significant issues.

In responding to the Commission's request, we take the latter view of what the agency intends in its efforts to risk inform the regulations.

In this respect, we identify a number of conditions that we believe hinder the progress of risk informing the regulations and implementing the changes for operating reactors. We have placed these "impediments" in two separate categories,"cultural/institutional" and "technical."

The cultural/institutional impediments are characterized as being related to attitudes, impressions, institutional or organizational barriers, processes, resource limits and similar such attributes. An important cultural/institutional impediment is the perception by licensees that they will need to expend substantial resources to update their PRAs to an acceptable level, provide additional staffing and resources to utilize and maintain the PRAs, and still have to comply with the current deterministic regulations. They fear that risk considerations will be add-ons to the existing regulatory system that will impose additional burdens.

There are many more cultural/institutional impediments than there are technical ones. We have chosen not to focus on the cultural/institutional impediments because it is our view that, as we risk inform the regulations in a technically defensible manner and consistently apply these regulations, most of the cultural/institutional impediments will fade away naturally with time. On the other hand, the technical impediments will not go away by themselves but will require significant effort and research for resolution.

We consider the more significant of the technical impediments to be:

1. PRA inadequacies and incompleteness in some areas.

2. The need to revisit risk-acceptance criteria.

3. Lack of guidance on how to implement defense in depth and on how to impose sufficiency limits.

4. Lack of guidance on the significance and appropriate use of importance measures.

5. Variation of PRA quality and scope and the need for Standards.

While we consider it important that efforts be undertaken to overcome these impediments, we believe that the state-of-the-art of PRA is sufficiently advanced that the agency can proceed with efforts to become more risk informed in its regulatory activities. However, it will be necessary to craft the regulations in a conservative manner to accommodate these shortcomings and in such a way that they can be easily evolved as improvements are made in the state-of-the-art of PRA. We also believe that the agency ought not to underestimate the risk analysis capabilities that will be needed to sustain a risk-informed regulatory system.

Our views on each of the technical impediments are discussed below:

1. <u>PRA Inadequacies and Incompleteness</u>

   Most of the current PRAs are inadequate for assessing risk contributions from fires, seismic events, human performance, organizational factors, and safety culture factors. They are incapable of assessing the lifetime average risk contribution from shutdown conditions. The reliability database is weak for passive components and "nonsafety-related" systems and components.

2. Risk Acceptance Criteria

It is necessary to have risk acceptance criteria applicable to individual licensees in a risk-informed regulatory system. The initial efforts to risk inform the regulatory activities have utilized two metrics for risk acceptance - mean values of core damage frequency (CDF) and large, early release frequency (LERF). The values for CDF and LERF used in Regulatory Guide 1.174 are consistent with the Commission's safety goals. These safety goals were, however, originally intended to be goals (i.e., some things to strive for) for the average risk status of the population of plants as a whole. It is generally recognized that safety goals are not risk acceptance values that would, for example, be surrogates for adequate protection.

In a risk-informed regulatory system, it is necessary to have risk acceptance limits. If we are to have limits on CDF and LERF that are "consistent" with "adequate protection," we believe these would differ from those in Regulatory Guide 1.174. It is important at this stage of risk-informing the regulations that quantitative limits be incorporated into an expanded definition of adequate protection.

3. Defense-in-Depth

According to the Commission's White Paper (SECY-98-144):

> Defense-in-Depth is an element of NRC's Safety Philosophy that employs successive compensatory measures to prevent accidents or mitigate damage if a malfunction, accident, or naturally caused event occurs at a nuclear facility.

If defense-in-depth is viewed as measures taken to compensate for the PRA inadequacies and uncertainties, then there is a need for guidance to help quantify how many compensatory measures are necessary and how good these have to be.

4. Importance Measures

We have noted that risk-informed decisions are often based on categorizing structures, systems, and components according to their importance in influencing changes to CDF and LERF. As discussed in our report on importance measures, there is a need for guidance on the appropriate interpretation and use of importance measures.

5. Need for Standards/PRA Quality and Scope

Most PRAs for existing reactors were developed in response to Generic Letter 88-20 and Supplement 4 requesting the individual plant examination (IPE) and individual plant examination for external events (IPEEEs). It has been noted that there is much variation in the scope and quality of these PRAs.

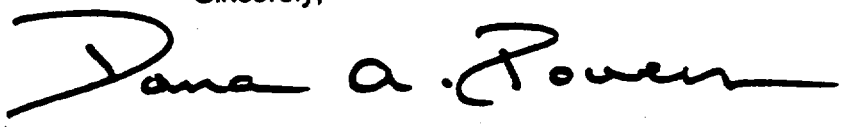
NRC has requested the American Society of Mechanical Engineers and the American Nuclear Society to develop Standards to ensure that the technical quality of PRAs is sufficient to support the regulatory review and approval of licensee risk-informed

applications. We believe that development of appropriate PRA Standards is important to risk-informing the regulations. However, we believe it is important that standards not stifle the continuing improvement of PRA methods.

We believe that the quality of any PRA is reflected in the quantified uncertainty distribution. It is important that the Standards include guidance on the appropriate determination of uncertainties (epistemic and aleatory) and the NRC staff needs guidance on how to consistently use these in the decisionmaking process.

As stated above, even though impediments exist, the agency has the capabilities necessary to make significant progress in developing and implementing risk-informed regulations.

Sincerely,



Dana A. Powers
Chairman

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1. Staff Requirements Memorandum dated December 17, 1999, from Annette L. Vietti-Cook, Secretary of the NRC, to John T. Larkins, ACRS, regarding Commission meeting with ACRS November 4, 1999.
2. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," July 1998.
3. U.S. Nuclear Regulatory Commission, Policy Statement, "Safety Goals for the Operations of Nuclear Power Plants," 10 CFR Part 50, August 21, 1986.
4. SECY-98-144, Memorandum dated June 22, 1998, from L. Joseph Callan, Executive Director for Operations, NRC, Subject: White Paper on Risk-Informed and Performance-Based Regulation.
5. Letter dated March 25, 1999, from Dana A. Powers, Chairman, ACRS, to William D. Travers, Executive Director for Operations, NRC, Subject: Proposed ASME Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications (Phase 1).
6. Report dated February 11, 2000, from Dana A. Powers, Chairman, ACRS, to Richard A. Meserve, Chairman, NRC, Subject: Importance Measures Derived from Probabilistic Risk Assessment.
7. U.S. Nuclear Regulatory Commission, Generic Letter 88-20, dated November 23, 1988, Subject: Individual Plant Examination for Severe Accident Vulnerabilities.
8. U.S. Nuclear Regulatory Commission, Generic Letter 88-20, Supplement 4, dated June 28, 1991, Subject: Individual Plant Examination for External Events.

APOSTOLAKIS

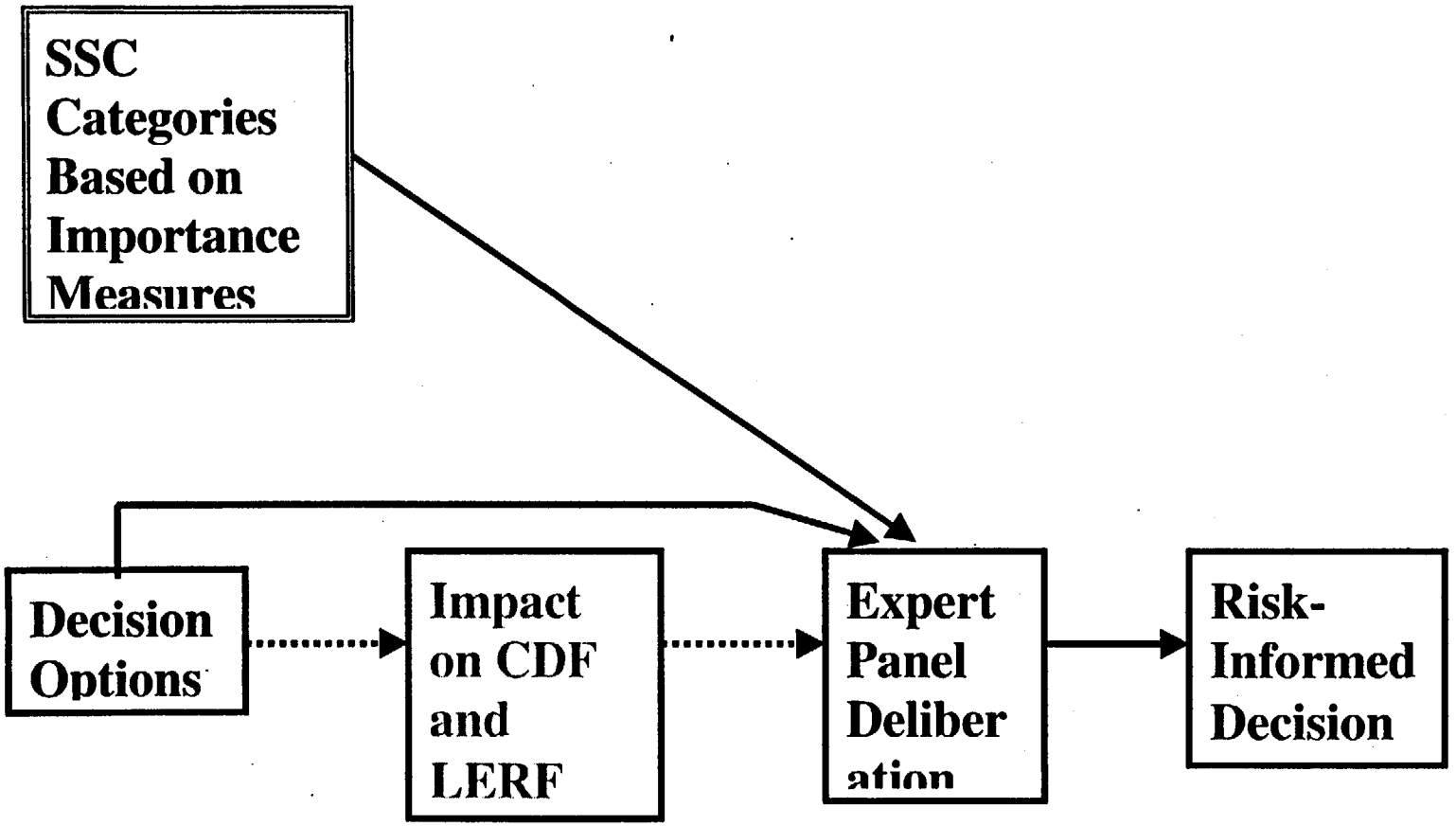
ACRS MEETING WITH THE NRC COMMISSIONERS

MARCH 2, 2000

IMPORTANCE MEASURES, CONSERVATISMS, UNCERTAINTIES, AND THE ESTABLISHMENT OF THRESHOLDS

DR. GEORGE APOSTOLAKIS
ACRS

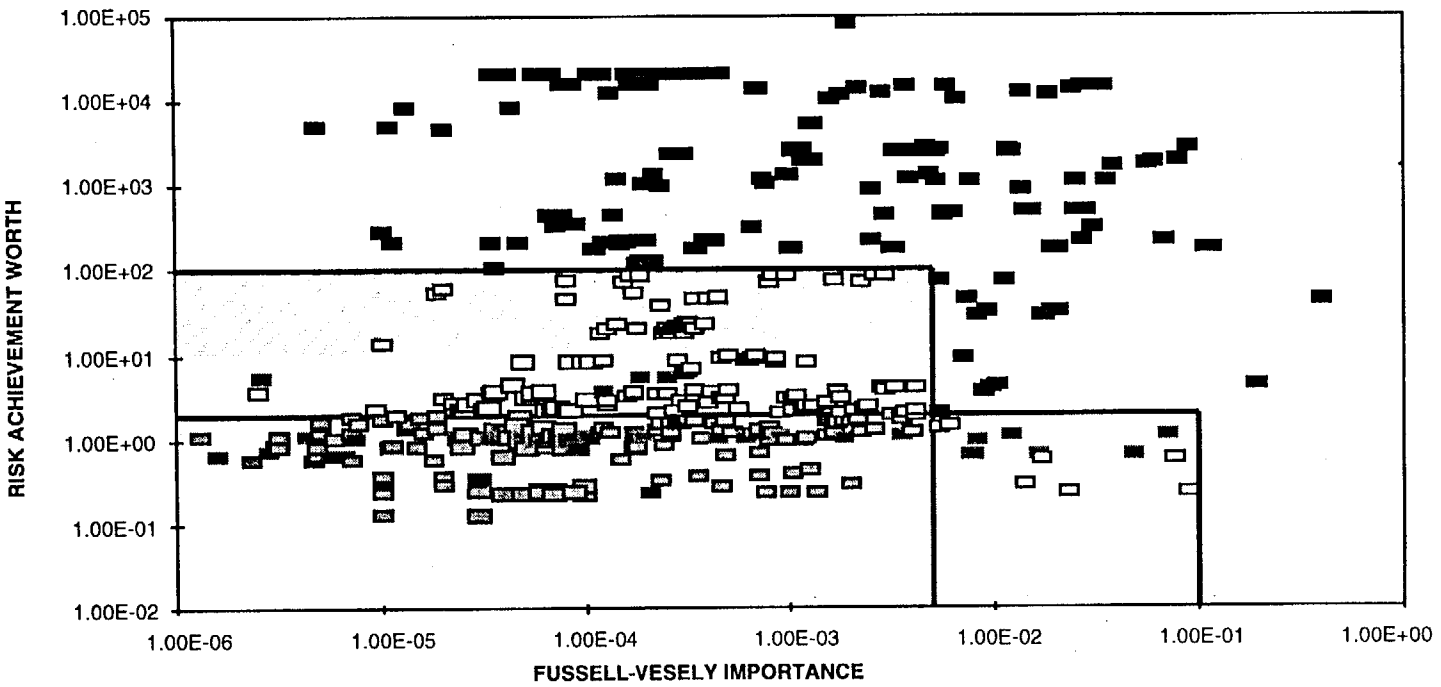
IMPORTANCE MEASURES



OBSERVATIONS

- Structures, systems and components (SSCs) are categorized individually, not as groups.
- PRA scope and quality affect importance measures.
- Even with full-scope, high-quality PRA, the importance measures have limitations.
- There is a certain degree of arbitrariness in the categorization of SSCs.
- Examples:
  - South Texas Project: Graded Quality Assurance
  - NUMARC 93-01: RRW $\geq$ 1.005 or RAW $\geq$ 2.0, and review of 90% of minimal cut sets
  - Consumers Energy: Top Event Prevention Analysis

RISK RANKING OF ALL PSA BASIC EVENTS

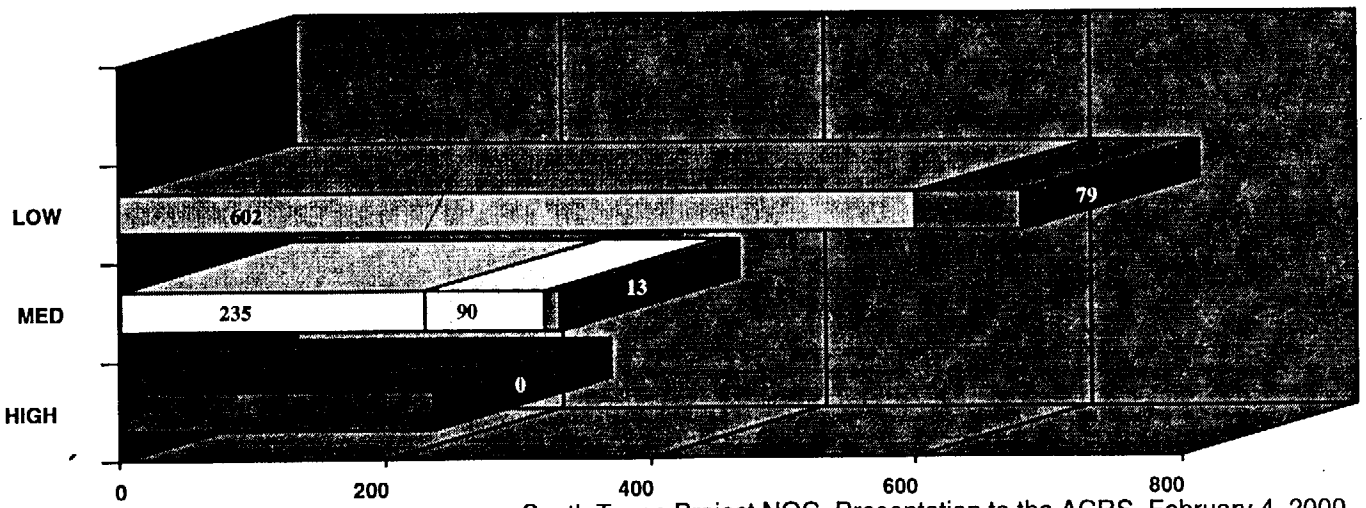


HIGH Full QA — RAW>2.0 and FV>0.005 **OR** RAW>100 **OR** FV>0.1

MED Basic QA — RAW>2.0 and <100 FV<0.005 **OR** RAW<2.0 and FV>0.005

LOW Basic QA — RAW>2 and FV<0.005

TOTAL BASIC EVENTS RISK RANKING

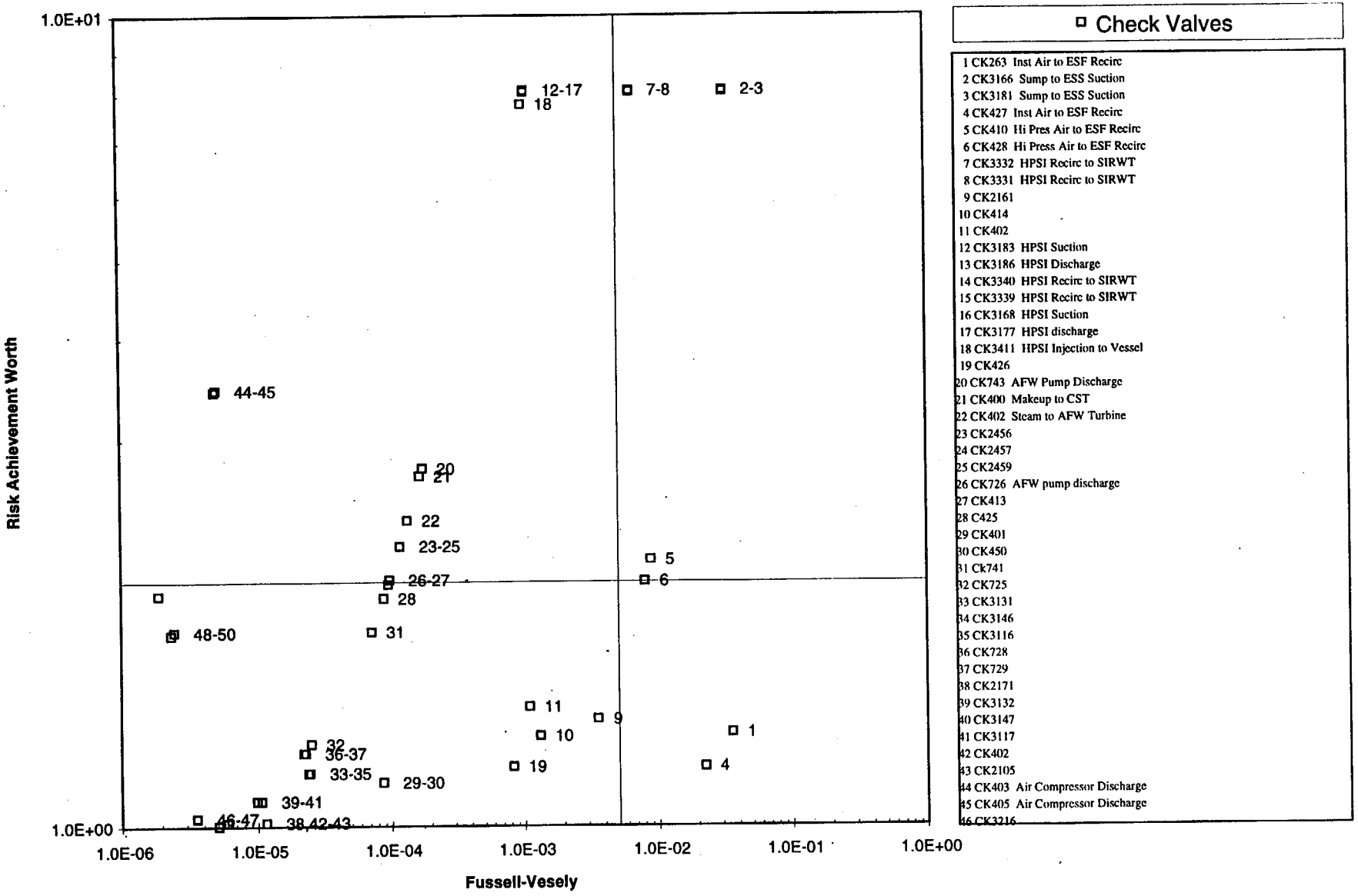


LOW MED HIGH — Non-Safety Related

Full + Basic (Critical Attributes Only) — RAW>10 and <100

Ref: STP-1996
Date: 6/3/97
File: Ranking5.ppt

Check Valve Importance Measures



RECOMMENDATIONS

- Identify limitations of each approach to SSC categorization. Recommend appropriate approach for specific applications.
- Develop relationship between importance measures and CDF and LERF.
- Develop guidance for training of the Expert Panel.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D.C. 20555-0001

February 11, 2000

The Honorable Richard A. Meserve
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Chairman Meserve:

SUBJECT: IMPORTANCE MEASURES DERIVED FROM PROBABILISTIC RISK ASSESSMENTS

During the 469th meeting of the Advisory Committee on Reactor Safeguards, February 3-5, 2000, we met with representatives of the NRC staff and Consumers Energy Company, Southern California Edison, and STP Nuclear Operating Company regarding the use of importance measures in risk-informing 10 CFR Part 50. We also had the benefit of the documents referenced.

This report responds to the Commission request in the December 17, 1999 Staff Requirements Memorandum that the ACRS evaluate the importance measures derived from Probabilistic Risk Assessments (PRAs) that are currently being contemplated for risk-informing Part 50 and, where appropriate, provide recommended additions or alternatives.

We believe that risk-informed decisions are best made using metrics, such as core damage frequency (CDF) or large, early release frequency (LERF), to evaluate the impact of decision options. There are, however, important situations in which this impact cannot be calculated easily. These include the risk-informed determination of special treatment requirements for structures, systems, and components (SSCs). The SSCs are first categorized according to their "importance," and then a decision is made regarding special treatment requirements for each category. The impact of these requirements on CDF and LERF is not quantified.

The risk-important categories of SSCs can be determined in a number of ways. The commonly used importance measures in risk-informed applications are the Fussell-Vesely (FV) and Risk Achievement Worth (RAW), although others, such as the Birnbaum measure, are occasionally used.

In evaluating the robustness of the SSC categorization, it is important to consider two facts: (1) depending on their definition, importance measures provide different insights regarding the

SSC importance and (2) the categorization is the result of an integrated decision by an expert panel that takes into account plant information in addition to the insights provided by the importance measures.

Since the determination of what is important, i.e., the definition of the importance measures, is somewhat arbitrary, these measures have limitations that include the following:

1. Importance measures are typically evaluated for individual SSCs. Yet, some decisions may affect groups of SSCs. While individual SSCs of a group may not be risk significant, the group itself may be.

2. Importance measures are strongly affected by the scope and quality of the PRA. For example, incomplete assessments of risk contributions from low-power and shutdown operations, fires, and human performance will distort the importance measures. Even with a full-scope, high-quality PRA, the importance measures have limitations, as discussed in our report of October 12, 1999.

3. The various categories of risk significance are determined by defining threshold values for the importance measures. For example, in some applications, a SSC is in the "high" risk-significant category when FV $\geq$ 0.005 and RAW $\geq$ 2.0, or FV $\geq$ 0.1, or RAW $\geq$ 100. In other applications, the numerical values are different. Some licensees choose to emphasize one measure over the other, e.g., RAW over FV. The relationship of these choices to CDF and LERF is unknown.

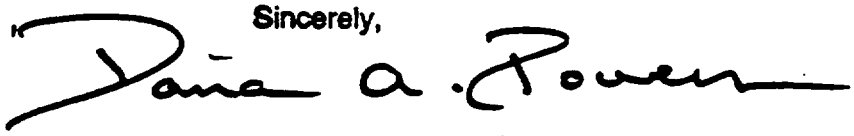
Given that the analysts have freedom in determining the criteria of risk significance, we were not surprised to find out that some licensees are implementing an approach that does not use importance measures at all. The Top Event Prevention Analysis (TEPA) utilizes success paths to determine what is important. We agree that this approach may have desirable defense-in-depth characteristics.

We note that the statistical literature also contains a number of methods for determining the sensitivity of a function, in our case the CDF or LERF, to its basic inputs, e.g., the failure rates. These methods allow us to investigate the issue of importance at a more elementary level (i.e., the parameter level) than that of FV and RAW (i.e., the SSC level).

As stated above, what really matters is the robustness of the SSC categorization that the expert panel produces through its integrated decisionmaking process that includes plant information in addition to the information provided by the importance measures. Since any choice of criteria for risk significance will likely involve some arbitrariness, we believe, as stated in our report of October 12, 1999, that the expert panel that determines the categorization of SSCs should be fully aware of the limitations and constraints of the chosen method. The panel should be provided with the results of sensitivity analyses, the results of alternative approaches, and an evaluation of the impact of these results on CDF and LERF. We recommend that a project be established to identify clearly the limitations of each proposed approach to importance

determination and to provide guidance to the expert panel on its deliberations regarding these matters. We believe that useful results can be produced in a short period.

Sincerely,



Dana A. Powers
Chairman

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ACRS MEETING WITH THE NRC COMMISSIONERS

MARCH 2, 2000

TECHNICAL ADEQUACY OF PERFORMANCE INDICATORS IN THE NEW NRC OVERSIGHT PROCESS

MR. JOHN BARTON
ACRS

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OVERALL OBJECTIVES OF THE NEW OVERSIGHT PROCESS

- Improve objectivity so that subjective decisions and judgment are not central process features.
- Improve scrutability of the process so that NRC actions have a clear tie to licensee performance.
- Risk-inform the regulatory process so that NRC and licensee resources are focused on aspects of performance that are important to safe plant operations.

AREAS OF GENERAL ACRS AGREEMENT

- In principle, the new inspection and assessment approach is better than the process it replaces.
- The objective of the new process is to assure that plant performance is at an acceptable level.
- The new process consists of:
  - Performance indicators based on the data supplied by licensees, and
  - Baseline inspections performed by the NRC.

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AREAS OF GENERAL ACRS AGREEMENT (continued)

- The pilot program should have been longer, either one year or one refueling cycle.
- The baseline inspection program provides most of the data needed for assessment.
- The new process is mostly risk-informed. Exceptions reflect limitations in the current technology for risk assessment.
- Performance indicators and their thresholds should recognize plant- or design-specific characteristics.

AREAS OF GENERAL ACRS AGREEMENT (continued)

- Performance indicators focus on equipment, and only indirectly reflect human performance and shutdown operations.

- There is no demonstration of safety equivalence for thresholds of different performance indicators.

AREAS OF CONTINUED ACRS DISCUSSION

- Values of the thresholds for performance indicators:
  - Values are not plant-specific and, thus, may be too high for some plants and too low for others.
    - Unable to identify trends.
    - Values are disincentives to improve plant performance.
    - Degradation in performance can be rapid.
  - Values are arbitrary
    - Choice of 95 percentile of industry performance is questionable.
    - One suggestion from ACRS members is to use values based on grouping of plants.

AREAS OF CONTINUED ACRS DISCUSSION (Continued)

- Selection of the performance indicators:
  - Based on data that licensees are willing to provide.
  - No clear correlation or interrelationship between performance indicators and the baseline inspection program.
  - No analytic method presently exists to show performance indicators are indicative of safety status.
  - No connection to risk analyses or risk posed by plants.
  - Types of performance indicators, such as human performance, are missing.
  - Performance indicators are not leading indicators.

EXAMPLE OF A QUESTIONABLE INDICATOR

- Barrier Integrity Cornerstone
  - Many licensees monitor these indicators at a lower threshold and have administrative limits that require that licensees take corrective action.
  - An additional performance indicator for low-power and shutdown operations should be considered.

EXAMPLE OF A QUESTIONABLE INDICATOR (Continued)

- Emergency Preparedness Cornerstone
  - The threshold for Drill/Exercise Performance is set too high.
  - Licensees only get **ONE** chance to make a proper Classification/Notification of a Protective Action Recommendation in a real event.
  - The Emergency Response Organization Participation Indicator can be easily managed to stay in the "Green Band."

UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D. C. 20555

June 10, 1999

Dr. William D. Travers
Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Dr. Travers:

SUBJECT: PILOT APPLICATION OF THE REVISED INSPECTION AND ASSESSMENT PROGRAMS, RISK-BASED PERFORMANCE INDICATORS, AND PERFORMANCE-BASED REGULATORY INITIATIVES AND RELATED MATTERS

During the 463rd meeting of the Advisory Committee on Reactor Safeguards, June 2-4, 1999, we heard briefings by and held discussions with representatives of the NRC staff regarding the pilot applications of the revised inspection and assessment programs, risk-based performance indicators (PIs), and performance-based regulatory initiatives and related matters. Our Subcommittees on Reliability and Probabilistic Risk Assessment and on Regulatory Policies and Practices also met on April 21, 1999, to discuss performance-based regulatory initiatives. We had the benefit of the documents referenced.

In February 1999, we reviewed proposed revisions to the inspection and assessment programs, including the proposed use of PIs, and provided a report to the Commission dated February 23, 1999. We previously reviewed staff efforts to develop risk-based PIs as Program for Risk-Based Analysis of Reactor Operating Experience of the former Office for Analysis and Evaluation of Operational Data. In April 1998, we reviewed staff plans to increase the use of performance-based approaches in regulatory activities (SECY-98-132) and issued a report dated April 9, 1998.

Recommendations

1. The PI thresholds should be plant- or design-specific.

2. The staff should explain the technical basis for the choice of sampling intervals of PIs used to select a value for comparison with the thresholds.

3. Prior to implementation of the pilot applications of the revised inspection and assessment programs, the pilot applications should be reviewed to make explicit what information will be collected and what hypotheses will be tested.

4. The staff should examine domestic and international studies to determine whether it is possible to develop useful PIs for safety culture.

5. The action levels should be related explicitly to the risk metrics such as core damage frequency (CDF) and large, early release frequency (LERF), where possible.

6. The current performance-based initiatives program should document the lessons learned from current NRC activities in order to focus the diverse NRC activities related to performance-based regulation.

Discussion

A major lesson learned from probabilistic risk assessments (PRAs) is that the risk profile of each plant is unique. The major accident sequences and their contributions to the various risk metrics vary from plant to plant. A consequence of this lesson is that the importance of a PRA parameter, e.g., the unavailability of a system train, with respect to PIs can be assessed only in the context of the integrated risk profile that the PRA provides.

The intent of PIs is to provide objective measures for monitoring and assessing system, facility, and licensee performance. The performance metrics of the chosen set of PIs should assist in making better informed decisions regarding deviations in licensee performance from expectations. This information, combined with the PRA lesson noted above, leads us to the conclusion that the PI thresholds must be plant-specific or design-specific, where practicable. The staff has recognized this in at least one instance, the white-yellow threshold (substantially declining performance) for emergency diesel generator unavailability (SECY-99-007).

In the proposed reactor oversight process, however, most of the thresholds are based on generic industry averages. For example, the 95th percentile of the *plant-to-plant* variability curve for a given parameter, e.g., system unavailability, is defined as the green-white threshold (declining performance). There are two fundamental problems with this approach:

1. Selection of this criterion automatically results in about five plants being above the threshold. This creates an impetus for the licensee to bring the PI below the threshold simply because other plants are doing "better." This may, in effect, create the perception that new regulatory requirements are being imposed on licensees. We do not believe that the oversight process should ratchet expectations for plants which already meet the requirements for adequate protection. We note that this potential for ratcheting, whether actual or perceived, deviates from the intent of identifying declining plant performance.

2. Establishing generic thresholds would not account for plant-specific features that may compensate for the risk impact of any particular parameter. For example, setting the threshold for the unavailability of a system on a generic basis without looking at each plant to understand why a particular value is achieved is contrary to the PRA lesson mentioned above.

The staff has acknowledged that there are both epistemic and aleatory uncertainties in the PIs and that the threshold values must account for both. It is not clear how the staff intends to

account for these uncertainties. How does the aleatory variability in an unavailability enter into an assessment? What is the sample that is used to calculate this unavailability? Is it calculated every month? Is the average value computed over a year? How does the sampling method affect the establishment of threshold values? We believe that the staff should prepare technical bases for these choices and develop alternative sampling methods to be tested in the pilot applications of the revised inspection and assessment programs.

This latter observation leads us to the issue of designing pilot applications. We would like to see a well-defined set of questions to be answered and hypotheses to be tested before the pilot applications of the revised inspection and assessment programs are implemented. For example, we would like to see in the pilot applications a staff evaluation of the administrative burden placed on inspectors. Although we agree that the proposed revisions to the assessment program are intended to enhance safety decisions and allocation of inspection resources, we are concerned that the proposed changes may adversely affect in-plant inspection time.

The staff has told us that it does not plan to develop PIs for the "cross-cutting" issue of safety conscious work environment (safety culture). The principal reason stated by the staff is that "if a licensee had a poor safety conscious work environment, problems and events would continue to occur at that facility to the point where either they would result in exceeding thresholds for various performance indicators, or they would be surfaced during NRC baseline inspection activities, or both." We believe that more justification is required for this argument. Safety culture has been recognized as an important determinant of good plant performance. For example, the International Atomic Energy Agency has developed an inspection manual that includes indicators of safety culture. Also, the Swedish Nuclear Power Inspectorate recently published a report describing a systematic procedure using elicitation of expert judgment to produce PIs for safety culture.

The values of the PIs that trigger regulatory action seem to be only qualitatively related to risk metrics (CDF and LERF). We believe that action levels should have a more quantitative relationship to risk metrics consistent with the guidelines in Regulatory Guide 1.174.

The NRC has several activities in the area of performance-based regulation that are either completed or ongoing. We believe that it would be useful to collect the lessons learned from these activities and develop a set of principles and recommendations for future programs. The staff should document these results. This should be the objective of the current program on performance-based approaches to regulation.

We commend the staff for its progress on these challenging matters.

Sincerely,

Dana A. Powers

Dana A. Powers
Chairman

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1. Memorandum dated March 22, 1999, SECY-99-007A, from William D. Travers, Executive Director for Operations, NRC, for the Commissioners, Subject: Recommendations for Reactor Oversight Process Improvements (Follow-up to SECY-99-007).
2. Memorandum dated January 8, 1999, SECY-99-007, from William D. Travers, Executive Director for Operations, NRC, for the Commissioners, Subject: Recommendations for Reactor Oversight Process Improvements.
3. Memorandum dated April 16, 1999, from Annette Vietti-Cook, Secretary of the Commission, to William D. Travers, Executive Director for Operations, NRC, Subject: Staff Requirements - SECY-99-086 - Recommendations Regarding the Senior Management Meeting Process and Ongoing Improvements to Existing Licensee Performance Assessment Processes.
4. Report dated February 23, 1999, from Dana A. Powers, Chairman, ACRS, to Shirley Ann Jackson, Chairman, NRC, Subject: Proposed Improvements to the NRC Inspection and Assessment Programs.
5. Draft paper entitled, "Development of Risk-Based Performance Indicators," by Patrick W. Baranowsky, Steven E. Mays, and Thomas R. Wolf, NRC, received May 26, 1999 (Predecisional).
6. Draft memorandum, from William D. Travers, Executive Director for Operations, NRC, for the Commissioners, Subject: Plans for Pursuing Performance-Based Initiatives, received May 12, 1999 (Predecisional).
7. Memorandum dated February 11, 1999, from Annette L. Vietti-Cook, Secretary of the Commission, to William D. Travers, Executive Director for Operations, NRC, Subject: Staff Requirements - SECY-98-132 - Plans to Increase Performance-Based Approaches in Regulatory Activities.
8. Report dated April 9, 1998, from R. L. Seale, Chairman, ACRS, to L. Joseph Callan, Executive Director for Operations, NRC, Subject: Plans to Increase Performance-Based Approaches in Regulatory Activities.
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D. C. 20555

February 23, 1999

The Honorable Shirley Ann Jackson
Chairman
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Chairman Jackson:

SUBJECT: PROPOSED IMPROVEMENTS TO THE NRC INSPECTION AND ASSESSMENT PROGRAMS

During the 459th meeting of the Advisory Committee on Reactor Safeguards, February 3-6, 1999, we reviewed the proposed changes to the NRC Inspection and Assessment Programs, including initiatives related to the development of performance indicators and a risk-based inspection program, which are discussed in SECY-99-007. Our Subcommittees on Plant Operations and Reliability and Probabilistic Risk Assessment also reviewed this matter on January 26, 1999. During these reviews, we had the benefit of discussions with representatives of the NRC staff. We also had the benefit of the documents referenced. We provided an interim letter, dated December 16, 1998, to the Executive Director for Operations on this matter.

Conclusions and Recommendations

1. The process outlined in SECY-99-007 represents a substantial positive step in improving the NRC Inspection and Assessment Programs. The proposed improvements should lead to a risk-informed, efficient process and should improve the objectivity, consistency, and scrutability of these Programs.

2. The objectives of these Programs should be clearly formulated. In particular, the staff should state whether the objectives are to ensure that a specific licensee is maintaining its baseline performance level (related to its licensing basis), or to assess whether any individual plant is an outlier with respect to an expected population-wide performance level.

3. The choice of thresholds for increased NRC attention should be made consistent with the definition of objectives.

Discussion

In response to both the Commission and ACRS concerns, the staff has made substantial progress in improving the NRC Inspection and Assessment Programs for evaluating the performance of nuclear power plant licensees. Since our interim letter, the staff has issued SECY-99-007 which presents recommendations for improvement to the Inspection and Assessment Programs (now termed "Reactor Oversight Process Improvements") in a consolidated manner.

During our discussion of SECY-99-007, two different interpretations of the nature of the inspection program emerged. In one interpretation, inspections are viewed as quality control measures, i.e., a plant is viewed as having an acceptable baseline performance and the inspection program is intended to confirm that the performance remains acceptable. The other interpretation is that the program is intended to identify plants that become outliers with respect to an industry-wide acceptable performance level.

The difference between these two interpretations is whether the acceptable performance levels have different values for different plants. In SECY-99-007, the staff identifies a set of performance indicators (PIs) and sets thresholds for each PI at a level such that 95% of the plants have met this threshold of performance.

The use of this type of threshold on the PIs could imply that the second interpretation is the high-level objective of the Inspection and Assessment Programs. This approach could evolve to be a new, de-facto, regulatory requirement. Furthermore, if the 95% thresholds were to be periodically renormalized, this would constitute a process of continual ratcheting to ever more stringent performance expectations. During our meeting, we discussed the possibility that this could be avoided by developing plant-specific PI profiles and using trends to assess the performance status of the plant with respect to its specific acceptable performance level.

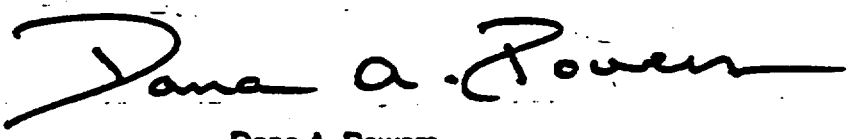
If, on the other hand, the 95% thresholds are one-time settings not subject to renormalization, the use of these thresholds will not lead to ratcheting and would serve the additional purpose of identifying potential outliers. In time, the process would evolve to the point that plant-specific considerations could be used to determine if these "outliers" actually have unacceptable performance.

We have also questioned the constraint of allowing only six months for the pilot program to assess the revised process. The concern is that a six-month pilot program could result in "cramming" (acceleration of both inspections and PI findings) a system intended to be exercised over a full year, such that the results may be distorted.

In addition, we believe that there is a need to use replicates in the pilot program to determine the effects of any uncontrolled variables such as the individuals performing the inspection. Clearly, it will be important to avoid confusing "inspector performance" with "licensee performance." As with any pilot program, there will be uncertainty associated with the results. The staff should include strategies for identifying and controlling such uncertainties in the interpretation of the results of the pilot program.

In the cover letter to SECY-99-007, the staff cites four policy issues that need to be addressed in conjunction with implementation of the revised Inspection and Assessment Programs. We have not heard the details of these policy issues, but expect to review them at a future meeting.

Sincerely,



Dana A. Powers
Chairman

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3. Memorandum dated November 19, 1998, from John C. Hoyle, Secretary of the NRC, to William D. Travers, Executive Director for Operations, NRC, Subject: Staff Requirements - Briefing on Reactor Oversight Process Improvements.
4. Memorandum dated June 30, 1998, from John C. Hoyle, Secretary of the NRC, to L. Joseph Callan, Executive Director for Operations, NRC, Subject: Staff Requirements, SECY-98-045, Status of the Integrated Review of the NRC Assessment Process for Operating Commercial Nuclear Reactors.