UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

OFFICE OF THE SECRETARY

***

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, 2000

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

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.]