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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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RELIABILITY AND PRA SUBCOMMITTEE

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MONDAY

JULY 22, 2013

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ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B1, 11545 Rockville Pike, at 1:00 p.m., John W. Stetkar, Chairman, presiding.

COMMITTEE MEMBERS:

JOHN W. STETKAR, Subcommittee Chairman

DENNIS C. BLEY, Member

MICHAEL L. CORRADINI, Member

JOY REMPE, Member

STEPHEN P. SCHULTZ, Member

NRC STAFF PRESENT:

JOHN LAI, Designated Federal Official

MICHAEL BALAZIK, NRR

JEFF CIRCLE, NRR

RON FRAHM, NRR

RANI FRANOVICH, NRR

LYNN MROWCA, NRO

ERIC POWELL, NRO

ALSO PRESENT:

BILL BRADLEY, NEI

JEFF GASSER, Southern Nuclear

*Present via telephone

C-O-N-T-E-N-T-S

P R O C E E D I N G S

12:59 p.m.

CHAIRMAN STETKAR: The meeting will now come to order.

This is a meeting of the Reliability and PRA Subcommittee. I am John Stetkar, Chairman of this Subcommittee meeting.

ACRS members currently in attendance are Dennis Bley and Joy Rempe. I believe that we will be joined soon by Steve Schultz and Mike Corradini.

John Lai of the ACRS staff is the Designated Federal Official for this meeting.

The Subcommittee will hear the staff and industry's response to the SRM on SECY-12-0081, Risk-Informed regulatory framework for new reactors.

There will be a phone bridge line. To preclude interruption of the meeting, the phone will be placed in a listen-in mode during the presentations and Committee discussions.

We have received no written comments or requests for time to make oral statements from members of the public regarding today's meeting. The entire meeting will be open to public attendance.

The Subcommittee will gather information, analyze relevant issues and facts, and formulate proposed

positions and actions, as appropriate, for deliberation by the full Committee.

The rules for participation in today's meeting have been announced as part of the notice of this meeting previously published in The Federal Register.

A transcript of the meeting is being kept and will be made available as stated in The Federal Register notice. Therefore, we request that participants in the meeting use the microphones located throughout the meeting room when addressing the Subcommittee. The participants should first identify themselves and speak with sufficient clarity and volume, so that they may be readily heard.

We will now proceed with the meeting. And I don't know whether anyone from the staff -- Lynn, do you want to say anything?

MS. MROWCA: Thank you for having us, and we look forward to your comments.

CHAIRMAN STETKAR: Well, that was short and to the point.

(Laughter.)

And with that, I will turn it over to the staff. I don't know, Eric, do you have the lead?

MR. FRAHM: Thank you, John.

First of all, this has been quite an effort with several people involved. My name is Ron Frahm.

I am in NRR in the Performance Assessment Branch.

With me, to help with the presentation today and, also, quite instrumental in developing this paper and our recommendations, are Mike Balazik, also in my Division, in NRR. He will be doing the Performance Indicator presentation.

We have Eric Powell from the Office of New Reactors. He will be talking about relative risk.

And we have Jeff Circle from NRR in the PRA Branch. They will be talking about our recommended approach on integrating risk insights.

With that, we do welcome the opportunity to brief and speak with the ACRS today on this topic. I, for one, have been looking forward to this. Having been here last summer and perhaps not succeeding -- (laughter) -- we are going to try again today and see if we can do it a little better.

Also with us, before I forget, are Rani Franovich from NRR and Lynn Mrowca from NRO, who have also helped out in this effort.

Moving along to the next slide, the purpose of today's meeting is to present our technical evaluations, conclusions, and recommendations, as noted in the Draft Commission Paper regarding risk-informing the ROP for new reactors. This paper was developed in

response to the Staff Requirements Memoranda on SECY-12-0081, and, actually, just a specific portion of that SRM.

The next slide is the agenda for today's meeting, which does differ slightly from the agenda that was published. I decided it made a little bit more sense to start off with the background and an overview. So, I will do that for the first several minutes of the meeting, which will basically summarize the main body of the paper and the first enclosure to the paper.

And then, I will turn it over to Jeff Circle, who will talk about the technical basis and examples of the integrated risk-informed approach, using qualitative measures. We will, then, move on to Eric Powell, who will talk about the technical evaluation of the relative-risk measures and a reexamination of the pros and cons from our 2009 White Paper. That is actually Enclosure 3 to the Draft Paper and Jeff's section is Enclosure 2.

And then, we will move on to the fourth enclosure of the paper, which is Mike Balazik talking about the appropriateness of the existing Performance Indicators and their thresholds for new reactor applications.

Then, we will turn the meeting back over

to me. I will kind of summarize and present our conclusions, based on our technical evaluations, as well as our recommendations that we put forth in the Draft Paper, and then, briefly go over next steps moving forward.

In the way of background, this has been going on for the past several years. It was determined a few years back that the baseline risk estimates for most of the new reactor designs are lower than those for the current fleet. And due to these lower-risk values, questions were raised as to how we would apply the acceptance criteria to both licensing basis as well as the regulatory response, to performance issues under the reactor oversight process.

As you are well aware, over the past several years, we have corresponded back and forth with the Commission, as well as the Advisory Committee on Reactor Safeguards, to address our recommendations related to risk-informing the guidance for the new light water reactor applications.

And actually, additional background information is in Enclosure 1 of the Draft Paper, as I mentioned earlier and a history of the correspondence and more background information.

Moving on, last summer we sent up SECY-12-0081 entitled, "Risk-Informed Regulatory Framework for New

Reactors," to provide our recommendations on both licensing and the oversight process. The focus of today's discussion and the Draft Paper that we are talking about is on the oversight process related to the ROP vice the licensing portion.

The tabletop exercises we performed last summer indicated that the current thresholds are appropriate for the ROP, though a few changes might be warranted, consistent with the risk-informed regulatory approach and Reg Guide 1.174.

We went forward and recommended an option 3(b), which was to augment the existing risk-informed framework with deterministic backstops to ensure an appropriate response.

Moving forward, we are kind of changing those words of "deterministic backstops" to qualitative measures because they more accurately describe our intent of the paper as well as our proposed approach going forward.

And then, also in the paper we sent up last summer, we acknowledged the ACRS letter that you all wrote that recommended using relative risk, but we did not actually provide that as an option in the paper.

Based on that paper, after a few months of deliberation and discussion, the Commission came down with an SRM in October. There were several portions

of that SRM. The portion we are here to talk about today relates to the ROP, and the SRM specifically said that the staff should give additional consideration to the use of relative-risk metrics or, if we believe that is not a viable option for new reactor oversight, we need to provide a technical basis for our conclusions.

And it did specifically say that we should provide the Commission with a notation vote paper that provides a technical basis for the staff's proposal for the use of qualitative measures, including examples; a technical evaluation of the use of relative-risk measures, including a reexamination of the pros and cons and a discussion of the appropriateness of the existing Performance Indicators and their related thresholds.

And as I mentioned earlier, we are going forward using the term "qualitative measures" as opposed to "deterministic backstops," just in the interest of clarity.

Our approach, when we were given this direction from the Commission, was to deliver a notation vote Commission paper for EDO signature. We are due to send that up in the fall of 2013.

From the start, we recognized the need to get involved with many internal and external stakeholders. We did that over the past several months. We did have

three public meetings, February 5th, March 25th, and April 15th of this year. They were highly attended by industry and the staff. Public interest did not seem to be that high. Most of the discussions were between the industry and the staff.

And I would like to point out that we left those meetings with a common understanding, at least in my impression, that we all generally agreed with our conclusions and our recommended approach that was provided in the Draft Paper.

One of the things we wanted to focus on was to stay within the scope of the request. And that is just to provide the technical basis and the discussion, and not to try to fully develop the concepts. We will wait for Commission direction to take it to the next step, where we actually fully develop the detailed guidance and concepts, I guess.

We did want to provide a crisp paper with enough detail to give the Commission what they needed to direct us accordingly. And we wanted to include the supporting details and the enclosures, which, of course, we have done with our four enclosures.

And I did want to point out that there were two other points in that SRM. There was a request for a paper on the large release frequency history as well

as an independent review of the ROP. And those portions of the SRM are not part of the scope of today's discussion or this paper, but are being handled separately.

In the way of a little background and to kind of set the stage today, the ROP was first implemented in April 2000. For those who have been around for a while, it replaced the old systematic assessment of licensee performance. And many folks were complaining that that was very subjective and not very predictable or repeatable.

So, some of the early goals of the ROP that we still adhere to today were to improve the objectivity of the oversight process, so that subjective decisionmaking was minimized; to improve the scrutability and predictability of NRC actions, such that regulatory response and actions have a clear tie to licensee performance. And, of course, to risk-inform the processes, so that the NRC and licensee focus on the issues of greatest importance to safety.

This is one of the pictures we developed back in the day, in the 2000 timeframe. It demonstrates -- what I really want to focus on here is the third line, which is the list of the seven cornerstones. I wanted to emphasize that there are a total of seven cornerstones that are equally-weighted in the ROP. The

real risk-informed ones are the three on the left: initiating events, mitigating systems, and barrier integrity. So, most of our discussions today will be focused on those three cornerstones. But I did want to provide this demonstration to illustrate that this is just three-sevenths of the ROP inputs. And actually, those are the more risk-informed cornerstones. The other four are a little bit more deterministic and a little less risk-informed.

Within each of the cornerstones, the staff, with industry involvement, developed an inspection program and Performance Indicators to use to assess licensee performance and to ensure that the cornerstone objectives were met. Within each of these areas, thresholds were developed to determine the significance of the issues. And these greater-than-green thresholds would feed this action matrix. They would be equally-weighted, as I pointed out, and based on where a plant lies in the action matrix, that will determine a predictable and reliable response to regulatory performance issues.

For the current fleet, our guidance for the significance determination process can be found in Inspection Manual Chapter 0609, and 0609, Appendix A is the appendix that applies to those first three

cornerstones that I mentioned earlier that are the risk-informed ones. There are a few other risk-informed insights spread throughout the other SDPs, but those are the primary ones. And as I mentioned earlier, several of the other SDPs in the other cornerstones are more deterministic.

Risk thresholds in the current SDP are a function of changes in CDF, in large early release frequency, against a plant's baseline risk. And then, in addition to Appendix A, there are several other appendices for the other cornerstones, et cetera, as well as Appendix M, which is used to supplement the risk-informed insights in Appendix A. And it considers more deterministic criteria, such as defense-in-depth and safety margins.

With that, that is really the background I wanted to provide to set up for the meat of today's discussion.

First, Jeff Circle will talk about the technical basis and examples for the integrated risk-informed approach, using qualitative measures.

MR. CIRCLE: Thanks, Ron.

As Ron mentioned, this is Jeff Circle. I am in the PRA Operational Support Branch in the Office of Reactor Regulation.

I am here to talk about how we develop the qualitative measures for this integrated approach in response to the SRM.

I got drafted into this pretty late, but I was pretty much involved with how this program had developed over the years because there were two SECY papers that were written prior to this which we got to review over in our Branch.

After the latest SRM, the question was asked about, what does a deterministic backstop look like? And a lot of us had it in our minds what a deterministic backstop should look like, but, luckily, when I got drafted into this, we had put this to paper.

So, what I am going to start off with is a quick list of the objectives of this afternoon's discussion. I am going to present the staff proposed response to the SRM on developing qualitative measures, formally known as deterministic backstops.

I am going to discuss the objectives and considerations in developing the concept and what pitfalls that we might have in its development.

I am going to talk a little bit about the specific features of qualitative measures. All right. And this is still a conceptual process. So, we are going to leave this up to the Commission to make the

decision on what and how we should proceed.

And finally, I am going to show you an example of how one can use these qualitative measures in assessing a finding in the new reactor design.

So, let's start off with a little background. This is very brief because Ron had touched upon most of this.

The SRM, SECY-12-0081, instructed us to provide a technical basis for the proposals we use in deterministic backstops, including examples. So, when I got drafted into this, I started looking into this and how we could develop this type of methodology. And I realized early on that the term "deterministic backstops" is really inappropriate because a backstop is something that you want to use to prevent a value from exceeding a certain limit.

The idea that I had in mind is to develop a methodology that could be integrated together and follow the tenets of Reg Guide 1.174 and all the other documents that came prior to this and prior to the SDP, you know, the PRA Policy Statement, and everything else that came before that.

So, we decided to call it a qualitative measure because we were going to use some of the deterministic concepts. So, for consideration, we need

to produce a methodology that represents one possible way in which a process can be developed to augment assessment in the ROP for the significance determination process.

This is not the methodology. This is one possible way we can use to evaluate ROP findings. It has to be easily understood and traceable. And as I said earlier, this has to be conceptual in nature for the purpose of this particular SECY paper.

MEMBER BLEY: It is one way --

MR. CIRCLE: Yes.

MEMBER BLEY: -- but you are only proposing the one way?

MR. CIRCLE: Right. We are leaving it open, actually, open-ended because we really didn't have the time to develop several different methodologies. And the SECY paper told us that we want you to show us what a backstop looks like and give us examples of how one works.

So, in order to develop one, in order to make that omelet, so to speak, you have to crack some eggs. So, we developed one methodology and we stuck through it to see how it would work in an example setting.

MEMBER BLEY: I think the current version of the letter that we saw in the report didn't make that

clear to me, that this is one among alternatives. "This is the way to do it" is the way I read it.

MR. CIRCLE: Well, the SRM told us to give us the technical basis for deterministic backstops and give us an example.

MEMBER BLEY: Okay, and you have done that.

MR. CIRCLE: So, that's what we did.

MEMBER BLEY: Okay.

MR. CIRCLE: So, that is why it is conceptual in nature. This is not "the methodology," but it is a possible methodology and it is something that we can take and expand on in the future if the Commission directs us to do so.

The really important thing about this is that it can be applied to new reactors as well as the existing fleet. So, we really didn't want to reinvent the wheel. We wanted to make it universal.

Also, we need to make it consistent with Near Term Task Force Recommendations 1 and 12. As you know, NTTF Recommendation 1, part of that is redefining or finding a good definition for what defense-in-depth is. And I will get to that a little bit later in my presentation.

CHAIRMAN STETKAR: Jeff, as you go through this, one of the questions I had in my mind, the fourth

bullet there says, "Can be applied to new reactors and the existing operating fleet." So, I kind of looked ahead in your slides. As you go through several of these qualitative measures, decisions, whatever you want to call them, could you give us an idea of which, if any, of those are being used currently in the ROP and how they are being applied?

MR. CIRCLE: Actually, they are being applied, but there is no methodology that we have for applying them.

CHAIRMAN STETKAR: Okay.

MR. CIRCLE: Our current ROP is a risk-informed process. You know, we do a quantitative assessment. We come up to a number. And then, we apply qualitative factors to that number. But, up until this point, we never had a hard-and-fast procedure or hard-and-fast guidance on how to apply these measures.

What I am attempting to do here is to actually put it into some framework that analysts and management can use to make these decisions.

CHAIRMAN STETKAR: Okay.

MEMBER BLEY: Well, I think one thing you made clear -- at least this is my interpretation of what you have -- is that you are really trying to account for things that are not well or fully represented in

the PRA, instead of coming up with the quantitative measures.

MR. CIRCLE: That is correct, yes.

MEMBER BLEY: There is one thing I have a question about. Because the ones you have worked through and talked about, I see where you are headed. There is something in some of the new reactors, especially the passive reactors -- well, we don't have a real PRA for any of these yet because we don't have one, and we won't get that until a year or so before startup. So, we don't have a PRA that covers everything for one of these new plants.

But I haven't seen any so far that give real consideration to things that might attack the phenomenology that makes the passive systems work, except in a kind of cursory way that says we did an experiment that shows this will work. And that is an area that I would like to see in PRAs, but, until it is there, this looks like it gives a nice structure to be able to handle those. But I don't see you talking about that anywhere.

MR. CIRCLE: Right. What you are talking about are the phenomenological-type events and --

MEMBER BLEY: Yes, things that would affect some of these, I would say, delicate balances that make

the passive systems work.

MR. CIRCLE: You know, this is really something developed not for PRA, but it is developed for the SDP.

MEMBER BLEY: Well, it is.

MR. CIRCLE: The SDP is --

MEMBER BLEY: It uses the PRA.

MR. CIRCLE: It uses some of that, and a lot of that will be qualitative in nature. You know, it is a decision that we leave up to management and to the analysts. If we have an event that will be impacting the phenomenological event or, let's say, impacting a passive system, we can look into that. We can actually --

MEMBER BLEY: Yes. I mean, I could use this to do that.

MR. CIRCLE: Yes.

MEMBER BLEY: What I didn't see was anything suggesting that was one of the things that might not be well-done in some of the PRAs. You mentioned some things that are not.

MR. CIRCLE: Yes.

MEMBER BLEY: And this is one that, at least for me, if you are a PRA person, the kind of phenomenological analysis and probabilistic treatment that we do in Level 2 for phenomenology after core damage, you know, it is

not that we need a new PRA.

MR. CIRCLE: That's right.

MEMBER BLEY: That kind of modeling is the sort of thing that we could use to look at these other issues, but so far I haven't seen anybody doing it.

MR. CIRCLE: Yes, I think I understand what you are saying. A lot of that can be covered by -- it is not; I didn't anything in there right now because I am just looking right now at the findings that you can get in the new reactors by looking at what the existing fleet has had so far in the past.

MEMBER BLEY: That's right. Well, good.

MR. CIRCLE: We won't know that until we start operating these new reactors and start to see events come in.

MEMBER BLEY: On the ROP side, but on the PRA side we could.

MR. CIRCLE: Okay. So, for consistency, you know, our concept that we develop has to follow the principles of good regulation. And that is obvious. Independence, openness, efficiency, clarity, reliability. Also, we intend to follow the ROP goals of objectivity, to be risk-informed, predictable, and understandable.

These are some of the documents that we used

to evaluate the methodology. And most of you are familiar with these documents, ranging from the PRA policy statement down to SECY-99-007A, which is our SECY for the SDP itself. We also use NUREG-1860 to pull some definitions of defense-in-depth out of that. And I will be talking a little bit more about defense-in-depth very shortly.

For concept development -- and this is a repeat of what Ron had told you earlier about the ROP -- the SDP is a risk-informed process, as you know, to evaluate licensee performance deficiencies in order to allocate inspection resources. Okay? So, it is not true PRA. It is really "PRA light". It has a quantitative core damage portion and large early release aspect. It has a qualitative deterministic aspect. And both should be considered together to arrive at a determination.

Now the qualitative part is -- the quantitative part, I should say, is well-defined because the quantitative part, we have end-state band colors. They are based on threshold increases in CDF and LERF.

We have detailed methodologies on how to apply them in Inspection Manual Chapter 0609, which has guidance for analysts. And we have, also, the Risk Assessment Standardization Program, the RASP manual to use as well.

So, what I am discussing here is really the qualitative guidance. My feeling is that the qualitative guidance should be as well-defined.

So, I sat down and I put together an integrated approach. Part of the integrated approach is really filling in the gaps on that qualitative analysis portion. Okay? So, for those elements, I considered adapting the traditional deterministic approach with deterministic elements. Each element is going to be evaluated with something that we call an impact rating.

And right now, for this particular exercise, the impact ratings were arbitrarily defined for this concept. And this is just to get us started. And then, afterwards, we can go with the Commission paper and see where the Commission wants us to go with this.

Part of the advantages of having a structured approach is that we can simplify it for all stakeholders to use and to reference. What my initial feeling was is to use either a decision tree or a table. I simplified the impact rating rules to avoid ambiguity. So, this way, it will be very clear on how to apply them.

And I also consider applying limited recovery credit outside of the quantitative scope. In the past, we have heard from industry complain to us that we didn't look at a particular B5B measure or maybe there was an

additional recovery that can be taken that is outside the scope of the procedures. Well, in this portion of the approach, such credit could be taken.

What we do afterwards, we apply them together and we come up with an aggregate rating, which would be our result for the particular SDP. And I will show in a simple diagram.

So, here we have the qualitative risk evaluation, which we are talking about this afternoon. Here we have the quantitative evaluation, which we do already. The two of them are going to be put together into this final determination table, which has, if you notice at the top, it has the traditional delta CDF, delta LERF ranges that we normally use. But on the lefthand side, we have the qualitative ratings that come out of this qualitative evaluation. And then, we apply the two to the table.

If you notice what is considered moderately degraded on this table, if you run across that line from moderately degraded, that particular row, you will notice that the color bands mimic that of the existing ROP for the existing fleet.

So, what were the qualitative measures that --

MEMBER BLEY: That kind of implies -- I hadn't thought about that part of this -- I'm not sure what

it implies. If the same thought structure were around before, that would imply that the phenomenal assumption is moderately-degraded defenses.

MR. CIRCLE: Well, I called it moderately degraded, and those names are actually arbitrary.

MEMBER BLEY: That's fine.

MR. CIRCLE: And after I defined those names, I realized that maybe I should have just given them unique non-descript identifiers.

MR. FRAHM: A, B, C, D, something like that.

MR. CIRCLE: Yes. So, that way, we wouldn't get into too many arguments. Because I know a lot of people looked at that and said, "Well, what does that mean? Does that mean that, from a deterministic standpoint, it is moderate? Well, it could mean that.

MEMBER BLEY: But you actually put some words to at least the first couple of those.

MR. CIRCLE: Yes. Yes, I did.

MEMBER BLEY: That seemed reasonable.

MR. CIRCLE: To make it easy and understandable. Because if I gave it unique identifiers, it would confuse everybody.

MEMBER BLEY: Go ahead.

MR. CIRCLE: Okay. So, I came up with four qualitative measures that we are going to look at for

this exercise. Now bear in mind that some of them may change, depending on the Commission's direction to us. But, right now, we are looking at defense-in-depth, safety margins, condition time -- and I will talk about that, what that means -- and qualitative credit.

MEMBER BLEY: I'm sorry, I want to ask you another question. In the existing process for current plants, you said the qualitative material can be included.

MR. CIRCLE: And should be.

MEMBER BLEY: And should be.

MR. CIRCLE: Yes.

MEMBER BLEY: But the bickering I have seen, when there is a disagreement between staff and the licensee -- and I haven't seen a lot of these; I have only seen a few cases -- seems to always focus on the quantitative part. Does it often --

MR. CIRCLE: Yes.

MEMBER BLEY: -- hinge on the qualitative part? Have there been many discussions there?

MR. CIRCLE: We have had cases -- and I have been through the process for many years, actually from the beginning of the licensee world -- yes, most of these events, most of these findings are usually on the quantitative argument.

There have been cases internally where we

have argued about qualitative merit of a particular finding. And the classic example is the finding that comes up to a delta CDF of 9.99E to the minus 7 per year, and the licensee is arguing with us that it is a green finding. But we have other mitigating, not mitigating, but actually other factors that point in the opposite direction; that it could be a white finding, and vice versa. We have had findings that were 1.05E minus 6, and then we were saying they are green. And even in internal agency discussions and arguments amongst the staff --

MEMBER BLEY: So, you have used the qualitative discussion --

MR. CIRCLE: Well, we have used it, and we have used it in our heads.

MEMBER BLEY: You have kind of structured it now --

MR. CIRCLE: Yes.

MEMBER BLEY: -- in a way that forces you to think of these things.

MR. CIRCLE: Exactly.

MR. FRAHM: It integrates the two together much better than we do today.

MR. CIRCLE: Right. Right, and it provides an easy structure because in the past what we have been

doing is we have been writing final determination letters to licensees, putting them in a paragraph or so, but not really explaining to them, I think, in-depth why we feel the way we do. This way, it leaves us a framework to make good risk-informed decisions.

CHAIRMAN STETKAR: Jeff, I will paraphrase Dr. Bley's use of the word "bickering".

(Laughter.)

You said that, up until this point, a lot of the discussion or disagreements, let's say, between the staff and licensee over a particular significance determination has been primarily based on those quantitative --

MR. CIRCLE: Right.

CHAIRMAN STETKAR: You know, is it 1.01E to the minus 6 or 9.99E to the minus 7? What are the sources of those quantitative differences? Are they differences between the SPAR model versus the licensee's model? Are they differences in data that you might use?

MR. CIRCLE: Most of the time, it is differences not so much in the model itself, but in certain elements of the model.

CHAIRMAN STETKAR: Okay.

MR. CIRCLE: It is sort of like human error probabilities come to mind, HEPs.

CHAIRMAN STETKAR: Okay.

MR. CIRCLE: Sometimes, you know, even though we may use different methods, maybe a licensee would use the THERP methodology and we would use SPARH. We find that it is the interpretation of the methodology is where we have the differences. Because the licensee may come to us and say about a certain human error probability that it is two orders of magnitude lower than what we calculated. And we will ask them, "Well, how did you do it?" And they will send to us the background. And then, we will look at all the credit that they are giving, and credit is sometimes in some cases too extreme.

CHAIRMAN STETKAR: Okay. Thanks. That helps.

MR. CIRCLE: Okay. Let me move on to the qualitative measures themselves. I will start off with defense-in-depth.

The definition of defense-in-depth is just about everywhere in Title 10, the Code of Federal Regulations, for every single thing, but it is not official and it is all over the map. I think that is one of the reasons why we have the Near Term Task Force Recommendation 1.

But the definition that I am using is that it is successive levels of protection, so that health

and safety will not wholly depend on any single element of the design, construction, maintenance, or operation of the plant. I look at it as individual barriers of potential accident mitigation. And as stated, you can find many examples of that peppered throughout Title 10.

Now, for this particular methodology, I have four impact ratings. And it just depends on what you see in a finding. So, if a particular finding at a plant has no impact to any barrier of defense-in-depth, I give it this impact rating of negligibly degraded. If there is an impact on one barrier, but without complete loss of that barrier, I will call it moderately degraded. If the finding causes a complete loss of only one barrier, that is degraded. And then, the loss of more than one barrier, we call it significantly degraded. So, if I have a finding that goes across the board and knocks everything out, that could be significantly degraded.

CHAIRMAN STETKAR: Jeff, before you leave this, I recognize that everything in Enclosure 2 is a concept and --

MR. CIRCLE: Right.

CHAIRMAN STETKAR: -- that Table 1 is a concept. On the other hand, these things tend to start taking on a life of their own very quickly. So, oftentimes,

it is important to understand the basis behind a concept.

And one of the things that I don't understand is that in the text and in Table 1, if defense-in-depth is negligibly degraded, the qualitative rating automatically becomes moderately degraded, and I don't care about any of those other qualitative measures. For the life of me, I can't figure out why that is.

Because if I have a negligibly degraded defense-in-depth barrier, it would seem that I really need to look at those other qualitative measures and find out where I am in safety margins and condition times, and so forth.

So, could you explain that to me?

MR. CIRCLE: Yes, and that is the first entry in the table.

CHAIRMAN STETKAR: It sure is. And I think for most events that I would expect to happen in the real world, I would probably discover that, based on these definitions anyway, that the barrier is negligibly degraded.

MR. CIRCLE: Yes, this is my neutral point. And I called it moderately degraded to get you into that part of the table, of the chart, that will follow the thresholds of the existing fleet.

CHAIRMAN STETKAR: And I will go back and

will say I still don't, for the life of me, understand what the heck that means.

MR. CIRCLE: Yes, and that has to do -- and I know it -- that has to do with what I mentioned earlier about giving them a certain name.

CHAIRMAN STETKAR: Okay.

MR. CIRCLE: That it was a poor choice of name to call it moderately degraded.

CHAIRMAN STETKAR: And so, I will use different terms. I will call them A, B, C, D.

MR. CIRCLE: Right.

CHAIRMAN STETKAR: And "A" means it is sort of, kind of really good; ain't no problem. I will use those sort of very descriptive terms. Why, if it ain't no problem, (a) don't I, then, also look at safety margins, condition time, and the possibility of qualitative credit?

MR. CIRCLE: Because, to use your term, if "it ain't no problem" in the qualitative world, it may be a problem in the quantitative world.

CHAIRMAN STETKAR: But don't mix that. This is defense-in-depth, though.

MEMBER BLEY: Yes. There seems to be, I mean, you talk about defense-in-depth, and then, you talk about safety margins. And you give kind of a general definition of safety margins. But when you actually

start using it, you seem to be applying it only to additional reduction or attacking of defense-in-depth, such that in the way I think you are using it, it would mean if you are negligibly degraded, then the safety margins don't affect it.

CHAIRMAN STETKAR: That's not my understanding. That is why I wanted to understand this.

MEMBER BLEY: Well, yes, that's not here, but it is in the chart.

CHAIRMAN STETKAR: Well, but the way the text describes it, it says that a degraded safety margin can rise up to, but not include a degraded barrier. In other words, a degraded safety margin is not as bad as a degraded barrier. It is something less severe.

MR. CIRCLE: If I have a degraded barrier, I would have a moderate degradation rate.

CHAIRMAN STETKAR: Yes.

MR. CIRCLE: It wouldn't be negligible.

MEMBER BLEY: John is really saying, if you have, I think he is saying, if you have a negligibly degraded barrier, you could still have eroded safety margins to the point --

CHAIRMAN STETKAR: Yes, and I could have had a piece of equipment out of service for six years and I could have, you know --

MEMBER BLEY: That is where we are having trouble.

CHAIRMAN STETKAR: -- still have another piece of equipment.

MR. CIRCLE: But my definition, then, this is a concept, again, but my definition is that, if you have an impact on any barrier without a complete loss of that barrier, is what you are describing in erosion, that is moderately degraded. It is not negligibly degraded.

MEMBER CORRADINI: I know, but I am listening to you guys go at each other, and it's like this (indicating). I think what they are asking is, given that, why don't you follow through on the other three criteria? Why do you skip it?

CHAIRMAN STETKAR: If anything at all goes into B --

MR. CIRCLE: Well, if I don't have any degradation, if you are talking about that first row --

CHAIRMAN STETKAR: Yes, right.

MR. CIRCLE: -- no degradation at all --

CHAIRMAN STETKAR: Right.

MR. CIRCLE: -- in defense-in-depth, I don't care about the safety margins at that point. I won't care about anything because, if I impact safety margins,

it impacts the barrier. So, you can't have a situation -- well, this is what I thought of the concept -- you can't have a situation where you erode the safety margin and not impact the barrier. You are not going to fail the barrier, but you are impacting it. Well, that brings it to the --

MEMBER CORRADINI: What do you mean by "impact" then?

CHAIRMAN STETKAR: Then I don't understand what the safety margin applies to. Because I thought I understood the safety margin.

MR. CIRCLE: Safety margin applies to the remaining barriers of defense-in-depth when we get to the safety margin.

MEMBER BLEY: That's the way you are using it.

MR. CIRCLE: That's the way I am using it, yes.

MEMBER BLEY: Yes.

CHAIRMAN STETKAR: Yes. That is what I would have said to start with. Okay.

MR. CIRCLE: So, that's why it is like an event tree that you have the first --

CHAIRMAN STETKAR: Okay.

MR. CIRCLE: -- sequence of an event tree,

and it passes right through because, if you didn't have the initial failure, you don't care about what happens to the rest of it; you are not going to go to core damage or to your unwanted state.

MEMBER BLEY: So, there is a little bit of disconnect in your storyline in the writeup on safety margins. You begin by describing them in the more traditional sense --

MR. CIRCLE: Yes.

MEMBER BLEY: -- but it is the engineering calculation and how close you come to a limit, essentially.

MR. CIRCLE: Right.

MEMBER BLEY: But, then, you go on and start speaking about it and using it in terms of actual degradation of the defense-in-depth barrier. And when you read it, you don't quite get what you are actually using it, how you are using it. I think you need to tell that story better.

MR. CIRCLE: Yes, and you are not just talking about the presentation; you are talking about the paper?

MEMBER BLEY: The paper.

MR. CIRCLE: Okay. Yes.

MEMBER BLEY: I am talking about the paper, period.

CHAIRMAN STETKAR: The presentation --

MR. CIRCLE: I will take a look at that because my concept for that is that the safety margin is something inside the barrier itself.

MEMBER BLEY: And you have kind of described that, but you also describe it in a more traditional sense where you wouldn't really have any degradation.

MR. CIRCLE: Right.

MEMBER BLEY: You don't have the safety margin from a unit that you were supposed to have, but you still haven't impacted that limit. You aren't close to it yet.

MR. CIRCLE: Yes.

MEMBER BLEY: And then, you start using it as if it actually is having an impact on the barrier. So, the two are integrally related in the way you are trying to use it, and the description of them reads more as if they are independent things. So, it is kind of hard to follow.

And since we have started this, I am, again, agreeing with John, it is conceptual. Your big table at the end where you put all these together has a couple of, to me, anomalies with respect to the writeup. So, I will just talk through it right now, and we haven't gotten to all this yet.

MR. CIRCLE: Well, when we get to it, just

point it out to me.

MEMBER BLEY: Let me do it right now, since we are on this thread.

MR. CIRCLE: Okay.

MEMBER BLEY: To me, as I read and am trying to see what you are doing in examples, defense-in-depth is your first one with barriers. And then, safety margins is almost a modifier on that.

MR. CIRCLE: Yes.

MEMBER BLEY: So, what we have got is some kind of logical combination of the two.

But, then, you come to condition time, and that is really, in a sense, you didn't write an equation, but that is in a sense more of a multiplier on these things. So, the first two are in a way additive. The third one is kind of a multiplier, and the qualitative credit one --

MEMBER SCHULTZ: It is kind of a multiplier, too --

MEMBER BLEY: Well, the way I read --

MEMBER SCHULTZ: -- or a divider.

MEMBER BLEY: The way you have got it in the table, it kind of is. But the way you write the words, it is very clean. And there, it says, if, in fact, there is a mitigation measure that has a good chance

to succeed, we will give credit. And that language says you really ought to look at this carefully, and to succeed would mean to make things better, to deal with those first two.

MR. CIRCLE: Right.

MEMBER BLEY: But there are cases where you don't give credit when you have credit. So, to me, it is like a subtractor. If you have credit, you ought to at least drop down a notch, if not a couple of notches. Or, if you don't take credit, you just stand with what you have.

And I know I am kind of guessing; you are worried about maybe how good the credit is, but that ought to be in the definition of the credit. If it is really there, it ought to make a difference.

MR. CIRCLE: But I do mention --

MEMBER BLEY: And it doesn't always. In fact, in about half the cases it doesn't.

MR. CIRCLE: Oh, you are talking about individual cases throughout the table?

MEMBER BLEY: Yes. This is conceptual, but it didn't follow through with what I was trying to build a mental model of how these factors ought to work against or for each other.

MR. CIRCLE: Right.

MEMBER BLEY: If you limit it, it does it, but I think -- and you don't have to do that now. This would be how you make it better later. But, still, I just wanted to tell you I don't think your model of how you built the table quite matches the words well.

MR. CIRCLE: Yes, and there are other considerations to take into account when you make some of these ratings. And it depends on what our feeling would be to certain findings. You know, would credit actually work in a case like that?

MEMBER BLEY: But, see, that is part of the definition. If it wouldn't, you shouldn't get it.

MR. CIRCLE: But I presented this as a concept.

MEMBER BLEY: Right.

MR. CIRCLE: I didn't want to get into too many of those details because, if we are directed by the Commission to actually forge ahead --

MEMBER BLEY: You have to work hard on that.

MR. CIRCLE: -- we are going to have to sit down and work out how each one of these ratings, what the overall qualitative rating is going to be.

MEMBER BLEY: Yes. And I thought especially on the first two, you really will have to build a structure that avoid ambiguity.

MR. CIRCLE: Yes.

MEMBER BLEY: And that is going to be a lot of work for you guys. It is not easy to come up with.

MR. CIRCLE: Yes, the first one we want to be qualitative neutral, so to speak, that we come out with a neutral rating, and then, we go to the quantitative table.

But, as far as the ones at the very bottom -- and I think you were looking at those -- you will notice that there was much of an improvement. That was done on purpose to see what would happen.

MEMBER BLEY: Yes, that's fine, yes.

One last kind of general comment. I wonder if you have run into questions about this, but I am sure you will. That is, mitigate an accident. You just use mitigation. Everybody knows what mitigate and prevent means, but there are always tremendous arguments here.

Mitigating an accident can mean a whole variety of things, and that seems to be the sense in which you have used it. Sometimes people talk about prevention is preventing a release and mitigation is mitigating that release if it happens.

Here mitigation often is preventing in a sense. So, I am not suggesting you change anything, but I think you could get tied in knots around mitigating

and preventing at some time. And you only use mitigating.

MR. CIRCLE: Yes, when I say mitigating, I mean after the fact.

MEMBER BLEY: Yes.

MR. CIRCLE: Preventing, you know, is usually taken to mean before the fact, except the case that you presented, which was prevents a release, and this is after the fact.

MEMBER BLEY: Prevent a sequence of events that leads to a release. So, there's lots of arguments about prevention and mitigation and --

MR. CIRCLE: It is actions that the licensee can take after the fact, after they know already that they are --

MEMBER BLEY: It might be worth a word or two to avoid arguments.

MR. CIRCLE: Okay.

MEMBER SCHULTZ: I think it is worth a paragraph, not just a word or two.

MEMBER BLEY: Maybe a page or maybe a different word. Because this can get you tied in knots. I have just seen that happen way too often.

MEMBER SCHULTZ: It should be clearly defined.

MEMBER BLEY: Yes.

MEMBER SCHULTZ: Let's leave it at that.

MR. CIRCLE: And a lot of this also was defined, I think, earlier in the SECY-99-007A when we issued that. It has to be consistent.

MEMBER BLEY: A paragraph is good --

MR. CIRCLE: Yes.

MEMBER BLEY: -- to make clear what you are talking about.

MR. CIRCLE: All right. If there aren't any more questions, I think I will just continue to the next element.

MEMBER BLEY: Good.

MR. CIRCLE: Okay.

MEMBER BLEY: Yes.

MR. CIRCLE: Safety margins. So, what I did is I looked at Reg Guide 1.174, and we consider those safety margins to account for this uncertainty in calculations. They fulfill a licensing requirement for licensing a design basis.

We have two flavors of margins, actually. We have the margins that are used for our licensing purposes, and then, the actual ultimate capacity of the system or component. And as most of you know, a good example could be how we do our accident design-basis calculations that you see in the FSAR. Sometimes the

margins that are used are very conservative versus what a particular component can actually withstand. But, for the context of this paper, I am taking the licensing limit as my maximum value.

And also, as I mentioned earlier, the safety margins that we will evaluate for this particular exercise are the safety margins for non-failed barriers or defense-in-depth. So, this way, I don't want to double-count the impacts, and I want to account for any erosions in safety margins of the other barriers that haven't been breached yet of defense-in-depth.

So, I have a very simple set of criteria for it. Again, no lost margin is negligibly degraded. Some margin lost, I am calling degraded, and if my margin is at the licensing threshold, that I will call significantly degraded. If it passes the threshold, we have lost the barrier. That was my thinking.

That brings us to condition time. And this is an unusual concept. It is evaluated in comparison with the plant's tech spec outage time. What we have been doing in the SDP was we have been looking at exposure time. So, when we do the quantitative analysis, we take exposure time, which is not necessarily the time that we have had the finding or the degraded condition -- it could be one-half of that time. It can be on some

failed-to-run findings. It could be working back of 24 hours' worth of operation until the particular performance deficiency was done. So, that time can slide.

This time is more of the tech spec allowed outage time.

MEMBER BLEY: Let me offer you something --

MR. CIRCLE: Yes.

MEMBER BLEY: -- on this one.

MR. CIRCLE: Sure.

MEMBER BLEY: When I read it, I really liked this concept and it is really getting at what the risk has been as a result of this finding. On the other hand, sitting here now watching it, if the exposure time, the condition time was fairly short because we had some system in place that catches it in a fairly short time, this is a measure that is really consistent with what the idea of risk is about. If, however, it is something that probably would have sat there for a year if we hadn't just stumbled across it, it kind of devalues the importance of a finding.

And it almost seems you have to think about that a little bit. Because it could be it happened yesterday and we stumbled across it just by accident. And normally, it could live in the plant forever. So, it could be a really bad thing, and we are discounting

it because the condition time was so short. And I am not sure how you deal with that, but I think you ought to think about it some.

MR. CIRCLE: Yes. Well, it will be picked up. Something like that would be picked up in the quantitative analysis. If you are talking about --

MEMBER BLEY: No, I'm not so sure about that.

MR. CIRCLE: Well, the way the process works, if they stumble upon something -- let's say the licensee had a performance deficiency.

MEMBER BLEY: Let's take the one example. You had this test on the diesels that wasn't done right, which allowed something to be there. In their example, it lasted three months or something like that, which is a reasonably-long time.

MR. CIRCLE: Yes.

MEMBER BLEY: So, it is important. But it could have been that a day and a half after the first time they blew the test, because they did it wrong or it was written wrong, the resident glanced at it and said, "Are you guys worried about this? This seems like it isn't working right." It wasn't anything systematic that got in there. It was just he walked in that day. Now that doesn't have much to do with anything that is in the quantitative analysis, I don't think.

MR. CIRCLE: Yes.

MEMBER BLEY: I will have to think about that some.

MR. CIRCLE: Yes. Well, you have to think about that. But there could be cases like that where the exposure time could be longer maybe than the condition time. That is something that we have to think about, those particular cases.

MEMBER BLEY: Uh-hum.

CHAIRMAN STETKAR: Jeff, this is one area where Dennis was thinking in the opposite direction from me, but I will throw this out also.

MR. CIRCLE: Yes.

CHAIRMAN STETKAR: Of the different qualitative measures that have been proposed, this is the one where I stumbled that it sounds an awful lot like doubly accounting for things. I mean, you tried to spend a lot of effort to make sure that that the qualitative credit was not something that is already in the PRA model; that the qualitative assessment of a barrier is not necessarily explicitly quantified --

MR. CIRCLE: Right.

CHAIRMAN STETKAR: -- and so forth.

This, as I understand the way that the exposure times are assessed in the SPAR models, or

whoever's models, it sounds like a substantial overlap. So, for example, if I have quantitative evaluation that looks at a condition existing for a year, and the quantitative evaluation doesn't care about tech specs; it just says it existed for a year.

MR. CIRCLE: Right.

CHAIRMAN STETKAR: And now I say, "Gee, because it existed for a year, and the tech specs only allow it to be out for three months, I am going to even further penalize them." Is that compounding the effects from that quantitative evaluation? Even if it was out for a year, it doesn't make any difference, let's say.

MR. CIRCLE: But, you see, that's the thing. We have to find a way to give it a qualitative evaluation based on that failure. You know, even though the times will overlap, I mean, it is one failure. It is one finding, one performance deficiency. So, we will look at it one way and we will look at time in the quantitative sense. And then, when we look at the qualitative sense, we have to look at time just as well, but we will look at it differently.

CHAIRMAN STETKAR: Okay. This is one area where I would have to --

MR. CIRCLE: Because we can't --

CHAIRMAN STETKAR: I understand what you're

saying, but --

MR. CIRCLE: Because we can't divorce it from time. And the way we have been doing this right now, when we have findings, for example, in the SDP for the existing fleet, a lot of times when we cite a licensee, we will cite them on the performance deficiency and maybe a potential violation. The violation comes out of the deterministic part, and they will look at the tech spec --

CHAIRMAN STETKAR: And that I understand completely, but that is a very specific deterministic --

MR. CIRCLE: Right.

CHAIRMAN STETKAR: It says it shall not be, you know, unavailable -- if it is unavailable longer than 30 days, you have to shut the plant down or something like that. That is not, though -- in a sense, it is this, but you are using this now in a new framework as effectively a multiplier on the quantitative results.

MR. CIRCLE: Yes. Well, it would be in this case.

CHAIRMAN STETKAR: Which is a different perspective.

MR. CIRCLE: It is. And I will give you a good example here.

CHAIRMAN STETKAR: Okay.

MR. CIRCLE: In a low of PWRs, containment

spray is not a very big risk contributor. So, if you have a containment spray pump out, let's say, for a year, you know, some outrageously long time, and if you look at the increase in CDF, in our process, in the quantitative portion, it may not be that hot. But having a containment spray pump out for a year from the deterministic side is a big deal. So, how do we capture something like that?

CHAIRMAN STETKAR: I understand --

MR. CIRCLE: The fact that it is out for three days may not be a problem. The fact that it is out for a year is a big problem. But, if you do the quantitative analysis, you may come up with something that is borderline --

CHAIRMAN STETKAR: Rather than using CDF, which is nothing, let's use large early release frequency, where the containment spray pump might show up if you did an actual Level 2 PRA --

MR. CIRCLE: Right.

CHAIRMAN STETKAR: -- which people don't have. But let's assume that you did, and let's assume, even then, that having one of your two containment spray pumps out for six years doesn't change your large early release frequency all that much.

MR. CIRCLE: Right.

CHAIRMAN STETKAR: Now that is what the real risk tells you. It is still you violated the law. You have to go to jail because you can't have one of those out, according to your tech specs. But the tech specs are not necessarily risk-informed. If you had risk-informed tech specs, you might have an allowed outage time on that containment spray pump of three years. You don't have that, though.

My concern, though, is going forward where people might have risk-informed tech specs, that accounting for this in the way that it is proposed, as essentially, I'll call it, a multiplier -- it is not quite that, but as a scaler on quantitative results -- might in some cases doubly penalize people in this context, not in the context of violating the law, whatever is written in terms of the technical specifications.

MR. CIRCLE: It will penalize them, but, remember, you are getting to this point from defense-in-depth and safety margins coming up to this place. So, it depends on how many barriers or how much of a barrier you have impacted, how much of the margins you have eroded away. And then, you land on this particular question.

MEMBER BLEY: Even in John's case, if he had a three-year tech spec, now he doesn't get in trouble

until he is beyond three years.

MR. CIRCLE: Exactly. That's a good point, yes.

MEMBER BLEY: And the PRA is assuming that he never goes beyond that limit. Very few PRAs account for the chance that you didn't do your maintenance as you are supposed to.

So, it is still a condition beyond what is analyzed there. So, I don't know --

CHAIRMAN STETKAR: But in the SPAR model, it is my understanding that, if he had had it out of service for three years, the SPAR model would take an exposure time that it was out of service for three years and seeing what the significance of that. Is that correct?

MR. CIRCLE: Actually, our process is written in such a way -- I don't want to get into too many details of the process -- but it is written in such a way that a year is the maximum time that you can --

CHAIRMAN STETKAR: All right, let's take a year instead of three years.

MR. SCHROEDER: -- for this process.

CHAIRMAN STETKAR: Fine.

MR. CIRCLE: That is why I go for a year.

MEMBER BLEY: But this isn't accounting for uncertainties and the like. And if you did that with

the SPAR model, it didn't include what things might happen if you had stayed out for a long time because you haven't the database to look at that. That is the same arguments we have had in areas where they are trying to relax these limits, and you are saying, well, you've got to make sure that we are not introducing new failure modes when you do that. So, I guess I don't quite see that.

But I want to go back to the one I raised --

MR. CIRCLE: Yes.

MEMBER BLEY: -- the other side of this.

MR. CIRCLE: Right.

MEMBER BLEY: And there is a lot of good about structuring this. It forces people to think about all of these pieces, which they might not have been doing before. Sometimes they did and sometimes they didn't.

MR. CIRCLE: Right, in their heads.

MEMBER BLEY: On the other hand, it gives you a formula. You don't have to think quite so much. So, if you had a case where whatever was done wrong, and whenever that was when it was found, it was really something that could be quite serious, and we just lucked out that we found it the day after it happened.

Under the old way, you would say, "Well, wait a minute. This is really serious, and I've got to go beyond my structure." Here there could be a

temptation to just follow the structure. My opinion is you still need to keep some room for going beyond the structure when an unusual condition occurs, and you need some encouragement to do that. And I know it is not your intent to do that, but it is a thing I worry about.

MR. FRAHM: That is an important point, though.

MR. CIRCLE: But going back to your example, this is based on until time of discovery.

MEMBER BLEY: That's what I mean.

MR. CIRCLE: So, using the context of your example, let's say --

MEMBER BLEY: But it is a real case, and if discovery was a fluke, and when you sat back and looked at it, you said, "In this plant, if this had normally happened, it probably would have sat here for two years before we ever found this. And it was good luck that we stumbled upon it the day after."

MR. CIRCLE: Many times when we give the licensee a violation, many times we look into that.

MEMBER BLEY: Well, I'm sure. My concern was, once we have structured this so well to pick things up, something like that could slip.

MR. CIRCLE: Yes.

MEMBER BLEY: So, I am not telling you what to do about it. I am just saying you need something to make sure we keep thinking about the things that are not quite within our structure, that aren't met well within the structure.

MR. FRAHM: Being overly-structured might not necessarily be a good thing.

MEMBER BLEY: Ninety percent of the time -- 10 percent of the time it might be just the wrong thing.

MR. FRAHM: Yes, but we do want to as objective and predictable as we can, but not overly. So, that is a great point.

MEMBER BLEY: That is all I was trying to get at.

MR. FRAHM: I wrote that one down. That's a great point.

MR. CIRCLE: We are not going to paint ourselves into a corner. And I know that is what your concern is.

MEMBER BLEY: And you don't see that you have done it until --

MR. CIRCLE: Yes.

MEMBER BLEY: -- three years later, when something bad did happen that you could have caught, you know.

MEMBER SCHULTZ: It is important to discuss in the original set out of the process that other 10 percent, so that it doesn't become a cookbook, and this is what was meant; this is how it is going to be done, because there are other features that ought to be taken into account.

MR. CIRCLE: Right, and this needs a lot of fleshing-in. You are absolutely right.

MEMBER SCHULTZ: It does.

MR. CIRCLE: There is more to it that needs to be written. We just put this together as a quick-and-dirty way that we can assess it, using a qualitative methodology. And we will leave it up to the Commission to direct us otherwise.

MR. FRAHM: But that is an important fact that I wasn't really considering. When I was thinking about this, I was thinking we want it as structured as it can be.

MEMBER BLEY: Yes.

MR. FRAHM: But you're right, if you structure it too much, you might just -- you could just spit it into a computer and have them give you the answer. And we don't quite want that, either.

MEMBER BLEY: People become that when --

MR. FRAHM: Yes.

MEMBER BLEY: -- it is working well.

MR. FRAHM: Well, that's a good point.

MR. CIRCLE: And that's human nature. We have seen this with the quantitative part of the SDP, where management and all the stakeholders, management and licensees will look at it and say, "Well, just run this number and give me this number."

MEMBER BLEY: Yes.

MR. CIRCLE: And we try to tell them it is not just the numbers; it goes beyond the numbers. You really have to think about the impact of this particular performance deficiency and what it means. We know that.

MS. FRANOVICH: If I could just chime-in here? Rani Franovich, NRR staff.

The significance determination process is used to characterize the significance of inspection findings, which are then inputs into the action matrix that we use to determine level of NRC inspection.

So, if we believe that the process in its predictable, transparent form gets us to an outcome that warrants some additional action above what the outcome would designate, the staff always has that option of deviating from the action matrix, because there are some unique circumstances that made this particular finding of more concern than what the significance determination

process would yield or less concern. So, that is always a tool available to the staff under the ROP framework. I just wanted to add that.

MEMBER SCHULTZ: I guess changing the framework in this way -- and a lot of work is going into the process of changing it -- we would also like to, therefore, capture some of the features that are only -- I don't want to use the word "qualitative," but are only a secondary feature of what we currently have.

And that is, since we are going ahead and structuring this in the way that we have described with qualitative measures, you can go back over this and exam what the product is, and then, examine whether those behaviors that you would like to encourage are captured in the process.

For example, the way I see this running down from Dennis' comments is it is not encouraging questioning attitude, the behavior of questioning attitude. It would be nice if the process itself could, in fact, capture that and encourage that behavior.

So, in other words, you are talking about credit for recovery, for example. And you were talking about, essentially, credit for questioning attitude.

MEMBER BLEY: Yes.

MEMBER SCHULTZ: It is discovered by the

licensee. It can be incorporated in and would be a --

MR. CIRCLE: Yes, this could be an example of what the qualitative credit can be. Yes, it is a good point.

MEMBER SCHULTZ: Thank you.

MR. CIRCLE: As far as the process is concerned, you know, if this gets worked into the existing process, we do have a continuous improvement process. We have a feedback process. So, we are always adjusting things and looking for ways to streamline this as much as we can and make it as understandable for all the stakeholders.

MEMBER SCHULTZ: I like understandable better than streamlining.

MR. CIRCLE: Well, yes.

MEMBER SCHULTZ: I'm concerned about streamlining.

(Laughter.)

MR. FRAHM: You don't want to cut too much out in streamlining.

MEMBER SCHULTZ: Automation and streamlining. Yes, I agree. I understand.

MR. CIRCLE: So, on to qualitative credit, and that is a perfect segue. We are calling it a risk-informed measure to credit operator recovery

activities not normally covered in the quantitative analysis.

So, in the quantitative analysis in many cases where we have a finding, we run it through our SPAR model, and we give recovery based on a series of rules. One of the rules is that operators, the licensee needs procedures on how to proceed, and we would like them to be procedures that operators are trained on, et cetera.

But in many cases you may find that a licensee will come back to us after we do an evaluation and say, "But wait a second. We've got this B5B pump that we use." Or "We have another action that is really guided by the Technical Support Center." And under certain conditions, the conditions that you are modeling, the TSC is going to be activated and we're going to give them instructions on how to proceed. And they would like us to give them credit.

And in the past, the way we have worked it is, as I mentioned earlier, we would look sometimes at the final CDF, delta CDF or delta LERF consideration, and we would just try to move it up, slide it up and down around the threshold to give the licensee credit.

Here I structured it, and I called it qualitative credit, but there are limitations to this

type of credit. Because if you do a human reliability analysis on some of these activities, you will find that it is pretty much in maybe 10 to the minus 1, like a .1 to .9 range. So, it has the greatest potential of maybe shifting the final result down by an order of magnitude or in our process by a color band.

So, the criteria is very simple. Okay? We have staged and tested equipment with sufficient guidance for operation which hasn't been credited in quantitative analysis, and we may be able to add in something about culture maybe; in other words, no credit. It is very simple.

Do you have a question, John?

CHAIRMAN STETKAR: Let me try something, because I am also curious how this would be applied. Suppose I have the quantitative results. I have run the condition through the PRA model.

MR. CIRCLE: Yes.

CHAIRMAN STETKAR: And I have contributors to the delta CDF that involve a number of operator errors. Operators could have cross-tied auxiliary feedwater. They could have depressurized for low-pressure injection or low-pressure feedwater. They could have initiated feed and bleed, but they didn't because of the human errors. Do they get credit for now having another portable

diesel-driven pump that they can hook up to the steam generator?

MR. CIRCLE: That comes under the heading of dependencies.

CHAIRMAN STETKAR: Well, yes, it does. It certainly does.

(Laughter.)

MR. CIRCLE: And what we will do is we will try to quantify those dependencies on the first go-around --

CHAIRMAN STETKAR: Let's say you did that.

MR. CIRCLE: -- when we did quantitative analysis, and we take that into account.

Now, for the qualitative writing, we haven't really thought this out yet. But you are bringing up a very good point. Because let's say we have a licensee -- and we are not going to name names here -- let's say we have a licensee that in this particular case has really screwed up to such an extent that we don't have confidence. Even though they may have this super-duper pump that would mitigate core damage, that particular scenario that we have in our top cut set involves all these human error probabilities with a dependency factor. And now they are telling us, "Well, this case is easy because we have the super-duper pump and we will hook

it up."

That is why I give it the maximum of one order of magnitude credit.

CHAIRMAN STETKAR: But one order of magnitude is a big, big number, and it is not just human error dependencies. It is if in my plant I have -- and I'll pick a number -- 25 different pumps that I can use, and I know I have to get one of those pumps hooked up and pumping water within an hour, I obviously can't send 25 different people to independently scurry around and try to hook up 25 of those pumps. I have some sort of list of priorities, each of those pumps.

MR. CIRCLE: Right.

CHAIRMAN STETKAR: I try on pump No. 1 for a while, and that doesn't work. And maybe I have two people working, and they try on pump No. 1 and 2.

MR. CIRCLE: Right.

CHAIRMAN STETKAR: And by the time it gets to three-quarters of an hour, I say, "Oh, my God, I have to go to see if I can get" -- now what do I do, pump No. 3 or the super-duper pump out in the yard? Or what do I do?

So, it is not just the fact that Operator No. 1 might be dependent on Operator No. 2 because they are receiving common direction. It is how much stuff

can I take credit for in a given time window. And just having one more pump available doesn't necessarily give me a factor-of-10 reduction in risk.

MR. CIRCLE: You are absolutely right. I didn't write that guidance in.

CHAIRMAN STETKAR: Yes. Okay.

MR. CIRCLE: This is really high-level.

CHAIRMAN STETKAR: But I'm trying to understand how it would be implemented in practice.

MR. CIRCLE: That is something that has to be fleshed-in. You know, as a guide, what kind of credit do you give? What are the times when you give credit?

Because that's true; if a licensee comes back and says, "Yes, we've got all this equipment that we can use," and you start to look at it and you realize that it is one to a customer, they can only use one.

CHAIRMAN STETKAR: Sure.

MR. CIRCLE: And they can't go out and use the second or third one. They wouldn't have enough time. We would have to take that into consideration, I think, yes.

CHAIRMAN STETKAR: That didn't quite come through because --

MR. CIRCLE: Oh, no.

CHAIRMAN STETKAR: -- just the fact that

that piece of equipment, or perhaps that action or perhaps somebody sitting in another room directing that action, aren't modeled in the PRA doesn't necessarily mean that the PRA hasn't effectively used up most of the available options.

MR. CIRCLE: Yes. No, it is something that we would have to put in.

CHAIRMAN STETKAR: Okay.

MR. CIRCLE: If we were directed to write this guidance, we would have to actually put down guidance and how to give qualitative credit because we can't just give it out freely like this.

CHAIRMAN STETKAR: I certainly agree with the whole concept. I mean, that is obvious that there's stuff that is in the PRA and stuff that isn't. But how do you account for that?

And then, you say, "Well, it's only an order of magnitude." That's --

MEMBER SCHULTZ: Maximum of.

MR. CIRCLE: Excuse me?

MEMBER SCHULTZ: You said a maximum of an order of magnitude.

MR. CIRCLE: A maximum, yes. It could be anywhere from .1 to .9. Obviously, at .9, it is not going to buy you very much. So, that is why I said it

is within that band, within that range, yes, as an order.

But, you know, a lot of times, also, you have got to realize that, when you are talking about human error probabilities that high, the actual reliability of the component starts to factor into things. Because maybe it wouldn't start. Especially if you have turbine-driven pump, it starts creeping up.

CHAIRMAN STETKAR: It is some of the sense of -- and again, you know, we have already acknowledged that this is a conceptual framework.

MR. CIRCLE: Yes.

CHAIRMAN STETKAR: But qualitative credit that takes a low yellow to a high white is a lot different from qualitative credit that takes a high yellow to a low white, for example.

MR. CIRCLE: That's true. But, for the case of our process, you know, as I mentioned earlier, this is not true 100-percent PRA.

CHAIRMAN STETKAR: Right.

MR. CIRCLE: It is "PRA light". It is a PRA-style analysis just to marshal inspection resources and regulatory response to a particular performance deficiency.

CHAIRMAN STETKAR: Okay.

MR. CIRCLE: I wanted to talk about the last

one, the overall qualitative rating. So, we go through this table, or it could be, also, a decision tree, and we come up with an overall qualitative rating. Okay? So, we apply the impact ratings to this, and this is developed in our Commission paper as a conceptual example. Okay? And that rating is applied to the following table, and a lot of you have seen this table already and we have discussed it before.

So, across the top, we have got the delta CDFs and delta LERF. On the lefthand side, we have got the qualitative ratings from negligibly degraded down to significantly degraded. And we have got the colors to use.

And this is a concept, actually, I took from our senior-level advisor, Steve Lauer in our Division. He put something together like this as a proposal for 0609, Appendix M, that Ron had mentioned earlier. And I looked at that and I said, you know, this is a good way to actually do this.

MEMBER CORRADINI: So, can I go back to that? I want to make sure I understand.

MR. CIRCLE: Sure.

MEMBER CORRADINI: So, within any one column, you would proceed from what it would have been down to different levels based on the qualitative

analysis?

MR. CIRCLE: Right.

MEMBER BLEY: It would have been moderately degraded.

MR. CIRCLE: Or it can actually go up. Because if you have qualitative credit, you can actually move it up a notch in the qualitative rating, which could move it up a notch in the color rating.

MEMBER CORRADINI: Okay. Then, I thought I understood this, but I don't. I guess what I was searching for on this is -- you guys know much better than I about this. But what I heard you say at the very beginning is you are trying to, I'll use the word "codify," but let's say "regularize" what you are already doing? So, given that, and nothing else changes, as I read the draft, then I am looking for a line that says, "What would it be if I didn't apply the qualitative ratings?" And I assume that line is the negatively degraded line.

MR. CIRCLE: Moderately degraded. No, the moderately-degraded line. In fact, I had mentioned that earlier.

MEMBER CORRADINI: And I missed that.

MR. CIRCLE: Yes. Moderately degraded is the neutral; I call it the neutral position. This is where it matches up the existing SDP process for the

quantitative --

MEMBER CORRADINI: Okay. Okay.

MR. CIRCLE: So, you understand?

MEMBER CORRADINI: Thank you very much. I missed that.

MR. CIRCLE: Yes.

Sometimes I think I should have called it just neutral, but live and learn.

MEMBER CORRADINI: But now, then, if I might?

MR. CIRCLE: Sure, go ahead.

MEMBER CORRADINI: So, your point -- I want to make sure I get this right -- your point is, and maybe this is too simplified, the proposal is that if the four levels, the qualitative levels you would go through are all negligibly degraded, they could bump up?

MR. FRAHM: Yes, it could, sure.

MEMBER CORRADINI: Okay.

MR. CIRCLE: Yes.

MR. FRAHM: The PRA numbers could say it is a low white, and the qualitative factor actually puts it into green. That could feasibly happen.

MEMBER CORRADINI: Okay. Thank you.

MR. CIRCLE: Okay. Now we go to the second part of the presentation, which are the examples. And I am only going to go through one example. In the paper

I believe I have three examples that I showed.

The criteria for choices for the examples were derived from experience with findings encountered in the existing operating fleet. Obviously, we didn't have findings in the new reactors. And so, we have to take the findings that we knew that had occurred, that were common in the existing fleet, and somehow superimpose them on the new reactor designs.

I considered the tabletop exercises that were done for SECY-10-121 and described in 12-081. These were the SECY documents that I had mentioned earlier that we had gotten involved with in the periphery.

And I wanted to show how the quantitative and qualitative assessments could work together. Now, for the quantitative part of the examples, I used the SPAR models that were developed for the new reactors. They were developed by our contractors at Idaho National Labs. I only looked at delta CDF because life is too short.

(Laughter.)

The new reactors NSSS that I considered for these exercises, the examples, were the USAPWR, which is a Mitsubishi design; the AP1000, which is also a PWR, and the advanced boiling water reactor.

So, the one I am presenting here this

afternoon is the turbine-driven, emergency feedwater pump for the USAPWR. So, a very simple description of the EFW system. Of course, like it does in its existing fleet counterpart, it removes decay heat through the steam generators. It is in standby mode during operations when normal feedwater is unavailable.

There are two turbine-driven pumps in this design and two motor-driven pumps. So, it differs a little bit from the existing fleet. And if I am not mistaken, each pump is designed to feed one steam generator with DC-powered cross-tied valves.

So, let's make up a performance deficiency for this example. So, what I did is I chose a very high-level one, improper testing and maintenance resulting in unavailability of EFW pump alpha until detected.

And what I did is I went and diverted into two different cases with and without qualitative credit, just to show how the qualitative credit could work in this type of an assessment. I chose a three-month failure condition leading up to discovery. And just for the sake of this exercise, I said, although inspected and found available, we had an extensive condition existing for the other pumps which had the potential to render the other defense-in-depth elements unavailable. So,

there might be something that goes across the system boundary and might impact another system, which would impact defense-in-depth, just for this exercise.

So, what I did is I ran the SPAR model, quantified it, and for a three-month exposure time, I got 7.7E to the minus 6 per year, which numerically at our quantitative end would give us a white finding.

Now, for the qualitative measures, I put everything on this little table. For defense-in-depth, I gave it a moderate degraded rating, since EFW impacts defense-in-depth but doesn't cause a complete loss of a barrier.

What I did for safety margins is I chose an example that has an extensive condition just to show that it could impact safety margins of other defense-in-depth elements. And I did that just for the sake of this exercise. So, I get a degrade rating for safety margins.

For condition time, three-month, I assumed -- and I don't have a copy of the USAPWR tech specs with me -- but I assumed that it is more than twice the allowed outage time, being three months. So, I gave it a significantly-degraded rating.

And then, this is where I bifurcated into two qualitative credit cases. Case 1 is the licensee

presents us with a portable pump as a possible recovery. This is the B5B case that I was talking about, something that wasn't proceduralized earlier.

And then, Case No. 2 is the licensee has no other means of recovery for this particular case.

So, running that through, I have my CDF, which is 7.7 minus 6 per year. I take it into my table, and I go into that second column from the left, which is my minus-6-to-minus-5 range. And then, for my recovery cases, the top arrow, if I give it qualitative credit, it falls on white. If I give it no qualitative credit, it could fall on yellow. Actually, I'm just looking at it now.

MR. FRAHM: If you hit it again, the next piece will come up.

MR. CIRCLE: Yes, that's right. Okay. There we go.

White in yellow.

CHAIRMAN STETKAR: So, let's go back to your picture. Let me try something.

Dr. Corradini first.

MEMBER CORRADINI: No, you go first.

CHAIRMAN STETKAR: Thank you.

So, in this particular case, the quantitative results from the PRA model taken by themselves would

give you a white finding, white significance finding?

MR. CIRCLE: Right.

CHAIRMAN STETKAR: Applying the qualitative measures, you might conclude that the finding was either yellow or white, depending on how much credit you give for that qualitative credit. So, in effect, the qualitative measures, if I ignore the qualitative credit, which by definition is not in the PRA, so I just take that out because that could be applied regardless of whether I am using quantitative or qualitative.

MR. CIRCLE: Right.

CHAIRMAN STETKAR: Application of the defense-in-depth, safety margins, and condition time would increase the significance from white to yellow. And then, we can argue about whether or not the qualitative measures, a qualitative credit allows a reduction to white.

MR. CIRCLE: Right.

CHAIRMAN STETKAR: Okay.

MEMBER CORRADINI: Okay. Since now you understand it, I'm lost. You said, without a qualitative credit, it is white.

CHAIRMAN STETKAR: No.

MR. CIRCLE: That's right.

MEMBER CORRADINI: Well, he said, without

qualitative credit, it is white. That was on the previous slide.

CHAIRMAN STETKAR: Without consideration of any qualitative issues.

MEMBER CORRADINI: So, what I understand --

MR. CIRCLE: Yes, let me explain it.

MEMBER CORRADINI: Yes.

MR. CIRCLE: The first half is the quantitative part.

MEMBER CORRADINI: Yes.

MR. CIRCLE: That's the numeric part.

MEMBER CORRADINI: Yes.

MR. CIRCLE: There are two halves to this. So, one half is the quantitative part; the other half is the qualitative part.

So, if I run the numbers alone, I get one answer.

MEMBER CORRADINI: Which is white.

MR. CIRCLE: Which is white. If I look at it from a qualitative standpoint, it brings it up higher because it is more serious from the tech spec --

MEMBER CORRADINI: Higher meaning it starts turning yellow?

MR. CIRCLE: It starts turning yellow. So, it goes up to a higher severity.

MEMBER CORRADINI: Then, I don't understand why you say no qualitative credit because you are applying qualitative credit.

MR. CIRCLE: Well, I presented two cases for this --

CHAIRMAN STETKAR: Now credit --

MEMBER CORRADINI: Let me go back to that.

CHAIRMAN STETKAR: Just don't use the word "qualitative". Without consideration of any qualitative factors, it would have been white.

MEMBER CORRADINI: Right.

CHAIRMAN STETKAR: They considered qualitative factors --

MEMBER CORRADINI: And it could be white or yellow.

CHAIRMAN STETKAR: It could be white or yellow, depending on whether I give them credit for these other things.

MEMBER CORRADINI: Right. And that qualitative credit --

CHAIRMAN STETKAR: If I don't give them credit for the other things, it would be yellow. If I give them credit for the other things, it would be white.

MEMBER CORRADINI: The "other things" is

the fourth category?

MR. CIRCLE: Right, that qualitative credit, that pump, the super-duper pump, so to speak.

MEMBER CORRADINI: Okay. Thank you.

MR. CIRCLE: Yes.

MEMBER SCHULTZ: Jeff, can we go back one slide? I want to understand how you determined the ratings that you have, the qualitative rating, given the elements that you have got there, before you get to the credit.

Condition time, isn't that incorporated into the delta CDF evaluation?

MR. CIRCLE: Well, it is actually -- and we have had this argument before -- what they said are in the CDF is the exposure time, which may be a different time than the condition time. There are rules on how we apply exposure time in different cases.

For example, we have the one-half lambda T rule, which we take one-half the time. If we have something that is degraded and we don't know exactly when it failed, between the time the performance deficiency was committed to the time of discovery, we could take one-half of that time because that makes the assumption that the failure rate is almost like a Gaussian distribution across the span of that time. So, we can do that.

The other type of time calculation we do for exposure time has to do when something has failed to run. It ran for maybe an hour or a short amount of time and then failed. Well, we don't say it failed immediately. From the time of the performance deficiency, we actually count backwards and we look at something.

For example, if a performance deficiency was committed, let's say, a year ago, but a diesel generator, and it was tested every single month, and it passed its surveillance test. And now, maybe six months later, they run that diesel for surveillance. It runs for two hours and then mysteriously fails.

We won't take the one-year period as the exposure time. What we will do is we will go through the records and we will see how many hours did they run that diesel for every successive test. And a lot of times they run diesels more often than the one-month performance. Sometimes every two weeks they will run it or maybe they will run it for three hours or four hours. We work our way back until we get 24 hours of accumulated runtime within that one-year period, and we count that as the exposure time.

So, that is a totally different time calculation than what this is. This is just a pure

deterministic tech spec time.

MEMBER SCHULTZ: So, when you come up with, if it doesn't have credit, without credit, it is going to be determined to be degraded. That is some average of what you have up there in rows A, B, C?

MR. CIRCLE: Well, yes, and, in fact, that is --

MEMBER SCHULTZ: There you go.

MR. CIRCLE: Yes. Yes. For the two cases, yes, we have moderately degraded if we have credit. We have degraded if we don't have credit. That is just a rating that we came up with using this.

MR. FRAHM: Those arrows should really be pointing us over here to these two points, yes, if that makes more sense to you.

MEMBER SCHULTZ: Right. That makes sense. I just --

MR. FRAHM: Yes, that is where they should really be pointing, and then, you refer to those two --

MEMBER SCHULTZ: But when you say, "That's what we came up with," you look at this table that you showed on a past slide, a previous slide. And then, you are going to make a determination?

MR. FRAHM: Right.

MEMBER SCHULTZ: It is not a mathematical

combination of A, B, and C. It is --

CHAIRMAN STETKAR: Well, it is simply that Table 1.

MR. FRAHM: Going through that decision tree or table.

MR. CIRCLE: This part is the mathematical part.

MEMBER SCHULTZ: I understand that part, yes.

MR. CIRCLE: I mean down here.

MEMBER SCHULTZ: Exactly.

MR. CIRCLE: This part is totally qualitative coming off of here.

MEMBER SCHULTZ: Based on the evaluation done that is shown on the previous table?

MR. CIRCLE: Right.

MEMBER SCHULTZ: So, you are looking at A, B, and C, and you're saying, "Well, that's going to fall into the degraded category without credit."?

MR. CIRCLE: And I just chose this example as a way to see how qualitative credits factor into an assessment for this particular case.

CHAIRMAN STETKAR: Before you go to the next slide, I have been debating with myself when I should say this. So, I will say it now since I had one vote

to say it now.

I took the same example and I looked at Enclosure 3. And there is a table that compares the tabletop exercises with the application of relative risk measures and something else with seismic that I will talk about later.

And the example isn't exactly the same because the exposure periods are different.

MR. CIRCLE: Yes.

CHAIRMAN STETKAR: So, your 7.7 times 10 to the minus 6 is somewhere between the 3.4 times 10 to the minus 6 and the 2.2 times 10 to the minus 5 that are shown in that table for one turbine-driven USAPWR emergency feedwater pump being out of service.

So, I just apply the relative risk measures in Enclosure 3, I am guessing -- and it is probably a pretty good guess -- that I would get somewhere in the upper yellow significance from the relative risk thresholds, quantitatively.

MR. CIRCLE: This is for a year exposure time? Because this table is the one-year.

CHAIRMAN STETKAR: Yes. That's right. So, it is not as bad as the 2.2 times 10 to the minus 5 from the SPAR model. I don't know why the SPAR model gives me 2.2 times 10 to the minus 5 and the Mitsubishi model

gives me 3.4 times 10 to the minus 6, but I will allow that 7.7 is somewhere between those two, which is why I am saying it is probably in the upper yellowish area, probably not in the reddish area.

MR. CIRCLE: That I can't answer you why --

CHAIRMAN STETKAR: Okay. And I don't care. My only point is that, without all of the other qualitative stuff, I would have come up with the yellow. Now we can argue about whether we take credit for the other super-good pump.

MR. CIRCLE: Right.

CHAIRMAN STETKAR: Okay. I did that for all three of your examples, and I came out, using the relative risk measures, with exactly the same color band as you did for your qualitative measures.

MR. CIRCLE: And when Eric makes his presentation on relative risk, we will discuss some of the pros and cons --

CHAIRMAN STETKAR: Okay.

MR. CIRCLE: -- and some of the pitfalls and obstacles we would have in using the relative risk approach. Because I'll tell you, I'll be honest with you; I like the relative risk approach.

And it was one of my ideas back two SECY papers ago. But I am a realist and I work in NRR. I

am involved in regulation, and I know that it is very difficult for all stakeholders involved, not just the regulatory, but the licensee as well, to put together a program using these relative risk measures. There are many, many pitfalls that you can get involved with. But I am going to leave that up to Eric.

CHAIRMAN STETKAR: Yes. No, we will hear about that after the break. I was going to wait until after we had the other part, but I looked ahead and this is the only place where I got a chance to get numbers into an example.

MR. CIRCLE: But you got it off your chest, right?

CHAIRMAN STETKAR: I did.

(Laughter.)

MR. CIRCLE: Gotcha. For now. For now.

CHAIRMAN STETKAR: It will come back.

(Laughter.)

MR. CIRCLE: Oh, yes, but I won't be speaking at that time.

(Laughter.)

CHAIRMAN STETKAR: But you are the one who dreamed up the example.

MR. CIRCLE: Well, I dreamed up the example based on what was done for the SECY paper two papers

ago.

CHAIRMAN STETKAR: Uh-hum.

MR. CIRCLE: So, it is not really my example.

CHAIRMAN STETKAR: Okay.

MR. CIRCLE: I had some better examples, but they didn't follow this.

So, a lot of this is what much of you have been mentioning before. Future developmental considerations:

We have to avoid double-counting. That is an important thing.

We need to develop guidelines for the application of qualitative credit. So, yes, I realize that. We don't know the number of qualitative developments and impact ratings we could find and use. I mean, we may decide to meld a few of them together.

We have to account for scoping changes in the SSCs in and out of tech specs because the new reactors are so much different than the existing fleet. We might have a technical requirement manual, and some items may be put into that instead of into tech specs, how we are going to account for that. We haven't worked that out yet.

We have to develop a framework for the impact and overall qualitative ratings. You are absolutely

right, we have to go back to that Table 1 and redo and really make sure that we have the right rating.

And, of course, we have to account for uncertainty. Now uncertainty is inherent in the process because, you know, we have got margins and defense-in-depth, but we still have to take a look at uncertainty.

So, in conclusion, our approach, we think it is an appropriate means to identify potential significant performance issues that would not otherwise be revealed by risk calculations. We want to be sure that it provides a clear and efficient way to ensure reliable and predictable regulatory responses within our ROP framework. But we realize that it is only a concept at this point and further development is warranted.

And with that, I conclude my presentation. If you have any more questions, I will be glad to take them.

MEMBER SCHULTZ: I just have one comment on the last two slides, and that is on the title of page 36, "Future Developmental Considerations". It seems that a better discussion or a title for the discussion would be, if it is determined to move forward with this approach --

MR. CIRCLE: Right. All this is going to --

MEMBER SCHULTZ: -- and a set of measures are selected, then it is imperative to assure that all of these elements are addressed.

MR. CIRCLE: That is an important caveat.

MEMBER SCHULTZ: This is not something out in the future. This is, if this is going to happen --

MR. CIRCLE: Exactly.

MEMBER SCHULTZ: -- then one must do these things.

MR. CIRCLE: Right.

MEMBER SCHULTZ: Thank you.

MR. FRAHM: That didn't fit in the little box they gave us -- (laughter) -- but that is exactly right.

MR. CIRCLE: Actually, I originally had it, and it was too busy. So, I took it out. But I did put in a little header "If selected," "If" --

MEMBER SCHULTZ: I am really not thinking of the presentation as much as the document --

MR. CIRCLE: Right.

MEMBER SCHULTZ: -- that is going to the Commissioners.

MR. CIRCLE: And we made that very clear.

MR. FRAHM: And I think it is clear. And

if it is not, that feedback will be appreciated.

MEMBER SCHULTZ: Okay.

CHAIRMAN STETKAR: Actually, truth be told, Ron and Jeff, when I read through -- of course, I'm biased, obviously -- but when I read through the enclosure and the paper, I actually didn't get the same impression about the amount of effort that would be needed to flesh-out this, the qualitative approach.

And I think that is partly because in the enclosure I have that three-page -- I think it is three or it might even be four pages long -- table that looks like, my God, we've put a lot of thought and a lot of effort into this already, that there isn't much additional effort needed. And in the supporting kind of guidance little tables, you know, degraded, significant, whatever those things are, those also sound like there has been quite a bit of effort placed in there.

So, you may want to think -- and a lot of what we have heard back this afternoon says, well, yes, we do need to think quite a bit about some of this.

MR. CIRCLE: I think we will put that, maybe we will write a paragraph in the paper, you know, stating that this is not set in concrete, and that there are things that need to be fleshed-in before we can go ahead, if they choose to have us develop this.

Yes, the reason why the table was so detailed was that I needed to work the examples in.

CHAIRMAN STETKAR: Sure. No, I understand.

MR. CIRCLE: I had to find something, some way to do it.

CHAIRMAN STETKAR: Yes, yes. Part of the reason that I bring that up is we are going to hear after the break a lot of the downside of the relative risk focuses on level of effort required to actually make the thing work; whereas, I don't get that same impression about the level of effort required to make this part of the process work.

MR. CIRCLE: Yes, there is a level of effort to this, but I think in the relative risk case -- and again, I don't want to steal Eric's thunder -- I think there is more --

CHAIRMAN STETKAR: Okay. We will hear about that.

MR. CIRCLE: -- that is involved in doing that than implementing this.

MEMBER BLEY: Just a couple of followup -- oh, go ahead.

MR. FRAHM: I was just going to add, I think level of effort in implementing this is a series of public meetings to hash out the details, which is pretty much

what we do routinely with the ROP already. So, this is a much more streamlined approach to make improvements going forward.

MEMBER BLEY: I just wanted to follow up with two things, one on that same thing. Of course, you have the one sentence that says, "Therefore, it is conceptual in nature." You kind of have to read between the lines and do some experimenting to get a feel for how much work you need to do to make this coherent and workable. So, I think that paragraph upfront that talks about that a little, you know, it is you are looking for the right to go ahead and flesh this out. And I think that is important to get in.

Pages 2 and 3 toss around uncertainty in a few different places, and they don't feel wholly consistent. You might look that over and see if you want to come up with --

MR. FRAHM: Are you talking about the Enclosure 2?

MEMBER BLEY: Yes, Enclosure 2, yes.

MR. CIRCLE: Yes, actually, yes, you're right with uncertainty. Originally, we had that in as a fifth element.

MEMBER BLEY: You did, and it is still there on the one line.

MR. CIRCLE: Yes.

MEMBER BLEY: And then, it goes away. So, you have to kind of work that out in your head.

MR. CIRCLE: I will take a look at that and we will --

MEMBER BLEY: I think you could easily clean that up, but it is worthwhile.

MR. CIRCLE: Thank you.

MEMBER BLEY: And I guess I had one more thing. Looking at the agenda, Ron's 15-minute talk was only five minutes, but we needed that time, but it left off the summary of the paper.

MR. FRAHM: Right, and we will have that at the end.

MEMBER BLEY: Okay. If we are going to have it at the end, then I will just wait because I had some comments about the paper.

But Enclosure 2, I think you are really on the right track. I think it is useful.

MR. FRAHM: Okay. Thank you. Good. Thanks. We appreciate the feedback.

CHAIRMAN STETKAR: Anybody else want to beat up Jeff while we still have a chance?

MR. FRAHM: And Jeff will still be here after the break. There will be plenty of opportunity.

(Laughter.)

MR. CIRCLE: This is like a carnival; you know, you can dunk me so many times.

(Laughter.)

CHAIRMAN STETKAR: Seriously, any other questions for Jeff?

(No response.)

If not, we will take a break and recess until 3:05.

(Whereupon, the foregoing matter went off the record at 2:48 p.m. and went back on the record at 3:06 p.m.)

CHAIRMAN STETKAR: We are back in session.

Eric, it's all yours.

MR. POWELL: Thank you.

Good afternoon.

My name is Eric Powell. I am a Reliability and Risk Analyst in the PRA and Severe Accidents Branch in the Office of New Reactors. I am presenting the technical evaluation of the relative risk measures and a reexamination of the pros and cons from the staff 2009 White Paper.

As Ron stated earlier, the Commission directed the staff in SRM SECY-12-0081 on risk-informed regulatory framework for new reactors to give additional

consideration to the use of relative risk metrics or other options to perform a technical evaluation of the use of relative risk measures and to reexamine the pros and cons listed in the staff 2009 White Paper.

As a quick reminder, the current significance determination process of the ROP has quantitative thresholds for CDF at 10 to the minus 6 per year, 10 to the minus 5 per year, and 10 to the minus 4 per year for the green/white, white/yellow, and yellow/red thresholds, respectively. And, also, the current SDP has thresholds at 10 to the minus 7, 10 to the minus 6, and 10 to the minus 5 for LERF. And those denote the thresholds between green and white, white and yellow, and yellow and red.

CHAIRMAN STETKAR: Eric, I haven't read back through history everything. Do you have any idea what the bases for those absolute numerical values are?

MR. POWELL: I would ask Jeff, who would probably be the best person to talk about that a little bit.

MR. CIRCLE: I have gone through the literature over the years, SECY-99-007 and 007A, and I really myself, I don't know why they picked those one-order-of-magnitude increments. I know they started at 10 to the minus 4 from the old safety goal. And then,

they worked their way back for this as an exercise.

CHAIRMAN STETKAR: Thanks.

MR. FRAHM: There is plenty of staff who knows that answer. They are just not in this room at the moment.

MR. POWELL: Just as a note, these thresholds are independent of the baseline CDF or LERF values for the plants which they are being applied to, and each threshold denotes an increase in safety significance of a finding.

This is the conceptual draft that the ACRS proposed in its letter dated April 26th, 2012, and this graph demonstrates one proposed method that could be used to implement a relative risk approach. This graph has a baseline CDF on the X-axis and a fractional CDF increase divided by the baseline CDF, or a percent change in CDF on the Y-axis.

I won't go into too much detail since this graph came from the ACRS, but I will say briefly that the general concept behind the relative risk approach is that the lower the baseline CDF value for a plant, the higher percent change that would be allowed for a finding before it would be greater than green, and the converse is also true, that the higher the baseline CDF, the lower percent change allowed before a finding would

be greater than green, as can be seen by this graph.

And moving on to slide 42, we, the staff, converted the ACRS graph on slide 4 to have a delta CDF on the Y-axis instead of a percent change. However, I would like to point out that the thresholds are the same and yield the same results. This can be seen by simply looking at a baseline CDF of 10 to the minus 4 per year on this graph. So, you look at this point right here.

The threshold to get to a white finding is a delta CDF of 10 to the minus 6 per year, which is a 1-percent change. And so, looking back at slide 41, you can kind of do a sanity check, and this is, indeed, a 1-percent change at 10 to the minus 4 when you look at .01 right here.

And also, if you look at the far left of the graph, a point with a baseline CDF value of 10 to the minus 8 per year. The threshold to get to a white finding is a 10-percent change, which is a delta CDF of 10 to the minus 7 per year. And looking forward onto slide 42, the delta CDF value for a 10 to the minus 8 plant per year is, indeed, 10 to the minus 7 delta CDF.

So, I just wanted to demonstrate that the two graphs are the same, but they just portray the information slightly differently.

And a brief explanation of why the staff used delta CDF instead of fractional change in CDF was because delta CDF is more commonly used by the staff and is consistent with Reg Guide 1.174.

And the change from fractional CDF to delta CDF is not a substantive change, but one that the staff believed would result in discussion or would be helpful in discussions moving forward with the technical evaluation of the relative risk approach.

So, now to describe this graph a little, the concept uses a total baseline CDF on the X-axis and delta CDF on the Y-axis for a plant to determine the significance of an inspection finding using the slope lines for the thresholds.

The concept behind this approach is that the lower the baseline CDF of a plant, the lower delta CDF value or a larger fractional change necessary for increased significance of a finding.

CHAIRMAN STETKAR: And, Eric, that statement that you just uttered that is now on the record, and that is written in the report, is, indeed, a fundamentally misleading statement to the persons who have not really studied this. Because you said the lower the baseline CDF, the lower the delta CDF to result in a finding. Mathematically, that is true, but you have subtly changed

the concept from one of how much risk am I willing to accept on a relative basis. What fraction of the baseline risk am I willing to accept before I raise a flag to an absolute concept? And that is a fundamentally different notion in the minds of the vast majority of people who haven't studied this.

MR. POWELL: I understand what you are saying, and I was trying to describe the mathematical --

CHAIRMAN STETKAR: When you first said it in this presentation, you said it right because you said that the lower the baseline CDF, the larger --

MR. POWELL: Fractional change.

CHAIRMAN STETKAR: -- fractional change

MR. POWELL: Percentage change, yes.

CHAIRMAN STETKAR: But as soon as you, then, start describing it as the lower the delta CDF is allowed, I'm thinking, oh, my God, you're going to ratchet me down. And that is not what this concept is saying.

MR. POWELL: No, and that is not my intent at all.

CHAIRMAN STETKAR: But be careful when you explain it.

MR. POWELL: Maybe I can try to explain it. When we did make the change, I tried to explain why we made the change. And then, I tried to keep the -- it

would be a lower delta but a higher fractional change.

CHAIRMAN STETKAR: Mathematically, they are equivalent. I am not arguing the -- but people do read the words, and people don't necessarily understand this at first blush because it is fairly subtle. People will read the words and say, if I have a lower baseline CDF, they are not allowing me the same delta CDF. And that is all they will look at.

MR. POWELL: Okay.

CHAIRMAN STETKAR: And mathematically, that's true in some sense, but, by translating this curve to delta CDF, an absolute value, and describing the concept in terms of absolute values, you have lost that notion of at what level of fractional increase in risk do we start raising the white, yellow, or red flags. So, just be careful when you present that concept.

MR. POWELL: Okay.

CHAIRMAN STETKAR: It is in the description of the concept also.

MR. POWELL: Okay. And the last point that I want to make on this slide is that the significance of a finding would be relative to the baseline CDF value instead of the current approach of absolute thresholds, which do not change given a particular plant's baseline CDF.

And these are the main points which I just discussed, but are included here for the members' benefit. I just felt that it would be more appropriate to discuss them while the graph was up, so you guys could all see it.

For the technical evaluation portion, the staff took the same scenarios from the 2011 tabletops, which were presented in SECY-12-0081, and applied the relative risk approach, both with and without including seismic estimates. And that can be seen from the last three columns on this slide right here.

This table, with the exception of the last two columns on the right, has already been presented to the ACRS at previous meetings last year. And for that reason, and due to time constraints, I am only going to focus on the new information, which is comparing the results in the two columns on the right to the results from the 2011 tabletop outcome.

The results show that applying the relative risk approach with and without including seismic estimates will increase the significance of, and therefore, the regulatory response to, some findings compared to the existing approach, as can be seen from the color increases in the various columns.

Focusing on the column here in the middle

of the three, applying relative thresholds without including the seismic estimates to the 19 cases from 2011, 13 of the findings moved up one color; for example, green to white, white to yellow, or yellow to red. This is an increase in the significance of the finding and represents an increase in the regulatory response accordingly.

When applying relative thresholds, including seismic estimates, to the 19 cases from 2011, only six of the findings moved up one color. A very approximate range of seismic CDFs -- the range that was used was from 3E to the minus 7 to 3E to the minus 6 per year -- was applied to the baseline CDFs. Baseline CDFs for new reactors -- that includes seismic estimates -- were examined because new reactor baseline CDFs will include internal and external events; for example, seismic, flooding, and fires. And it is believed that the CDF values for new reactors could be dominated by external events, particularly seismic events.

MEMBER CORRADINI: So, can I make sure I understand what you just said? That would imply to me that I should ignore the middle column and just simply look at the colored column on the left and the colored on the right and forget the central one.

MR. POWELL: That is not entirely true

because there was an estimate that the staff used for the seismic. It is not known what the seismic estimates for the new plants will be.

MEMBER CORRADINI: Okay.

MR. POWELL: The middle column is just focusing on internal events at power. So, I think it does portray some relevant information.

MEMBER CORRADINI: Okay.

MR. FRAHM: In fact, it is more apple-to-apple comparison.

MEMBER CORRADINI: I'm sorry?

MR. FRAHM: It is a more apple-to-apple comparison.

MR. POWELL: From the 2011, yes. The 2011 was just internal events at power.

MEMBER CORRADINI: Right, but, okay, you're right in one sense. But, in the other sense, your explanation made sense to me, which was that you would expect the external events for the new plants to have a more dominant effect, and if you include it, you see little change.

CHAIRMAN STETKAR: Well, let me probe that a bit. When you developed the third column, did you simply increase the core damage frequency and just use that as the divisor?

MR. POWELL: Yes, I increased the baseline, yes.

CHAIRMAN STETKAR: Let me ask you how you accounted for the following: suppose, as has been shown in many plants, that the results of seismic events have a fairly strong effect on AC power availability. And for those plants, turbine-driven pumps, provided that their support systems don't depend on AC power, are pretty much all I have left.

So, for example, for an USAPWR case and your ABWR case that takes out your RCIC pumps and your turbine-driven emergency feedwater pumps, I could pose an argument that having those pumps unavailable would make the seismic risk even higher than you would measure from just the internal events. And your righthand column doesn't account for that, does it?

MR. POWELL: No, it does not.

CHAIRMAN STETKAR: So, what does the righthand column tell me then?

MR. POWELL: The righthand column was our attempt to --

CHAIRMAN STETKAR: Sure, if I made the core damage frequency 10 to the minus 2, the righthand column would be all green, just arbitrarily. If I dissociate a PRA comparison from the actual contributors to a PRA,

it doesn't mean anything.

MR. POWELL: I understand that. And the way that the seismic estimates were used, we used the HCLF value of about .5 G's and we had the lower bound and upper bound, and we used the estimate of 3E to the minus 7 to 3E to the minus 6.

I understand the subtleties that you are saying, that --

CHAIRMAN STETKAR: It is not subtle. I am trying to reinforce the notion that, if you are using a risk assessment, you use the whole risk assessment, a seismic risk assessment, a fire risk assessment, a flooding risk assessment, an internal events risk assessment, a low-power and shutdown risk assessment. All of those include all of the plant. If you have only included an arbitrary number for a presumed seismic core damage frequency without at all considering the contributors to that number, you are not doing a risk assessment. All you are doing is playing numbers games.

MR. POWELL: There is limited value for those numbers. However, I would like to point out that the staff doesn't have a full-scope PRA --

CHAIRMAN STETKAR: Okay.

MR. POWELL: -- model to exercise. So, we had to make estimates.

CHAIRMAN STETKAR: Why do we have the third column in this comparison then? What is the third column in this comparison actually trying to tell me?

MS. MROWCA: Can I take a stab at that?

CHAIRMAN STETKAR: Sure.

MS. MROWCA: Or would you like to, Eric? This is Lynn Mrowca.

CHAIRMAN STETKAR: Uh-hum.

MS. MROWCA: I think we added that just to show that there would be a difference once you added these other contributors to the full-scope PRA, but not that you should take this and say, "Oh, gee, a certain percent of them will go down or go up," but that there is going to be a difference when you finally add everything together, like we expect to do.

MEMBER BLEY: Better to just say that than to present something that doesn't --

MS. MROWCA: Okay.

MEMBER BLEY: -- hang together.

MS. MROWCA: Thank you.

CHAIRMAN STETKAR: Because there certainly will be a difference. And, indeed, if, in fact -- let's take seismic as an example -- if, indeed, certain contributors to your internal events are completely unaffected by the seismic stuff, then, indeed, you will

see a lower importance from those. And that is just the real world. I mean, you know, if your risk is dominated by one thing, and you are looking at the relative importance of something completely different, its relative importance will be much lower. But that is actually the real world, and that would apply.

On the other hand, a comparison like this to infer that, if I add seismic, things uniformly are either less important or equally important is really misleading.

MS. MROWCA: Okay. That was not the intent.

CHAIRMAN STETKAR: And that is the inference that you get from this table, especially for those cases that have turbine-driven stuff in it.

MR. POWELL: I understand what you are saying. During the public meetings, there was a lot of discussion about external events and how a lot of people believe that they will dominate the CDF values for these new plants.

CHAIRMAN STETKAR: Yes.

MR. POWELL: And so, this was the staff's attempt to put those scenarios in line with the rest of them to give a perspective of what it would look like.

CHAIRMAN STETKAR: What you have not done -- you have to be careful with what you say because

you said "scenarios". You have not put the scenarios into the context. You have simply put a number in there, an uninformed number.

Now the number is informed by HCLF and stuff like that, but without looking at the actual contributing scenarios, you don't have the ability to compare the left column and the right column -- I'm sorry -- the left column and the center column to the right column.

MS. MROWCA: So I think maybe a word description of the impact of adding a complete scope PRA versus internal events --

CHAIRMAN STETKAR: Okay.

MS. MROWCA: -- would be maybe more appropriate.

CHAIRMAN STETKAR: That would be fine, but be careful because I can draw the same questions about, gee, we haven't looked at low-power and shutdown events. We have not looked very much at fire events currently. And why can't I raise the same questions about the comparisons for the left and the center column today, not worrying about the relative fraction and seismic. So, just be careful about that because people I think would be very easily misled by that third column and what message it is trying to convey.

MR. POWELL: Thanks for the feedback.

MEMBER BLEY: That one is just wrong.

(Laughter.)

MR. POWELL: Okay. So, before I move on from this graph or this table, a couple of notes or disclaimers that I would like to mention is that it should be noted that 13 of the 19 cases had a significance of red already, based on the current SDP. So, no increase was possible.

Also, in all the 19 scenarios, if the finding color increased, it only increased to the next threshold up. None of them moved up more than one threshold.

And also, finally, back in 2011, in order to achieve higher safety significant findings, long exposure times and common-cause failure of equipment was assumed.

Once again, these are the main points which I just discussed on the previous slide.

So, moving on to slide 46, the Commission directed the staff to give additional consideration to the use of relative risk metrics, which I have just covered, or other options. And now, I will discuss the other options that were considered.

The first being the staircase thresholds approach. The conceptual approach uses a step function with the total baseline CDF on the X-axis and a delta

CDF on the Y-axis for a plant to determine the significance of an inspection finding using the staircase lines for the thresholds.

A staircase function is a concept that simplifies the selection of thresholds by not having to use an algorithm like the relative approach to calculate the thresholds of a function of baseline CDF or as a function of baseline CDF.

This approach, however, has very acute cliff effects that have very negative implications. It is possible that a licensee could calculate total baseline CDF just to the right of the cliff and lessen the chance of non-green findings by increasing the thresholds.

MEMBER CORRADINI: Say that again, please.

MR. POWELL: It is possible that a licensee could calculate a total baseline CDF just to the right, just to the right of the cliff, where it would raise the threshold. So, for example, if you were a --

MEMBER CORRADINI: So, if you become conservative in your baseline CDF, you could come out with a green when you should get a white? Is that another way of saying it? That's what I think you just said.

MR. POWELL: Yes. Repeat that one more time, just so I make sure I understand.

MS. MROWCA: Or, basically, if you increase

your total baseline CDF --

MEMBER CORRADINI: Yes.

MS. MROWCA: -- that will put you to the right of the cliff. And so, therefore, you have more margin.

MEMBER CORRADINI: Right. That's what I just said.

MS. MROWCA: Yes, uh-hum.

MEMBER CORRADINI: That's what I tried to just say.

MR. POWELL: Then, yes.

MEMBER CORRADINI: So, let's think the psychological. Is that a good thing or a bad thing? So, are you taking the -- this is something I have been thinking about since I read your Enclosure 3, and I am still not sure where I am coming down on this.

When you do this, you are going to have the -- now we are talking new reactors, so all the pieces that John said will be in there, right? And it is the licensee's PRA? Who's baseline CDF are you going to use?

MR. FRAHM: That's part of the problem.

MR. POWELL: That touches on one of the cons. We would have to establish what baseline CDF meant and what it is and --

MEMBER CORRADINI: Well, then, who is going to find CDF for a current licensee to use?

MR. CIRCLE: We develop our SPAR models, which is based on our interpretation of the licensee's models. Licensees develop their models and they work with us on each finding. So, we have our own models, at least for internal events in-house.

MEMBER CORRADINI: Okay. But, then, so let's just roll this forward. I want to make sure I get the complete picture.

MR. CIRCLE: Okay.

MEMBER CORRADINI: So, with the new reactors -- this is what we're talking about anyway -- you are going to have to develop a baseline CDF with all components in it?

MR. POWELL: Yes, a baseline CDF will have to be established. What that is is to be determined at this point. But, currently, it is widely accepted and believed that baseline CDF for new plants are internal events and external events in all plants or all plant operating modes.

MEMBER CORRADINI: Okay. All right. But --

MR. POWELL: Whether or not that would be used here for this risk-informed reactor oversight process

approach is to be determined, but that is currently how it is done today.

MEMBER CORRADINI: Okay. So, I am still at the rules-of-the-game part of this. So, what is the rule of the game in terms of the baseline CDF? I assumed that it would be the licensee's estimate with you doing some sort of QA to make sure you are kosher with it.

MR. CIRCLE: We haven't decided that yet, but if we mimic what we do for the existing fleet, we have our own models that we run.

MEMBER CORRADINI: Okay.

MR. CIRCLE: So, we will work with the licensee. We engage them during the process, and we will have them run their models and we will compare the two answers.

What Eric was talking about is that, conceivably, there could be a situation where a licensee will come in and they will develop a baseline model, throwing the entire kitchen sink into it, an all-hazards model, which you will have seismic; you will have fire; you will have internal and external flooding, and shutdown, John mentioned.

And now, they will generate a baseline CDF that is extremely high because let's say, conceptually, not much higher, but high enough to get to the righthand

side of the 10 to the minus 6 on this chart.

Let's say we have an internal events finding on a licensee. And if the licensee applies an internal events finding to this all-hazards model, the delta CDF will be a lot smaller than it would be if you were comparing an internal events finding to an internal events baseline CDF.

MEMBER CORRADINI: I understand.

MR. CIRCLE: But that is the pitfall that we can have. So, how do we assess these? And that is the question that is going to come up that Eric will probably get to later on.

MEMBER CORRADINI: Right.

CHAIRMAN STETKAR: Let me ask you this, though: how is that different from today?

MR. CIRCLE: Today we still compute a baseline. And if we have, for example, if I have a fire-related finding, I would do a baseline on a fire PRA and I would take the delta on the fire as well as the delta on the internal events CDF.

The thing that I am worried about, the thing that concerns us is that, if you have an internal events finding, they are going to have to assess it, run it through the internal events model, run it through all the external event models, as well as the shutdown model,

in order to compare it to the baseline.

So, we don't want to get ourselves into that trap where we only look at internal events and we don't look at the all hazards.

CHAIRMAN STETKAR: How is that different than today? Suppose I am a licensee who has done a full-scope, all-hazards, all plant operating states, Level 3 risk assessment, and I come in and a high-pressure safety injection pump has been out of service. And I come in and I say, "Well, you know, my delta CDF is pretty small." And you say, "Well, I've only got an internal events model. It only has LOCAs and a full transients in it, and my delta CDF is pretty large."

So, how is that situation different today compared to a new reactor tomorrow, compared to the use of absolute CDF versus relative?

MR. CIRCLE: Well, it shouldn't be different, but --

CHAIRMAN STETKAR: Okay.

MR. CIRCLE: -- we are worried about cases where we may have to ask licensees to exercise the full-scope model or we exercise the full-scope model. That is the big pitfall.

CHAIRMAN STETKAR: But today, if licensees disagree with your finding, don't they exercise their

model and you start negotiating over who's got the better model?

MR. CIRCLE: Right.

CHAIRMAN STETKAR: Okay.

MR. CIRCLE: But I will tell you, with shutdown also, some licensees might decide to put in low power and shutdown, and those events right now are evaluated differently. And I don't want to open up a whole new can of worms about the event and condition assessments.

CHAIRMAN STETKAR: The only point I am trying to understand is this argument about why this particular issue is a function of using a relative risk approach for new reactors, because everything that I hear says the same issues apply today in terms of differences in the level of scope of a SPAR model versus a licensee's models, in terms of differences in contributors.

MR. CIRCLE: And they do, but the thing that you have to understand is that, if we adopt this particular approach --

CHAIRMAN STETKAR: The staircase, you mean?

MR. CIRCLE: The staircase. Well, let's say we take 10 to the minus 6 as the cutoff.

MEMBER CORRADINI: No, the staircase I understand. I am just trying to see -- where this is

fleeting is anything that shows a slope will have people tend to want to overestimate -- I don't want to say "overestimate" -- conservative on their risk.

But it seems to me that all the current baselines anyway are too low compared to reality anyway, unless I miss it. I don't know enough about PRAs to say whether it is a factor of two too low or a factor of ten too low, but it is too low, because all the pieces aren't there.

MR. CIRCLE: Right. So, if all the pieces are put into place, it may bring everything up past 10 to the minus 6. So, we are right back to square one. It is going to follow the same thresholds that we already have for the existing fleet. So, there is really no advantage in having that type of methodology, if you pick 10 to the minus 6.

MEMBER CORRADINI: And having any sort of slope on the concept implies -- and I am still trying to get at that -- implies that you would see more findings, but more findings that really doesn't add to the safety of that population of plants? I'm still back at the principle that started this whole thing off, which was, if I start off with a safer plant, I would not expect them to have more headroom, significantly more headroom only went to the current operating plants.

MR. CIRCLE: Well, yes, the idea is to have a little bit of flexibility when they operate the plant. But we are looking really at findings, and to look at the seriousness of findings and to see what type of regulatory response we want to give. I mean, there are other underlying factors such as safety culture and cross-cutting issues, et cetera, that can cause a degradation in the plant's operation that we want to catch ahead of time.

MR. POWELL: And I think we might touch on what you are trying to get at when we get to the pros and cons portion.

MEMBER CORRADINI: Okay. Fine. I'll wait.

MR. POWELL: And we're almost there.

So, the last point that I want to make on this graph is that, due to the negative implications of the acute cliff effects, the staff does not view approach as a viable option.

And once again, these are the main points which I just discussed on the previous slide.

So, moving on to slide 48, continuing with other options that were considered, the second option was the hybrid threshold approach. This approach received a lot of discussion at the public meetings. This approach uses the total baseline CDF on the X-axis

and delta CDF on the Y-axis for a plant to determine the significance of an inspection finding using the hybrid, the sloped and flat lines for the thresholds.

This conceptual approach combines relative thresholds with the existing thresholds, with the transitioning happening at a baseline CDF of 10 to the minus 6 per year on the X-axis. And just to frame it, this is a conceptual draft, and where that knee is, it was done for the purposes of illustrating a concept.

The industry mentioned at the public meetings that it would expect the total baseline CDF values for new reactors, which include internal and external events, to exceed 10 to the minus 6 per year. Whether or not new reactor designs will have total baseline CDF values greater than or less than 10 to the minus 6 per year is debatable. However, if not now, eventually a design will likely have a total baseline CDF value below 10 to the minus 6 per year. And if the knee was drawn as it is on this concept, the same concerns identified by NEI in their 2009 White Paper would apply.

Therefore, the staff used this approach as a short-term solution. And if new reactors' total baseline CDF values are, indeed, greater than 10 to the minus 6 per year, there would be no benefit to implementing the hybrid thresholds approach because it would yield

the same results as the existing approach, given the thresholds would be identical.

And what I am talking about there is, once you go over 10 to the minus 6, the lines are flat, and those are the exact same lines as the current existing SDP.

And therefore, because of those reasons, the staff does not view this as a viable option.

On slide 49, these are the main points which I just discussed on the previous slide, but are included here for the members' benefit.

MEMBER SCHULTZ: I don't understand your last point. You say that -- the third bullet -- isn't that where you would want the process to be? If the new reactors don't produce results that show a lower CDF, then there should be no credit given.

MR. POWELL: I don't know what you mean by credit given, but --

MEMBER SCHULTZ: Well, there would be no benefit to implementing the hybrid thresholds approach.

MR. POWELL: The point you are making is, in fact, true. If the new plants are above 10 to the minus 6, then the whole exercise of looking at relative risk for the ROP wouldn't be a worthwhile adventure because you would be in the same range as the operating fleet,

and therefore, you could use the current SDP thresholds.

MEMBER SCHULTZ: Okay. Okay. Isn't that reasonable? I don't understand why --

MR. POWELL: That is reasonable. However, if a plant, whether or not it is this next generation of fleet that is going to come online or a small modular reactor, or something else that wasn't considered during these tabletops, the staff believes eventually there will be a plant that has a baseline CDF below 10 to the minus 6.

MEMBER SCHULTZ: Uh-hum.

MR. POWELL: And at the public meetings, NEI said that, if that were the case, then all of the existing disadvantages or cons that they brought up would still apply at that point in time.

MEMBER CORRADINI: Just at a lower value? They wouldn't start right away. They would just start at 10 to the minus 6 or some arbitrary thing and below.

MR. POWELL: Yes.

MEMBER CORRADINI: So, let me as you a hypothetical because I know where you are going with this. Let me ask you a hypothetical. I guess I can see where the staff is coming from from a regulation standpoint. Because you said it is how you would essentially assess penalties based on performance.

But if I had two new reactors and a fleet of -- let's just pick an approximate number -- four new reactors and a hundred old ones, then I might buy into this, right? But is that how I regulate for a new technology, is I just let it come in at the performance of the old technology and not expect better performance? That is kind of what the --

CHAIRMAN STETKAR: See, I approach it -- before they answer -- I would ask them, not expect better performance, but at what level do we raise a flag for enhanced regulatory scrutiny?

MEMBER CORRADINI: Fine.

CHAIRMAN STETKAR: But that is a different concept.

MEMBER CORRADINI: I understand. But with it comes -- what I read in Enclosure 3 was, with it comes a whole series of activity that staff doesn't want to really deal with. And my thought is, wasn't that the whole point of having advanced reactors?

MR. POWELL: And you are kind of touching on the whole point of why we eve began this exercise to begin with. And it is because, given the internal events at power for the new reactors, you are dealing with plants that are either close to the same CDF values as the operating fleet at the high end or one to two

orders of magnitude lower. And so, because they are lower, we went down this path of looking at how we would want to use the existing framework for the new reactors. And we came to the point of the risk-informed ROP, and we are bouncing the Commission-stated expectation that the new plants will have enhanced safety, but at the same time they will have increased operational flexibility.

MEMBER CORRADINI: So, if I were the staff and I wanted to make an argument for not changing it, I would just simply say that the external events or the common-cause initiators will never be so low that I wouldn't have to essentially treat them all about the same. However safe the plant is by engineering design, nature will come and find a way to keep me above a certain failure threshold.

In other words, back to your hybrid, I would never get below 10 to the minus 6 because outside events will essentially rule the day. Or, to put it a different way, if I actually compute the baseline CDF properly, it will be always behind.

MR. POWELL: That is a real possibility.

MEMBER CORRADINI: But I didn't see that. I was looking for some sort of argument about reality come and take hold of me, but I got the argument that

it was just too much work; it would create too much entropy, which doesn't strike me as a very useful argument.

MS. MROWCA: This is Lynn Mrowca again.

The Commission actually in their SRM said, you know, recognizing the enhanced safety, as Eric said, would give them more operational flexibility, and the current values and limits that we have right now should stay the same, unless you tell us differently by performing these tabletops. So, we are really Commission-directed at keeping those limits, unless we found something that caused us to go back and tell them that there was a significant decrease in the margin of safety. And then, they would maybe take another look.

CHAIRMAN STETKAR: Lynn, this is one area where I did read a lot. And there is nothing -- the Commission said, I think -- this is my opinion from what I have read -- that they did not want to impose lower absolute limits on core damage frequency and large release frequency, absolute. They didn't want to say a new reactor should have 10 to the minus 5 core damage frequency and 10 to the minus 7 large release frequency or large early release frequency, whatever term I want to use for that large thing.

They said we want to keep it 10 to the minus 4 and maybe 10 to the minus 6 if it is large release,

but I am not quite sure what that is. So, let's just talk about core damage. And I understand that.

I don't think the Commission said anything about the relative increase in risk from a power plant before the staff increases their scrutiny. In other words, if I flip it, currently, if I double the core damage frequency from a 10-to-the-minus-4 plant, it is a bad day in regulatory space. If I increase the core damage frequency from a 10-to-the-minus-4 plant by 1 percent, it is a day of negotiations in regulatory space. If I increase the core damage frequency from a 10-to-the-minus-8 plant by a factor of 1,000, won't that get the regulators' intention, or 100, or something? That doesn't affect that 10-to-the-minus-4 absolute value.

And that is a bit of the concern about mixing this notion of absolutes and relatives. And everybody keeps coming back to the absolute and saying, "Well, the Commission said you're supposed to keep the same absolute values because they are some surrogate measure for societal acceptable risk." It doesn't say anything, I can't find anything where the Commission said at what level should the regulators exhibit enough of a concern to say, "Gee, let's take a closer look at this."

MR. FRAHM: And I would like to think that

the paper gets at that point and makes the argument that this integrated risk-informed approach using qualitative measures actually gets you there, to give you that increased regulatory response, when needed, in a more predictable and simpler manner than this relative risk approach would, at the risk of jumping ahead to my conclusions and recommendations.

(Laughter.)

CHAIRMAN STETKAR: I will give you the three examples where I applied the relative risk measures and I got to the same place as your qualitative approach.

MEMBER SCHULTZ: You didn't do enough examples.

CHAIRMAN STETKAR: I didn't do enough examples, but --

MR. POWELL: I do understand the point you were making. However, the Commission reaffirmed the existing safety goals for the new reactors, and the staff interpreted that as the current regulations are good for the operating fleet and the new fleet. And so, I agree that it is not explicitly stated about whether or not there could be a relative change and where that would line, but the staff had disagreed with you and interpreted it as everything would stay the same across the board.

CHAIRMAN STETKAR: I think, and I would hope, in the staff's presentation that you make this clear. Because, essentially, you are saying that if I a 10-to-the-minus-8 core damage frequency, that core damage frequency can increase by a factor of 10,000 before it becomes a day of interest and regulatory concern, a factor of 10,000.

MR. POWELL: Well, that is a reality-given --

MR. FRAHM: It is not a risk basis.

CHAIRMAN STETKAR: Hum?

MR. FRAHM: But we have this qualitative measure to consider as well.

CHAIRMAN STETKAR: No, no, no, no.

MEMBER CORRADINI: It is not going to play that well.

MR. POWELL: That is the reality, given the current significance determination process.

CHAIRMAN STETKAR: And I think that the Commission needs to understand that in very clear terms. And I subject that, from what has been prepared so far in writing, that is not clear. It might be clear, but I doubt it.

MR. POWELL: I agree, the point wasn't made in the paper because we are proposing the risk-informed

qualitative thresholds which would eliminate that possibility of such a large increase in CDF value.

MEMBER BLEY: You have no guarantee of that. You could look good qualitatively. There is no guarantee of that. Write out an example that proves that and bring it back. Give it to the Commission. I don't think it's true. It could happen, but it is not necessary.

MS. MROWCA: But I think, overall, when we started this, because it was the ROP, I think in the first public meeting that we had one of the things that Rani brought up is that question of degraded performance and what would get us there, and not trying to say, is it relative risk; is it this? Let's just come from degraded performance and see what gets us to that point.

And if we can think of an approach or a blended approach, a qualitative, quantitative, whatever it is, that is really the point because I think staff had some of the same concerns. Let's say they kept bumping up against multiple times doing the same thing. Wouldn't that increase your risk? That is something that we are concerned about. So, we were thinking that this approach, at least on the table, is one way to do that with this blended qualitative/quantitative. So, if that is not clear in the paper, maybe we can stress that point.

MR. POWELL: But the whole goal of any

approach that we would propose to apply to the new reactors would be to balance the enhanced safety margins and the operational flexibilities. I mean, that's the ultimate goal.

Okay. So, that brings me on to the reexamination of pros and cons portion. One of the major pros of the relative approach, as stated by the ACRS letter dated April 26th, 2012, and that was discussed at the public meeting, is that it would preserve the Commission's stated expectation to maintain the enhanced safety margins for new reactors while providing greater operational flexibility than current reactors.

The concept of maintaining enhanced safety margins while at the same time providing operational flexibility is difficult to achieve because these are fundamentally competing ideas. But relative risk is one plausible way that both of those Commission expectations could be achieved.

Another pro of the relative risk approach is that a single methodology could be adapted for all operating and new reactors. Both internal and external stakeholders noted at the public meetings that the ROP should be consistent for operating and new reactors, and that if a change to the ROP was made for new reactors, it was the consensus by all participants at the public

meeting, staff, and NEI, and industry, that it would likely impact the operating reactors as well.

MEMBER SCHULTZ: Likely impact or that it should be incorporated for? You said two different things there. One, earlier you said that there ought to be a methodology that would apply to both old operating and new reactors.

MR. POWELL: That's the main point.

MEMBER SCHULTZ: All right. Thank you.

MR. POWELL: So, moving on to the cons, some of the more significant cons to the relative risk approach for new reactors that were discussed during the public meeting included concerns with implementation, depending on how baseline CDF is defined. This comes to some of the points that Dr. Corradini was making, that the use of relative risk approach depends on total baseline CDF, and that before implementing such an approach, a definition of total baseline CDF would be necessary.

MEMBER CORRADINI: But that would imply regardless, right? Whether it is relative, whether you have a flat white line of a sloped line, or a partly flat and partly sloped, it still would apply? You still are going to have to go through that discussion, unless I misunderstood it. You are still going to have to wrestle with that one for the new reactors, right?

MR. FRAHM: Only if you do a relative risk approach. If we stayed with the hold approach and just used the existing quantitative approach and used the qualitative measures with them, that would not change. We would go with the absolute.

MEMBER CORRADINI: You still would have to have a baseline that is different for the new reactors. You couldn't just use an internal event. I mean, am I missing something?

MR. CIRCLE: You would need a full baseline.

MEMBER CORRADINI: Yes, you would need a full baseline --

MR. CIRCLE: Yes.

MEMBER CORRADINI: -- which means you would have all that fun regardless of whether it is sloped or unsloped, wouldn't you?

MS. MROWCA: I think you have to define what that baseline is. I think Eric mentioned that before.

MEMBER CORRADINI: Right.

MS. MROWCA: And if you just look in internal events, you could have some that are down in the 10-to-the-minus-8, I know 10-to-the-minus-7 range. But if you add the full scope in, then you are getting closer to the current operating plants and we would be in that range.

MEMBER CORRADINI: All right.

MR. POWELL: But the importance for defining baseline is because where you fall on the thresholds would be dependent upon that baseline, more so for the operating fleet where it is not dependent upon the baseline CDF values where the thresholds are.

CHAIRMAN STETKAR: That is sort of consistent, though, with Reg Guide 1.174, that your margin depends on where your baseline CDF is.

MR. POWELL: So, total baseline CDF for new reactors is commonly referred to as all contributors from internal events and external events during all operating modes.

However, alternate definitions of baseline CDF metric may be needed for specific risk-informed applications. For example, the overall risk for some new reactors may be dominated by external events which are relatively insensitive to changes in the availability or configuration of specific SSCs. And I think this touches on Dr. Corradini's point of reality coming in and playing a contributor to the overall CDF values for these plants.

Risk-informed decisions under the ROP are concerned primarily with the significance of operational events, equipment failures, and abnormal plant

alignments. It could be more appropriate to focus those ROP applications on changes in the CDF from internal hazards. And this is just an example of some of the things that would need to be considered when trying to define baseline CDF for the relative risk approach.

Another con would be difficulty articulating the potential differences in regulatory approach for operating in new reactors. Applying the relative approach to new reactors, but not operating reactors would create a double-standard. Having two sets of SDP thresholds, one for new reactors and one for operating reactors, would create public perception issues.

The double-standard would bring into question the thresholds for operating reactors and why those values are safe enough for the public and the environment when the new reactors, which are supposed to have enhanced safety margins, are held to more restrictive thresholds.

Also, a site with both a new reactor and one or more already-operating reactors, for example, Vogtle or V. C. Summer, those sites would have different SDP thresholds for potential findings at various units on the same site. This would not provide consistent regulatory response within the existing ROP framework and, to be frank, would just be kind of confusing.

Another con is the potential to overly infringe on the operational flexibility afforded the safer and more robust new reactor designs. At the public meeting, it was mentioned that the potential exists to overly infringe on the operational flexibility afforded the safer and more robust interactive designs with a relative risk approach. While this is not the main concern as the regulator, it is still something to be mindful of while ensuring safety.

Participants stated that, if the Commission directed the staff to pursue a relative risk approach, the details would be important to ensure a balance between enhanced safety and increased operational flexibility.

Moving on to slide 52, continuing with the cons that were discussed at the public meetings, complexity in developing, documenting, and implementing a relative risk approach was identified as a con.

Potential to inadvertently focus licensee and staff attention on relatively-insignificant issues as far as overall plant safety is concerned was another con.

And participants at the public meeting discussed the potential to inadvertently focus licensee and NRC staff attention on relatively-insignificant issues as far as safety is concerned, if the approach

selected were mostly risk-based instead risk-informed.

The concern was that, if the Commission directed the staff to implement relative risk thresholds, that more focus would be given to a finding at a plant with a lower baseline CDF value. For example, a plant with a baseline CDF of 10 to the minus 8 per year would have a greater-than-green finding if the delta CDF was greater than 10 to the minus 7 per year, given the staff approach on the relative risk graph that was presented. However, the current SDP threshold is at 10 to the minus 6 per year for a greater-than-green finding.

So, essentially, more attention would be placed on a finding at 10 to the minus 7 by both the licensee and NRC staff for a plant that was designed to be safer than a finding of 10 to the minus 6 per year at an operating reactor.

CHAIRMAN STETKAR: Can I say that a different way? That the staff is willing to accept a hundredfold increase in the core damage frequency before you apply a white level of scrutiny compared to a tenfold increase?

MR. POWELL: No, I would not say that because --

CHAIRMAN STETKAR: That's what it is.

MR. POWELL: That is just the example that I chose. I don't know of any operating plants with a

10 to the minus 8 CDF value.

CHAIRMAN STETKAR: That is your example, and your concern was, if it increased from 10 to the minus 8 to 10 to the minus 7, that might be an inappropriate burden; whereas, if it increased from 10 to the minus 8 to 10 to the minus 6, then we would get concerned. That is a hundredfold increase versus a tenfold increase.

Again, I am going to try to keep you on relative measures, not on absolutes.

MR. POWELL: That is true, but the intention of the staff is not that we would need a hundredfold increase before we would be alarmed or we would need increased regulatory oversight there. This is just an example to show how the potential to inadvertently focus resources on a relatively-insignificant issue could arise.

MR. FRAHM: If we were strictly using a threshold approach without considering other qualitative factors.

CHAIRMAN STETKAR: Understand.

MR. POWELL: Okay. The final con for the relative risk approach is that it would be resource-intensive for both NRC and the licensees to develop accurate plant-specific, broad-scope PRA models. There is no regulatory requirement for operating reactor

licensees to develop or use broad-scope PRA. If the Commission decided on the relative risk approach, than the NRC would need to develop broad-scope PRA models for every plant. This would be necessary in order to establish a baseline CDF value and to evaluate the significance of each finding.

Licensees are likely to also want to develop their own plant-specific broad-scope PRAs to use in discussions with the NRC regarding SDP evaluations and outcomes.

Implementing the relative risk approach and developing the broad-scope PRA models would be resource-intensive for both industry and the NRC. This is one of the more significant cons of the relative risk approach.

The amount of resources and time required to develop broad-scope PRAs that include internal and external events for all operating reactors has not been estimated, but it would be significant.

MEMBER SCHULTZ: By broad-scope PRA models, I presume you mean full-scope, external events, internal events --

MR. POWELL: Yes.

MEMBER SCHULTZ: -- operating modes, and so forth?

MR. POWELL: Yes. It is another term to explain that.

MEMBER SCHULTZ: So, if we don't want to go there because of cost, that is one decision one could draw. But we do want to develop a process that is consistent, can be consistently applied to new plants and operating plants, is that true?

MR. POWELL: Yes, I would say that is true.

MEMBER BLEY: Was that part of the direction you got from the Commission?

MR. POWELL: No, it is not.

MEMBER BLEY: The Commission asked you to look for new plants?

MR. POWELL: They did.

MEMBER BLEY: Would new plants have the full-scope PRAs?

MR. POWELL: Yes.

MEMBER BLEY: Yes, they will.

Go ahead.

CHAIRMAN STETKAR: How do you address something that there are -- I think this is true -- there are operating plants that have residual heat-removal systems that are strictly residual heat-removal systems that are not low-pressure injection systems? How do you currently address a finding for fire that would affect

a residual heat-removal train or trains, given the fact that neither of you have low-power and shutdown models --

MR. CIRCLE: Right.

CHAIRMAN STETKAR: -- or fire models?

MR. CIRCLE: Right. And the rule of PRA is that you go to, let's say hot standby. You don't go to RHR in some cases.

CHAIRMAN STETKAR: But if I had my full-scope low-power and shutdown model with all internal/external, I would be able to do that.

MR. CIRCLE: We would then be able to address it.

CHAIRMAN STETKAR: But I can't do that today.

MR. CIRCLE: Well, we do. What we do is we take things on a case-by-case basis.

CHAIRMAN STETKAR: Okay.

MR. CIRCLE: Okay? So, if I have -- in fact, we just had one recently where we had a model that was impacting the fire response, and we didn't have a full-scope fire PRA, but we sat down and we developed a baseline fire just for that. And we looked at that performance efficiency, given the fire in certain selected zones in that particular plant.

So, it is done almost on an ad hoc basis. What Eric is talking about, we would have to

institutionalize it. And it is true the SRM told us to look at the new reactors and see about, you know, relative risk for them. But, in reality, you know, we are going to probably, if we do something for the new reactors, we are going to have to implement something for the existing fleet. You know, we can't have a double-standard. We could, but it wouldn't be ideal.

MEMBER SCHULTZ: No, I think we ought to be very cautious there, though, because what I hear is that we are limiting or choosing the approach we are going to take based on what I consider to be artificial considerations. We don't have full-scope PRAs for operating in new plants. So, therefore, we can't do things for new plants differently than -- I'm not getting it; I'm not, why we would choose an approach based upon the methodology we have.

If you want to do it consistently, then take the internal events analyses for new plants only, develop a system that is for internal events approaches, and move forward. Or, you said right now you have a fire event, you have a fire-related finding at a plant.

MR. CIRCLE: Right.

MEMBER SCHULTZ: So, you are going to take the fire PRA. Well, for the new plants, you have got fire PRA. You could adopt that approach for

seismic-related and fire-related. I wouldn't recommend it, but you could do it consistently in that way.

MR. CIRCLE: And then, do independent assessments?

MEMBER SCHULTZ: Yes. I'm not saying that is ideal, an ideal approach, but I think we are trying to choose the methodology based upon what I consider to be artificial considerations of how we can't --

MR. CIRCLE: There is a pitfall with that.

MEMBER SCHULTZ: We can't do it for new plants. We can't do it for operating plants because of methodology considerations and concerns.

MR. CIRCLE: It is resource concerns mostly.

MEMBER SCHULTZ: In other words, we are kind of going in one direction, drawing a conclusion in another direction with a different set of assumptions and drawing a separate conclusion, depending on --

MR. POWELL: In a way, I can see the point that you are making. But I think this kind of transitions nicely into the conclusion. Considering all the cons that were discussed, the integrated risk-informed approach that Jeff described achieves a similar outcome as the relative risk approach would with fewer impediments to its implementation.

MEMBER SCHULTZ: I'm not sure I agree,

because, again, we seem to have drawn conclusions about the relative risk approach based upon other features, other things that we thought perhaps the Commission would like to achieve, or that a regulatory process would like to have as an outcome.

MEMBER REMPE: Jeff, did you start to say there was a pitfall in what Steve was suggesting?

MR. CIRCLE: Well, yes, I was thinking about it. Let's say we carry on business as usual, and we assess the new reactors the same way that we have been assessing the existing fleet, by just taking little bits and pieces. If it is a fire-related finding, we look at the fire baseline. If it is internal-events-related, we look in the internal events baseline. And we apply the relative risk approach just to those little snippet analyses that we do.

Then, what happens is the baselines are all going to be shifted to the left because they are small, little pieces of the whole picture. So, what happens is you skew the thresholds when you do that because now you don't have the same thresholds as you would have if you had a baseline that had everything together and a performance deficiency delta increase that had the entire baseline. You may see a smaller delta than you would if you have individual analysis, and do each one

relatively --

CHAIRMAN STETKAR: You're right, and that is not fair.

MR. CIRCLE: Yes.

CHAIRMAN STETKAR: That is not fair on that end of the scale, the same way as it is not fair to take the seismic core damage and not evaluate --

MR. CIRCLE: Right.

CHAIRMAN STETKAR: -- the importance relative to seismic events on the other end.

MR. CIRCLE: Right. And that is the pitfall that I was worried about.

MEMBER REMPE: Also, on that far left end, too, aren't the uncertainties going to dwarf any sort of understanding? I mean, don't they become much more important in trying to evaluate things?

MR. CIRCLE: Yes, yes. They get swamped out. The uncertainties will be swamped out by something like this.

MEMBER SCHULTZ: Well, let me go back to Dennis' comment, which is, going forward, we are going to have for new plants full-scope PRAs. Why aren't we thinking to the future and go ahead and separate what we do for operating plants from what we will do for new plants? It will not be too long before we will only

have new plants with full-scope PRAs. At some point in the future, that is where we will be, and it won't be in terms of the regulatory process a long time.

Why aren't we developing an approach that is going to work for full-scope PRAs? What is wrong with having a different approach for operating plants and new plants?

You know, having it be a little bit complicated for a site that has two new plants and two operating plants --

MR. CIRCLE: That's what I was thinking about.

MEMBER SCHULTZ: Why is that a huge problem? Why can't we handle that problem?

MR. POWELL: Well, that is a possibility, and the Commission could direct us to go down that path. One of the cons that I identified was the public perception issues with having two sets of thresholds for operating in new plants. Essentially, the Commission, the NRC would be saying that it is safe enough for the operating fleet, but it is not safe enough for the new fleet, and have a lower threshold for what their findings could potentially be.

MEMBER SCHULTZ: I think we ought to be able to address that issue.

MR. CIRCLE: Another thing to consider is, if these sites, let's say there are two plants that sit on one site, two different designs, an existing design and a new design. What happens if they use the same personnel to do maintenance and do operations?

You know, if we have a finding that concerns the culture at one plant, couldn't that culture exist at the new plant as well, but it would be masked by the fact that the new plant has a lower threshold? And the same behavior that got the existing plant, let's say, into a white finding may not get the new plant into that white finding. So, we run that risk.

And then, it becomes a public perception risk, a risk of public perception, no pun intended, because then the public looks at us and says, "Well, how come, NRC, you're not going after the licensee? They're doing the same thing at the new plant as they did in the existing plant, but you only went after them there." Our SDP is designed to go on a plant-by-plant basis, not on a site basis at this point.

MEMBER SCHULTZ: I think that is good. I'm not sure that that doesn't need to be handled by the licensee and the regulatory process anyway.

MR. CIRCLE: Yes, and we need to have some sort of bases for our regulatory response. That is why

we should be consistent across the board. That is just my feeling.

MR. FRAHM: And the SRM did specifically talk about applying to new reactors. And, as I will get to in our conclusions and recommendations, our recommendations are very specific to how to apply this to new reactors, but we do mention in the paper that we do think it is relatively important that we use the same approach for operating and new. But we are not putting that forth as our recommendation, that the Commission tell us to use the same approach for both because they didn't ask us for that.

CHAIRMAN STETKAR: There is obviously a lot of interest in this on both sides. We are running at least a half-hour late. I don't know what constraints folks have on travel time and things like that. I know that we have a little bit of a constraint.

First of all, Eric had one more slide. So, if you want to throw up your last slide there, so we can see it?

MR. POWELL: It is just the conclusion that I am sure you guys have all figured out. The staff's conclusion is that the relative risk approach may potentially have merit, but the cons of the relative risk approach appear to outweigh its pros. And therefore,

the staff does not view this as a viable option.

And that concludes my portion of the presentation.

CHAIRMAN STETKAR: Thank you.

Now I am going to ask the members something. The staff has a presentation on the Performance Indicators, which is part of the Draft Paper. The industry has a presentation, at least one presentation, if not more than that. The question is in terms of time management, should we allow the staff to finish with the Performance Indicators and then go to the industry? Or either very briefly go through the Performance Indicators? Or something that Michael I am sure will be really upset about, skip the Performance Indicators?

(Laughter.)

MEMBER BLEY: I don't have a lot on the Performance Indicators. So, I think a quick pass would be good.

CHAIRMAN STETKAR: Joy?

MEMBER SCHULTZ: I would like to see a quick pass, a quick pass-through.

CHAIRMAN STETKAR: Can you take a quick pass-through on this?

MR. BALAZIK: I'll do my best.

CHAIRMAN STETKAR: Okay. Let's see if we

can do that then, so that we close that book.

MR. BALAZIK: Leave it to me to rush.

All right.

Good afternoon.

My name is Mike Balazik. I am the Performance Indicator Lead in the Office of NRR. I was tasked with reviewing the existing Performance Indicators to determine if the current set of Performance Indicators could be applied to new reactor designs to inform a regulatory response.

First, let's start with some quick background. MSPI, Mitigating Systems Performance Index, indicators were evaluated in SECY-12-0081. Pretty much the SECY paper concluded that -- there were tabletop exercises conducted that MSPI would be largely ineffective in determining an appropriate agency response. The cases indicated that it would be rarer and unlikely to cross the greater-than-green MSPI threshold for active new reactor designs.

In addition to that, passive designs are too different to evaluate at this time, and MSPI may not be possible for passive systems without significantly altering the methodology in the PI program guidance.

So, the MSPI indicators were the only PIs that were addressed in 12-0081. So, the SRM tasked the

staff to discuss the appropriateness of PIs, the remaining PIs, to the new reactor designs.

First, I will run through the Performance Indicator program real quick. PIs are a means of obtaining information related to licensee performance in certain attributes of each cornerstone. They provide indication of problems; if left uncorrected, may increase the probability or the consequences of an off-normal event. Because not all aspects of a licensee's performance can be monitored by the PIs, areas not covered by the PIs are assessed using the Reactor Oversight Process Inspection Program.

PIs, along with inspection findings, are inputs into the ROP action matrix that help determine a commiserate regulatory response. I would like to add that the submittal of PI data is a voluntary program. Licensees are not required to provide us this data. Although PI submission is voluntary, 10 CFR 50.9 requires information provided to the NRC to be complete and accurate. So, PI data are subject to enforcement. Licensees report the PI data to the NRC on a quarterly basis.

MEMBER BLEY: Does everybody report it?

MR. BALAZIK: Yes, sir, everyone reports.

MEMBER BLEY: And everybody always has?

MR. BALAZIK: Yes.

MEMBER BLEY: I didn't realize it was voluntary.

MR. BALAZIK: Yes, sir.

MEMBER BLEY: Are they complete in it, or can you tell?

MR. BALAZIK: Yes, sir, we have an inspection procedure that actually verifies --

MEMBER BLEY: Even though it is voluntary?

MR. BALAZIK: Even though it is voluntary, we do have an inspection program --

MEMBER BLEY: Okay.

MR. BALAZIK: -- that goes out and verifies the PI data.

MEMBER BLEY: Great. Thanks.

MR. BALAZIK: Uh-hum.

MEMBER BLEY: I didn't know that, yes.

MR. BALAZIK: Our thresholds for the PIs were established so that sufficient margin exists between nominal performance bands to allow for licensee initiatives to correct performance problems before reaching escalated regulatory involvement, and sufficient margin exists to allow both NRC and licensee diagnostic and corrective actions to be accomplished in response to declining performance.

Okay. Some of the program documents. Inspection Manual Chapter 0608 provides guidance on implementation of the reactor oversight process, the Performance Indicator Program. Manual Chapter 038 is basically a technical basis for the PIs, and NEI 99-02 basically describes the PIs and how they are calculated, and how and when to report PI data to the NRC. So, NEI 99-02 is an industry guidance. So, it pretty much describes on how the PI is reported.

This arrangement was agreed upon to encourage industry acceptance and participation in an ROP. There is an NRC RIS, Regulatory Issues Summary, 2008, "Voluntary Submission of Data," which basically informs stakeholders that the NRC accepts this guidance in reporting PI data.

In addition, the NRC staff meets with NEI and industry during monthly working groups to discuss different interpretations of the guidance, address unique situations, and incorporate changes into the PI reporting guidance. This process is known as the FAQ process.

PI data is evaluated against predetermined thresholds or performance bands to establish the significance of each PI, which helps us determine appropriate regulatory response. The results are, then, expressed as colors to help communicates significance easily to the public and compare PI data to findings.

So, it allows us to take apples and compare them to oranges.

Green indicates performance is at an expected level of performance; cornerstone objectives are met. And the NRC will not take additional action for green PIs. White, yellow, or red indicators reflect increasing safety significance of PIs for which the NRC will take additional actions.

Some PIs are more risk-informed and use PRA insights than others, and others are more deterministic. For some PIs, you have a white/yellow, and the yellow/red thresholds were not identified because the indicators could not be directly tied to risk data.

This slide shows the cornerstones of the current set of PIs for the existing fleets. Like I said earlier, PIs are one of a few action matrix inputs to determine a regulatory response. PIs are plant-specific data on operational occurrences and parameters, equipment availability and reliability, EP drill performance participation, and RP occurrences.

Each cornerstone has at least one PI. PIs monitor trend and measure performance in cornerstone key attributes not covered by direct inspection.

So, the first thing I looked at is I reviewed the basis documents and determined basically which PIs

use risk data. This data identifies if they are risk-informed PIs. As you can see, 6 of the 16 PIs are directly related to risk, which are contained in initiating events and mitigating systems cornerstones.

MEMBER SCHULTZ: You didn't put that in animation?

MR. BALAZIK: What's that? Well, I tried.

(Laughter.)

MEMBER BLEY: Next time we will hire you full-time on that.

MEMBER CORRADINI: Is he the one that can make it twirl and --

(Laughter.)

MEMBER SCHULTZ: That was Jeff. That was Jeff.

CHAIRMAN STETKAR: Let's see if we can finish all of this up by about 4:40, if we can, including Ron's closing stuff.

MR. BALAZIK: Yes, sir.

Like I mentioned earlier, MSPI was evaluated, and 12-0081 is largely ineffective in determining the appropriate regulatory response for the new reactor designs. And also, some PIs, unplanned scrams for 7,000 critical hours, were directly linked to PRA data. And that was not evaluated in 12-0081.

Meeting PIs and thresholds were more deterministic and could apply to new reactor designs in determining a reactor response. These thresholds were mainly based on historical industry performance and evaluated by both industry and NRC experts.

All right. So, the risk-informed PIs, the Mitigating Systems Performance Index, we have already talked about that. Basically, it is a sum of changes in the simplified core damage frequency evaluation for monitored systems, resulting from differences in unavailability and unreliability. MSPI is a 12-quarter rolling average that uses risk-based performance thresholds. They are the different systems that MSPI monitors.

Unplanned scrams simply is a measure of the rate of scrams per year. This indicator provides an indication of initiating event frequency. A value of 7,000 hours is used because it represents one year of reactor operation at 80-percent capacity factor. So, it is basically a normalizing factor.

Yes, I will go through these examples. This is just basically a MSPI example of high-pressure injection. And here is an example of scrams, a PI example. You can see the thresholds for the unplanned scrams is 3.0 for the green/white transition, 6.0 for the

white/yellow transition, and 25 for the yellow/red transition. And that is on a yearly basis.

CHAIRMAN STETKAR: You are proposing to keep those the same?

MR. BALAZIK: Yes, sir, I am.

CHAIRMAN STETKAR: Okay. Despite the fact that I could have 50 of them for a new plant and it still wouldn't make any difference?

MR. BALAZIK: Yes, sir. And even looking at the existing fleet, there were numerous plants, when they looked at different SPAR models and PRA models, some plants were greater than 100. It would take 100 scrams for them to exceed --

MEMBER CORRADINI: So, I know I am not allowed to ask you a question, but they can get mad at me later.

So, with the new plants, and let's take the four that actually are, well, we think actually are going to be built. There is a lot of passive safety systems. So, what do you do about those systems in terms of how do you monitor them to make sure that they are --

MR. BALAZIK: Yes, sir, that is the big question for MSPI. We concluded that MSPI, we need to revamp MSPI.

MR. FRAHM: Yes, the whole scope is going to change.

MR. BALAZIK: And we need to take into account those passive systems. We are not exactly sure how to handle them yet.

MS. FRANOVICH: Of course, the NRC Inspection Program could always be used to compensate for loss of MSPI for new reactors.

MEMBER BLEY: As I recall, you have proposed working on that in the future.

MR. BALAZIK: Yes, sir.

CHAIRMAN STETKAR: Yes, the whole MSPI --

MR. BALAZIK: Yes, sir, the whole MSPI --

CHAIRMAN STETKAR: -- the scope of the systems, and how will you measure it --

MR. FRAHM: As a result of last summer's tabletops as well.

CHAIRMAN STETKAR: Sorry.

MR. BALAZIK: No, that's okay.

I'm going to skip all that.

Basically, evaluating the MSPIs was in 12-0081, and they evaluated the unplanned scrams for 7,000 critical hours. And basically, CDF sensitivity studies were conducted. They informed initial thresholds. The settings, the current settings, are extremely conservative for the existing fleet, and these existing thresholds of performance would bound the lower

risk of new reactors.

In conclusion, we already talked about MSPI. The unplanned scrams can be applied to the new designs since the thresholds are set conservatively and would sufficiently capture declining performance of the new designs.

And in those scrams with complications, that is a subset of the unplanned scrams, it informs the NRC that a scram is more risk-significant than a normal scram. Basically, it requires additional operator actions beyond that of a normal scram.

We would have to develop qualitative questions to determine what band is determined complicated. We don't know the level of this complication, but just that the scram is considered complicated. And that threshold is 1.0 per year.

The remaining PIs were more deterministic and based on standards and regulations that can apply to new designs to determine the appropriate regulatory response.

Any questions on PIs, Performance Indicators?

CHAIRMAN STETKAR: I only had one --

MR. BALAZIK: Yes, sir.

CHAIRMAN STETKAR: -- and I hesitate to ask

this. One of the Performance Indicators is on security.

MR. BALAZIK: Yes, sir.

CHAIRMAN STETKAR: And I don't want to go into detail here, but, as I read it, it is all physical security. Have you thought at all about cybersecurity in new reactors?

MR. BALAZIK: No, sir.

CHAIRMAN STETKAR: Okay.

MR. BALAZIK: Not in PI space, no, sir.

CHAIRMAN STETKAR: Thank you.

MR. BALAZIK: Uh-hum.

MR. FRAHM: Okay. Moving along, I just wanted to recap basically what we have talked about today and present our conclusions.

As Jeff noted earlier, we believe that the conceptual integrated risk-informed approach using qualitative measures is a good means to identify the potentially-significant issues that would not otherwise reveal themselves based solely on risk calculations. And this approach actually provides a clear and efficient way of ensuring a reliable and predictable regulatory response, which goes in line with our ROP framework and principles of good regulation.

And I also just wanted to point out that this is simply a concept at this point, and the details

would have to be developed going forward, if the Commission directs us accordingly.

On the next slide, as Eric noted previously, we do believe there are significant challenges in the development and implementation of a relative risk approach and that these outweigh the benefits. We don't consider this approach to be a viable option. And we believe that, if we were to develop this approach, we would still need some sort of integrated risk-informed approach to capture things that the pure relative risk approach would not get at, such as defense-in-depth and, in particular, barrier integrity, as well as the degradation of passive components.

As Mike just talked about just moments ago, his conclusions were that many of the PIs are based on regulations and standards that would also apply to the new reactor designs, but some PIs and initiating events and mitigating systems would require additional work. Primarily MSPI and the unplanned scrams with complications would need to have the complicated scram defined.

And based on these conclusions, our recommendations are that the Commission approve our plans to further develop the qualitative measures using the risk-informed qualitative approach to ensure an

appropriate regulatory response, and that they give us direction to further look at the current PIs and the initiating events and mitigating systems cornerstones.

MEMBER BLEY: Ron, you didn't walk us through the draft letter, and I just want to mention a couple of things.

MR. FRAHM: Please.

MEMBER BLEY: I think it could use a fair amount more work. I don't know if this is true, but it kind of reads like it was possibly written before Enclosures 2 and 3 were completely fleshed-out, but I don't know if that is true or not.

There are just some places where it doesn't seem wholly consistent with those. And then, there are some things that, at least to me, are a little funny.

"Qualitative methods (traditional deterministic)," most of the deterministic methods I know of are very quantitative. They are just deterministic in whether they meet the criterion or not. It is not the qualitative side.

And I won't go through the whole catalog, but I think you ought to go over it carefully looking for consistency with the other documents.

MR. FRAHM: And we did do that, and I would appreciate any specific feedback that you have, either

now or at a different time, whatever the protocol may be. But we do want to make it as clear and consistent as possible.

MEMBER BLEY: This isn't intended to be snippy, but if we are going to start and make a big pitch about how low the risk on new reactors is, orders of magnitude better than anything, and then we blow out a method that lets it go up, I find that inconsistent.

We had that discussion and there was the idea that, if it goes up a lot, and the qualitative backups will take care of things -- well, I just say they won't because it is the PRA that went up; the stuff is all in the PRA. What went up is stuff that is modeled well. So, you won't see it because you are not looking, you are not going to double-count things that are already in the PRA. So, think about that, Ron, and then, offline if you want to talk, I have marked a few other things.

MR. FRAHM: Okay. I would appreciate that.

And really, we just had one more slide, which was next steps. I just want to go through this very quickly.

We do have a public meeting scheduled for August 5th where we are actually going to solicit feedback from members of the public and NEI and others. That might be an opportunity.

And then, actually, we will probably have a full ACRS meeting September 5th-6th. We are waiting to hear the details on that. And perhaps an ACRS letter. I thought it was the 5th or the 6th. But, anyway, that will be hashed out.

(Laughter.)

Based on the feedback --

CHAIRMAN STETKAR: It is on the schedule.

MR. FRAHM: Okay.

CHAIRMAN STETKAR: We do what we are told.

MEMBER BLEY: We are only the members; we do what we are told.

CHAIRMAN STETKAR: We do what we are told.

(Laughter.)

MR. FRAHM: And then, based on the feedback from the ACRS and other external stakeholders, we will revise the draft SECY paper and send the paper up to the Commission in October.

And those are the next steps.

With that, I think staff is done with their portion of the presentation.

CHAIRMAN STETKAR: Any other questions for the staff?

(No response.)

Thank you. Thank you very much.

MR. FRAHM: Okay. Thank you.

CHAIRMAN STETKAR: And I really appreciate your accelerating the last part of the presentation. I know you took a lot of time to prepare all of that, and it is just a lot of material to cover in an afternoon. So, thanks a lot.

MEMBER BLEY: I think we could say we read it and didn't feel the need to really delve into it too far, yes.

CHAIRMAN STETKAR: And now, I will ask -- I don't know who is coming up, but I will just generically characterize them as "the industry" and see who actually sits down.

(Laughter.)

MR. GASSER: That would be me.

CHAIRMAN STETKAR: Yes, I have heard rumors. Okay, it is going to be Jeff? Good.

We purposely keep the seats low, so you feel appropriately humbled.

(Laughter.)

MR. GASSER: It worked.

So, good afternoon.

I'm Jeff Gasser, and I'm an Executive Vice President for Southern Nuclear Operating Company. And my responsibilities including building the operational

organization to commission and run Vogtle Units 3 and 4, as well as integrating the site into one four-unit operating site, which will be the eventual outcome.

In my previous roles as a Plant Manager and a Site Vice President and Chief Nuclear Officer, and last year as a loaned executive to the Institute of Nuclear Power Operations, I have advocated and worked to improve safe operations of a site and of our fleet and of the industry.

One of the most significant improvements that I have experienced was the originally implementation of the current reactor oversight process.

I want to start by identifying the points where we are on common ground here. Southern Nuclear values the NRC's role in monitoring plant safety performance. The public's trust and confidence can only exist through a credible and intrusive regulator.

Secondly, Southern Nuclear agrees with the Committee that it is important to preserve the safety gains that are provided by the advanced passive reactor designs. We are investing billions of dollars and assuming financial risk to build a first-of-a-kind plant. We do not want that to be for naught, due to poor operating practices.

Now, based on the first two bullets and my

desire to maintain the effectiveness of the reactor oversight process, I want to identify what I believe to be the fatal flaws associated with using a relative risk approach in the significance determination process.

Fundamentally, relative risk fails to fulfill the intent of the reactor oversight process and, in fact, would be counterproductive to its purpose.

NUREG-1649 is the NRC document describing the reactor oversight process, and it states five purposes of the ROP. Now I am not going to read these to you, in the interest of time.

CHAIRMAN STETKAR: You have all the time -- we can run over. You don't need to rush.

MEMBER CORRADINI: He rushed the staff only so you could take your time.

CHAIRMAN STETKAR: I wanted to make sure you have absolutely as much time as you need. So, don't feel rushed at all.

MR. GASSER: I appreciate that.

So, these purposes were referred to in both Jeff and Eric's presentations earlier this afternoon. So, I think, of these five purposes that are in the NUREG, what I would like to point out is that the concept of relative risk supports only one of them, and it works detrimentally against the other four.

Specifically, this afternoon there has been a lot of discussion about throwing a flag or raising a finding to greater-than-green in order to get the NRC's attention or to get licensee action on that issue. And while that does achieve bullet No. 2, it conflicts with the other four. And I think it is really important to recognize from a licensee perspective that green findings aren't okay. I mean, it is not business as usual when we receive a green finding. It means we have violated the regulations. We are required to take corrective action, and that corrective action is subject to followup NRC inspection. So, that is not a prerequisite to NRC or licensee action, to be greater-than-green.

Now the use of relative risk in the significance determination process appears to be a surrogate for achieving our common purpose of preserving the safety gains that are provided by the new designs. I don't think this is the appropriate vehicle to achieve that end purpose.

Basically, the new plants that are licensed under Part 52 have a requirement that doesn't exist for the currently-operating plants. Now this requirement to develop and maintain PRA models will be an effective tool to detect any erosion of safety gains.

Additionally, existing requirements, such

as the Maintenance Rule and problem identification and resolution, will be effective regulatory mechanisms to prevent the erosion of safety gains.

In closing, relative risk would result in a poor allocation of resources, both of the licensee and of the NRC. At a four-unit Vogtle operating site, a white finding at Unit 3, which is actually less risk-significant to public safety than a green finding of similar nature on Unit 1, would receive more resource allocation in order to correct.

I also want to emphasize that the ROP has resulted in a benefit not included in the purposes of NUREG-1649 that I showed on a previous slide. What it has done is it has created an incentive for plants to invest capital in improvements that provide safety gains. The concept of relative risk eliminates that incentive.

And that is the end of my remarks, and I would open it up to any of your questions.

CHAIRMAN STETKAR: I guess I would like to understand, I was going to ask you about the four red boxes on your 1649 slide. But your closing statement there, I guess I would like to better understand your perspectives for why that is the case.

MR. GASSER: Well, obviously, the world exists of -- there are constrained resources. So, money

is not unlimited. And so, in my case I was operating a fleet of six units at three sites and, then, soon to be eight units at three sites. It was always a challenge determining where we allocated capital for improving plant performance, whether it be safety performance or reliability and production performance.

And so, under the current regulatory process, there was clear benefit, mainly benefit that improved public confidence in our ability to operate the unit safely by investing in capital improvements that gave us greater margin to thresholds in the significance determination process here.

Very specifically, at Plant Farley, we invested millions of dollars both upfront we invested with our NSSS vendor in helping with their research and development cost to develop improved reactor coolant pump seals that greatly extended inventory in a post-station blackout environment. And we have implemented that; we are implementing those at Vogtle 1 and 2. So, I mean, that is a very real case where all of the benefit was to give us more margin to the thresholds in order to improve, provide safety gain from a design standpoint, which directly results in improved public confidence in our operation of the units. And so, if that threshold moves with those kinds of

improvements, you know, a significant amount of that benefit is eliminated for our company.

MEMBER SCHULTZ: I'm trying to -- oh, go ahead, John. You are on the same track.

CHAIRMAN STETKAR: Well, I am still sensing, though, some level of mixing of the notion of absolutes and relatives. Your example said that that is an example why the use of relative thresholds for increasing regulatory scrutiny is not appropriate. I understand capital improvements to reduce your total risk, but in some sense that relative monitoring process is saying, well, should we be concerned if that risk increases by a factor of 1 percent, 10 percent, 100 percent, 1,000 percent, 10,000 percent --

MR. GASSER: Sure, sure.

CHAIRMAN STETKAR: -- 100,000 percent --

MR. GASSER: Sure.

CHAIRMAN STETKAR: -- regardless of where it is. You know, at what level of increase should there be improved or let's say enhanced scrutiny.

MR. GASSER: Okay.

CHAIRMAN STETKAR: Take a closer look at what caused that --

MR. GASSER: Sure.

CHAIRMAN STETKAR: -- increase. Is it

something that is applied progressively over a long period of time? Is it something that there has been a sudden change in operations or maintenance or whatever --

MR. GASSER: Sure.

CHAIRMAN STETKAR: -- philosophy?

MR. GASSER: Yes. So, I agree with that point. The reason why the second block is checked there is I agree that, so we improve our risk profile. In our exact case I described, I don't want to lose that. And so, that is why I would say that starting to lose that, the relative risk increase, that would be a performance problem.

CHAIRMAN STETKAR: Yes.

MR. GASSER: Okay? And so, that is why I checked that it does fulfill that intent, but I believe that, because it works counter to the other four, that the staff should figure out an approach, when they have proposed an approach, that would tend to get to that intent, that objective, with less likelihood of having a negative impact on the other four purposes of the reactor oversight process.

CHAIRMAN STETKAR: And at least, if I understand what you are saying, it is that you have better confidence in the integrated combination of qualitative and fixed numerical metrics to achieve that purpose than

the application of the relative metrics?

MR. GASSER: Yes. So, I think, obviously, the staff's recommendation is a work-in-progress, and we will continue to engage, the industry will continue to engage. But, from my understanding of what I have read about it, I think it is less likely to cause the potential negative consequences that I have got here and that Eric also pointed out. And so, I think there is more likelihood that we will achieve the objective without the negative impacts.

CHAIRMAN STETKAR: Okay. Thanks.

MEMBER CORRADINI: Oh, I'm sorry.

MEMBER BLEY: Yes, I was just going to follow up a little, because I appreciated your presentation, especially your talk about the green findings not being a good thing.

(Laughter.)

That gets forgotten sometimes along the way.

I am wondering, because none of us want to see the kind of thing we have talked about happening where you erode the real good quality of these new designs. I kind of suspect that, for the normal kind of things we see crop up, we are mostly not going to see a lot of difference in taking one approach or the other. But I would sure like to see something that shines a flag

other than just the PRA on cases where you are really changing things a lot for one of these plants that are starting so good. I know you wouldn't be happy with that anyway.

But maybe you ought to think about that a little more, how you get that without causing some of the problems you are seeing. And it is not completely clear to me how significant those really are for the kind of things we normally see happen. But more to think about.

I'm sorry, Mike. Go on.

MEMBER CORRADINI: I guess I was taken by your last set of sentences. I am trying to figure out, to say it differently. But what you said was, if I heard it correctly, is that you had Vogtle 1 and 2. They are sitting there at green. And you had soon-to-be Vogtle 3, and it got a white. Your management can't tell the difference between relative and absolute. It would view that all as absolute and go put more resources on something that, unless I misheard you, something that actually from a risk standpoint is less-risk-significant than a green that might have turned white.

In other words, you are on the border of green to white with 1 and 2, but you are sitting here in white with a relative risk measures and 3. And given

that -- and I am going to use the management -- the management looks at it like the public might, strictly absolute. That is how I interpreted what I heard you say.

MR. GASSER: Let me try to clarify that slightly. It is that having a white finding is an acute problem versus being on the green-to-white border is a chronic problem. Okay? So, from a management perspective, I have to go -- I mean, I have got an inspection coming up from the NRC, and I have got to fix this and I have got to fix it now because failing that inspection becomes an even more acute problem for us and communicates to the public even a worse or a greater lack of confidence in our ability to run the unit.

So, because I know the relative nature of them, I won't just ignore the Unit 1 or 2 issue that is on that border; it is green, but close to white. But, from a priority standpoint, I will work on both of them, but I have got to put the full-court press on the white issue because it is an acute problem I have got to solve.

MEMBER CORRADINI: Okay.

MR. GASSER: So, that is how the resource priority --

MEMBER CORRADINI: No, that's fine. That's fine. That helps.

MEMBER REMPE: So, I would like to ask what I think Dennis was saying a little more in-depth. The last bullet on your slide before this one says that the PRA required updates, and upgrades will provide effective insights regarding any potential performance-induced erosion safety gains.

But, in light of all this discussion about how to focus your resources, what will you do about those insights?

MR. GASSER: Well, first, I think the staff can use those insights to continue to modify or make recommendations of modifying the process.

What we are all worried about is something that has not yet happened, right?

CHAIRMAN STETKAR: Yes.

(Laughter.)

MR. GASSER: And, of course, I am not advocating that we wait for a problem to take action. But I kind of go back to when the current reactor oversight process was implemented. One of the real concerns in the industry and NRC staff discussion, one of the real concerns at that time and today, all of the operating plants actually have different margins to the threshold. Okay? They have different risk levels today.

And so, one of the concerns was that the

plant, Vogtle 1 and 2, one of the more-recently-licensed sites with greater design margin, that those kinds of plants would basically allow those margins to go away, those safety gains go away, and kind of everyone go to the lowest common denominator because we could. Okay? That was a concern then.

Well, that hasn't happened. That has not come to pass. And in fact, I believe that the evidence shows the opposite, which is what I don't think everyone really realized, but was that the benefit of creating the incentive to actually improve those safety margins has driven the licensee's actions.

And so, personally, we are invested. Like I said, we are taking on risks we didn't need to take on to build an AP1000 with a first-of-a-kind. We don't want to lose that.

I would say that our past practice would say we are not going to allow that to erode, but if it does, there will be time for the NRC to know it, recognize it, and decide how they want to act.

MEMBER REMPE: Thanks.

MEMBER SCHULTZ: Well, the current ROP approach helps you with Vogtle. In other words, you have got a plant with larger safety margins. You have developed those and incorporated all of that into the

PRA. So, you have an advantage with regard to the current ROP process. And so, that is all well and good.

But I am still trying to capture where you would recommend we would go with regard to Vogtle 3 and 4 because I really think it is critical, your bullet No. 2, preventing erosion of the safety gains. We are not building these plants, I don't think, new plants, other than the fact that we have made the case that they are much safer than the operating plants. Otherwise, I don't believe we would be building them, and I don't think we should be building plants that aren't up-to-date where the operating plant is given. The operating plants were built decades ago.

So, what we were trying to develop with the relative risk approach was something that, in fact, would really, really achieve your bullet No. 2.

MR. GASSER: Uh-hum.

MEMBER SCHULTZ: We have made a commitment that Vogtle 3 and 4 are going to have and maintain a higher degree of safety performance and capability than the current operating plant. So, we want to do that.

And I am not sure that having a white finding on Vogtle 3 and 4, because with the relative risk approach, something really, really, really bad has happened at those units. I think that is what we expected would

happen, would cause that, as compared to something with a green finding in Vogtles 1 and 2.

I am not sure that is a bad thing.

MR. GASSER: Okay.

MEMBER SCHULTZ: And to put it a different way, I really don't think you are going to get the white finding in Vogtle 3 and 4 with the relative risk approach. It is very, very, very infrequent. I mean, it has to be.

MR. FRAHM: So, again, I mean, I am as committed to not allowing the erosion of those safety bands --

MEMBER SCHULTZ: And let me add to that. I think it is important that we continue to explain to the public the differences. I think it is appropriate we have a different approach for new plants versus old the plants, operating plants -- excuse me -- for the reasons that I stated.

We have made a commitment that the new plants are going to have larger safety margins, better capability in severe accidents, and so on and so forth. So, we need to continue to demonstrate that we are maintaining that.

You know, shame on us if we later on say, "Well, we have allowed a 10-to-the-minus-8 plant to become

a 10-to-the-minus-7 plant, because operating plants, they are 10 to the minus 6." Whatever the metrics are, we cannot let that happen.

MR. GASSER: I agree with that.

MEMBER SCHULTZ: And so, we do need an ROP process that I feel ensures that.

MR. GASSER: I agree with that. Like I said, I believe that the staff's approach achieves that without the potential significant downsides of misallocating resources and creating confusion in the public's eye as to the relative safety of the units in their backyard, in their neighborhood.

CHAIRMAN STETKAR: I guess one of the things I would -- Stephen, do you want to finish up?

MEMBER SCHULTZ: What I saw in the staff's approach, it still bothers me that there is a push to develop a program and process that is the same for new plants and for operating plants, current operating plants. I'm not --

MEMBER CORRADINI: I'm sorry, I didn't mean to interrupt you.

MEMBER SCHULTZ: Go ahead. That's it.

MEMBER CORRADINI: I guess I was expecting the staff to say there's enough uncertainty on the calculation of the baseline, that that is why we don't

want to do it yet, and we will come back to this once we have a more certain baseline.

MEMBER SCHULTZ: Well, that's what --

MEMBER CORRADINI: And I didn't hear that. So, I was looking for a reason that wasn't in the enclosures. All the reasoning in the enclosures to me strikes me as interesting; I am more struck by your argument, at least the way I heard it, is that the management thinks like the public. "I see a white. I'd better go to do something or I'm toast," in the public perception, in the management perception of it, when, in actuality, a green to become a white in 1 and 2 actually from a risk profile standpoint is more of a concern.

MR. GASSER: And I think that is because we have to react to the public --

MEMBER CORRADINI: No, I understand. So, shall I turn it back to you and say, "Okay, if you don't an erosion and you have limited resources, how would you use the fact that you have got a safer plant, fundamentally safer plant, and track it and monitor it, so you don't have erosion?" If this is the wrong way, what is the right way?

I mean, your argument is that the ROP approach misdirects effort, worry, resources in the wrong way. So, what is the right way to make sure you don't have

an erosion?

MR. GASSER: I think that, first of all, again, because we are dealing with a problem that hasn't occurred yet, I think that this point of us having the required PRA models, which the NRC will be able to inspect and monitor, that the NRC will know, if it does begin to happen, the NRC will know that it is happening. Okay? And even before the periodic updates, in monitoring the findings and the nature of the findings, and due to things like cross-cutting issues and other elements of the reactor oversight process, I think the NRC will know if the ROP has the tools, the regulatory tools, they need to get the performance that they desire out of licensees.

So, I think that is from a regulatory standpoint. I am not a regulator, of course. So, from a licensee's standpoint, our own plans are that we monitor our performance from a PRA standpoint and we set our own internal thresholds for what we expect performance to be, and we are going to be setting those thresholds in a manner that preserves, you know, that internally would preserve the safety gains the design provides.

MEMBER SCHULTZ: I guess to follow up on your point, Mike, the other thing I was going to ask of the industry is, have enough tabletop exercises been

done? We saw an example presented by the staff on one new plant design and one particular consideration with regard to this approach, in combination with the qualitative measures.

And my question is, have you done this with the Vogtle units, doing the "What if's?" to determine whether, in fact, you would get into a white finding?

MR. GASSER: No, we have not actually sat down and tried to tabletop all the various scenarios of equipment out of service or failures. We have not done that yet.

CHAIRMAN STETKAR: Let me see if I can flip something. I am trying to develop a semi-coherent thought here.

Let's suppose there was a condition that occurred at Vogtle 3 and 4 that, indeed, merited attention. And I'll call it yellow. It doesn't make any difference what color it is; some yellow. And that we all agree that that condition, whatever it is, ought to trigger that level of regulatory scrutiny; that that is something that, for whatever reason, is appropriate to trigger that.

Some of my perspective is, how do we reach that? You know, what tools do we use to most effectively reach that conclusion in the sense of the explicit goals

of the reactor oversight process, which is objectivity, being risk-informed, being reproducible, being consistent from plant-to-plant, inspector-to-inspector?

And I think, in some sense, if we look at it from that perspective, the question is, what is the most effective toolkit do we use to achieve those goals? Is it a quantitative measure solely? Probably not. Is it a qualitative measure solely? Probably not. Is it a mix of the two? Probably.

The question, then, becomes, what is the mix between quantitative and qualitative? I mean, it is a decision that needs to be made.

You know, there are some of us -- and I will raise my hand -- who believe in a more quantitative approach because it reinforces that notion of objectivity, repeatability, consistency. You can run your PRA model --

MR. GASSER: Sure.

CHAIRMAN STETKAR: -- and know beforehand --

MR. GASSER: Yes.

CHAIRMAN STETKAR: -- where you are going to fall.

There are others who believe that a greater reliance on qualitative measures, as we saw in the examples there, that the qualitative measures effectively determine the final finding because the final finding

was relatively insensitive to what the PRA told me, in the three examples that the staff used on that.

And I think that is fundamentally where we are. You know, you can probably achieve the same goal both ways. And I don't know if you have any sort of insights/feedback on that. I mean, that is sort of the place I have come to on this.

MR. GASSER: Yes, and I think that -- I mean, I agree with that. So, where we are at somewhere is where is the right balance there. And so, I have been in a situation where I have had a plant in column 2, and I have been in a situation where I have had a plant in column 3.

And one of the most significant drivers for the licensee is the public perception and the loss of confidence. Because, if you think about it, from my own -- I won't speak for the NRC -- I believe the whole color code system was set up for the public to easily understand the risk to their safety of a plant's performance. That is the purpose of the colors because the NRC could elevate their resource allocation without using colors.

So, I believe licensees, probably more so than either the regulator -- I shouldn't say that -- but more so than many were extremely sensitive to having

a process where it is easy for the public to distinguish relative performance between the plant that is 10 miles away from where they live and a plant that is 500 miles away from where they live, and have an idea of where they fall out in the NRC's view of relative performance against a common standard. So, that is our sensitivity as a licensee.

CHAIRMAN STETKAR: Anything else among the members?

(No response.)

If not, thank you. That was really good.

MR. GASSER: Thanks. I really appreciate the opportunity.

CHAIRMAN STETKAR: A half-hour well-spent, I think.

MR. GASSER: Thank you. I appreciate the opportunity.

CHAIRMAN STETKAR: A couple of closeout things. Let me, before we close out the session, ask if there are any members of the public or anyone else in the room who would like to make any comments or say anything.

(No response.)

If not, let's open the bridge line, just in case there, indeed, is someone out there.

It sounds like it is open.

If there is anyone out there listening-in, could you just please say something, so that we can confirm that it is open? I know that always sounds silly, but it is the only way we have of confirming this.

MR. LARSON: This is Jerry Larson from Farmer Station.

CHAIRMAN STETKAR: Good. Excellent. Thank you very much. At least we know it is open.

Now is there anyone on the bridge line who would like to make a comment or a statement?

(No response.)

Hearing nothing, I will presume that the answer is no, and we will close the bridge line again, only because it makes a lot of pops and crackles in here.

And with that, what I would like to do is what we normally do in a Subcommittee meeting, is go around the table and see if any of the members have any final comments that they would like to make. And I will start with Dr. Rempe.

MEMBER REMPE: Well, thank you.

I found the discussion helpful, the examples very helpful, compared to prior to discussions we have had on this topic. And I just would like to express my thanks for the preparations by the staff and the

industry.

CHAIRMAN STETKAR: Thank you.

Dr. Corradini, sir?

MEMBER CORRADINI: Well, I wanted to thank the staff and Southern Nuclear, too, for their comments and discussion.

I guess I still see the benefit of the relative risk, but, as I hear the discussion about how it could cause what might be termed unnecessary activity, I am appreciative of it. I am just not exactly sure how to deal with it.

I am thinking more about when the staff was talking about how they would develop the baseline CDF. I didn't think about it until as they were going through the discussion, how that actually might be even more of a concern. It is independent of whether you do a relative risk or an absolute. But I think that is actually something that would create actually larger values. And therefore, a lot of this may be moot. That is, we might be at a region where, regardless of whichever way we choose, we would end up with a similar approach to it.

The only other thing that I guess I am struggling is I think Southern Nuclear's discussion was interesting because I would view it that maybe the

management as well as the public may actually think about things in an absolute sense, which might skew it not the direction you maybe would want.

So, I came in thinking that we really want to hold to some sort of thinking of relative risk, but now I am a bit more cloudy about it. So, I think the staff at least has got me thinking some more about it.

So, I would thank the staff for their efforts.

CHAIRMAN STETKAR: Dr. Bley?

MEMBER BLEY: Yes. To the staff, I really appreciated the presentations. Things were very well-put-together.

I am just going to say a couple of words about relative risk and qualitative measures. I think the work on qualitative measures is really a very good start on something I think is quite an important issue. And that is true regardless of whether one ends up using delta risk or just delta CDF, relative risk or delta CDF.

It is important because it allows a structured focus on things that are missing in the quantitative analysis. Eventually, it would be nice to get more of that in the quantitative analysis, but for now and for the foreseeable future, that is an important thing to pick up.

The relative risk discussion and presentations raised, I think, some key issues. And I think there are some problems in making the system work.

To me, reading the staff paper and Appendix 3, I may have misread what they were intending, but the words I read dwelt so much on how hard it is to do relative risk, that to me it devalued what is important.

Now there is something that is hard, and what is hard is making this process fair across old plants and new plants, plants with complete PRAs and plants without complete PRAs. And that is something that needs to get looked at and worked out. But just doing the calculation is not that big a deal.

Whatever happens, I think within this process one needs to have some measure that will prevent the erosion of safety goals that I saw on the slide. It has got to be here. I mean, there are other ways to get it, but why not here?

And if it is relative risk, that is one way, but maybe there is some hybrid approach in there that picks up both categories. I think of the important problems, the ones I just mentioned, and also the idea of trying to allocate fixed or highly-constrained budgets to attack these problem is important.

I think this idea that a more risk-significant green finding on a plant with a high core damage frequency being not addressed because of a white finding on something else or something with a lower one is an important issue. But we don't want to let these plants degrade, these new plants that have such good advantages.

Sorry I babbled so long.

CHAIRMAN STETKAR: Steve?

MEMBER SCHULTZ: I would just pick up on the last point because I talked about it a lot this afternoon. But I do feel that it would be appropriate to set a new approach associated with new plants that is different than what we have for operating plants. I understand that it is nice to have consistency, but I think that can be handled separately, should be able to be handled separately.

I like an approach that takes advantage, full advantage, of the PRA capability that is going to be available for new plants, in combination -- I agree with what John said -- in combination with a qualitative evaluation.

I really appreciate what the staff has put together with regard to that, and I think that is appropriate. But I certainly would not impose, therefore, an application to operating plants to,

therefore, have to develop full-scope PRAs and all the attributes that are being developed for new plants.

So, I think something has to be done there, and I don't feel that just saying a particular approach should not be used because it can't be applied both to new plants and operating plants is an appropriate way to go. I think we have to dig deeper into ways to handle this in terms of the regulatory process, and I think that is achievable.

I do appreciate Jeff's presentation and the comments there. And I do feel deeply, as he feels deeply, that maintaining approaches that are well-understood by the public, by those that we serve with operating plants and with new plants both, is very important. And we don't want to cause an inconsistency or confusion with regard to the overall approach and processes we apply to the fleet, to the industry. So, we have to be careful and cautious there. So, perhaps we need to think a bit further, more broadly, about how we do the regulation part and how we do the public communication.

But I thank the staff for all the work that went into their presentation and process development, and look forward to more in the future.

CHAIRMAN STETKAR: Thank you.

I really don't have much more. I do very

much appreciate the effort that the staff put into developing the Draft Paper and the examples. A lot of thought went into that.

I also really appreciate the industry's perspectives on this.

I do echo Dennis' concerns a bit, that the Draft Paper itself seems to present many, many arguments against the relative risk measures that perhaps need a bit more elaboration or thought. It seems to presume a very efficiently and effectively implemented use of qualitative measures without the same degree of, let's say, critical scrutiny. And I will just leave it at that.

Because I think that the final statement that I made when Jeff was up there is that what we are all looking for, I believe, here is a process that gives the regulator, and probably more importantly, the public, the confidence that if something, indeed, is occurring at a plant -- and I won't distinguish for the moment between an operating plant or a new plant -- a plant that has substantially eroded the existing safety margins for that plant, that we have a process whereby the regulator is alerted to that, to trigger a certain degree of scrutiny.

Hopefully, the plant is alerted to it even before that, but so be it, something happens that the

regulator is alerted to that. And that the process of reaching that level of determination, whether it is a green or a white or yellow or red, or whatever color scheme we use, is a process that satisfies the real goals of the ROP. And I will come back to the objectivity, reproducibility, expectance, you know, not a reliance on -- kind of situation-specific, inspector-specifics, plant-specific, qualitative judgment, an over-reliance on it anyway. Qualitative judgment will always be a part of that whole process.

And I don't have the answer certainly. I don't think any of us do.

Again, I really appreciate all of the effort that has gone in, and we look forward to our meeting on whatever day it is with the full Committee.

(Laughter.)

September.

MEMBER CORRADINI: And do we know the month?

CHAIRMAN STETKAR: It is September. John tells me it is September. I trust him.

(Laughter.)

And with that, unless there are any other comments, we are adjourned.

(Whereupon, at 5:20 p.m., the proceedings in the above-entitled matter were adjourned.)

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RISK-INFORMING THE REACTOR OVERSIGHT PROCESS FOR NEW REACTORS

Advisory Committee on Reactor Safeguards
Subcommittee on Reliability and PRA

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July 22, 2013

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Meeting Purpose

Discuss staff's technical evaluations, conclusions and recommendations as noted in draft Commission paper regarding risk-informing the Reactor Oversight Process for new reactors in response to the SRM on SECY-12-0081

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Agenda

- Background and Overview of Paper
- Technical Basis and Examples of Integrated Risk-Informed Approach Using Qualitative Measures
- Technical Evaluation of Relative Risk Measures and Reexamination of Pros and Cons
- Discussion of Appropriateness of Existing Performance Indicators and Thresholds
- Conclusions and recommendations in draft paper
- Next steps

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Background

- Baseline risk estimates for most new reactor designs are lower than those for a design similar to that of the current fleet
- Lower risk values raised questions about how to apply acceptance guidelines for changes to licensing basis and regulatory response in ROP
- Over past several years, staff has corresponded with Commission and ACRS to address staff's recommendations related to risk-informed guidance for new light-water reactor applications

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Background (cont.)

- SECY-12-0081, "Risk-Informed Regulatory Framework for New Reactors," issued June 2012 to provide staff recommendations on both licensing and oversight processes
- Tabletop exercises indicated that current risk thresholds are appropriate for ROP; however, a few changes may be warranted consistent with integrated risk-informed principles in RG 1.174
- Staff recommended Option 3B; to augment existing risk-informed ROP tools with deterministic backstops to ensure an appropriate regulatory response for the new reactor designs

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Commission SRM Dated October 22, 2012

- The SRM states, in part, that the Commission has disapproved the staff's recommendation (Option 3B) related to the ROP
- The staff should give additional consideration to the use of relative risk metrics, or if the staff believes that this is not a viable option for new reactor oversight, it should provide a technical basis for its conclusions.
- The staff should provide the Commission with a notation vote paper that provides:
  1. A technical basis for the staff's proposal for the use of deterministic backstops, including examples
  2. A technical evaluation of the use of relative risk measures, including a reexamination of the pros and cons
  3. A discussion of the appropriateness of the existing performance indicators and the related thresholds for new reactors

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Staff Approach

- Deliverable is a Notation Vote SECY for EDO signature in October 2013
- Involve internal and external stakeholders, including NRR/DIRS, NRO/DSRA, NRR/DRA, RES, NRO/DCIP, Regions, Industry, ACRS, and public
- Stay within scope of the request (provide technical basis and discussion) and do not try to fully develop the backstops, relative risk approach, etc.
- Provide a crisp paper with enough detail to provide the Commission the information they need to direct the staff appropriately, with supporting details in enclosures
- The LRF history and independent review portions of SRM are not within the scope of this paper

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ROP Objectives

- Improve the Objectivity of the Oversight Processes - Subjective Decision-making is Minimized
- Improve the Scrutability and Predictability of NRC Actions - Regulatory Response and NRC Actions Have a Clear Tie to Licensee Performance
- Risk-inform the Processes - NRC and Licensee Resources are Focused on Performance Issues With the Greatest Impact on Safe Plant Operation

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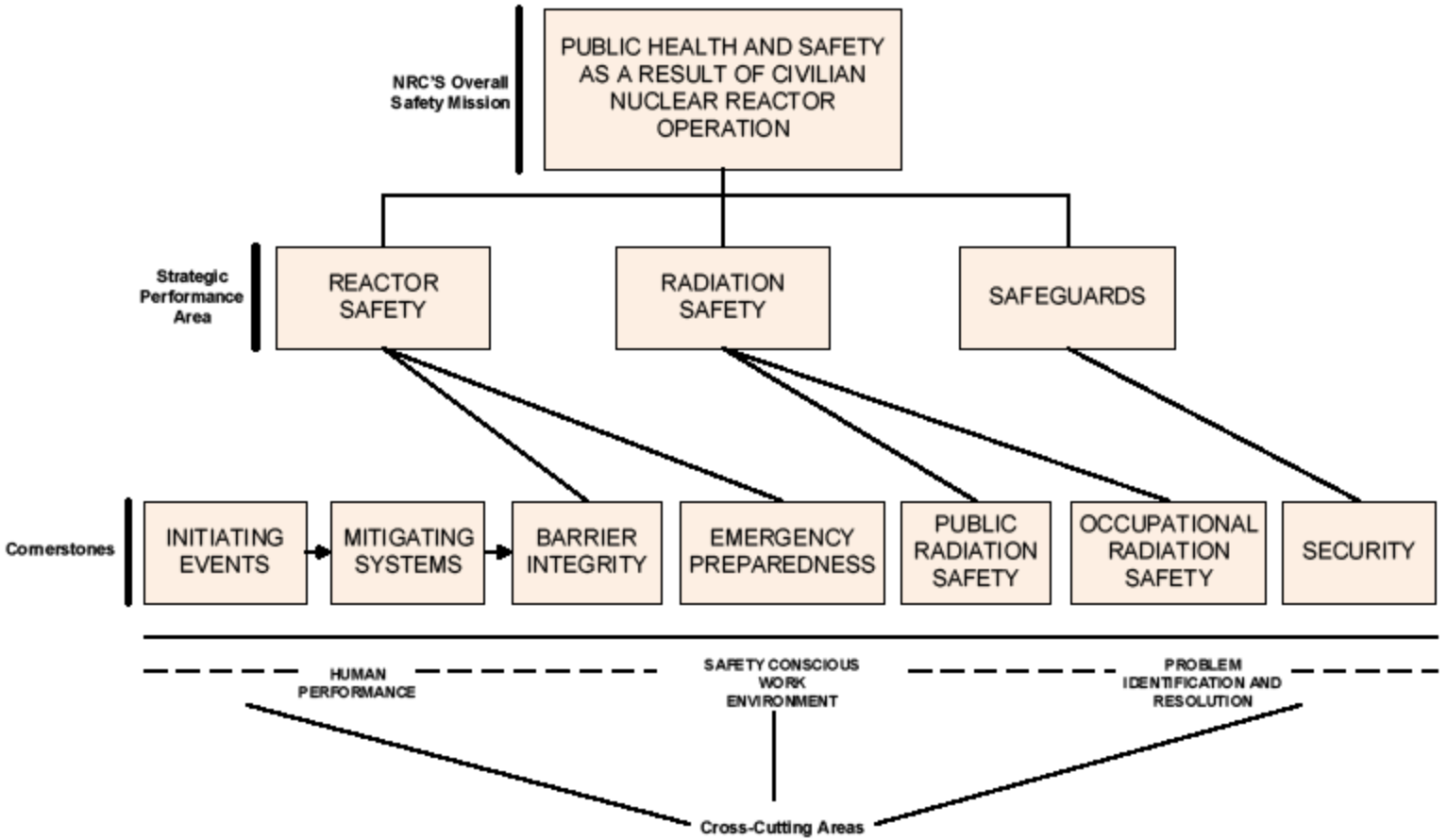
REGULATORY FRAMEWORK



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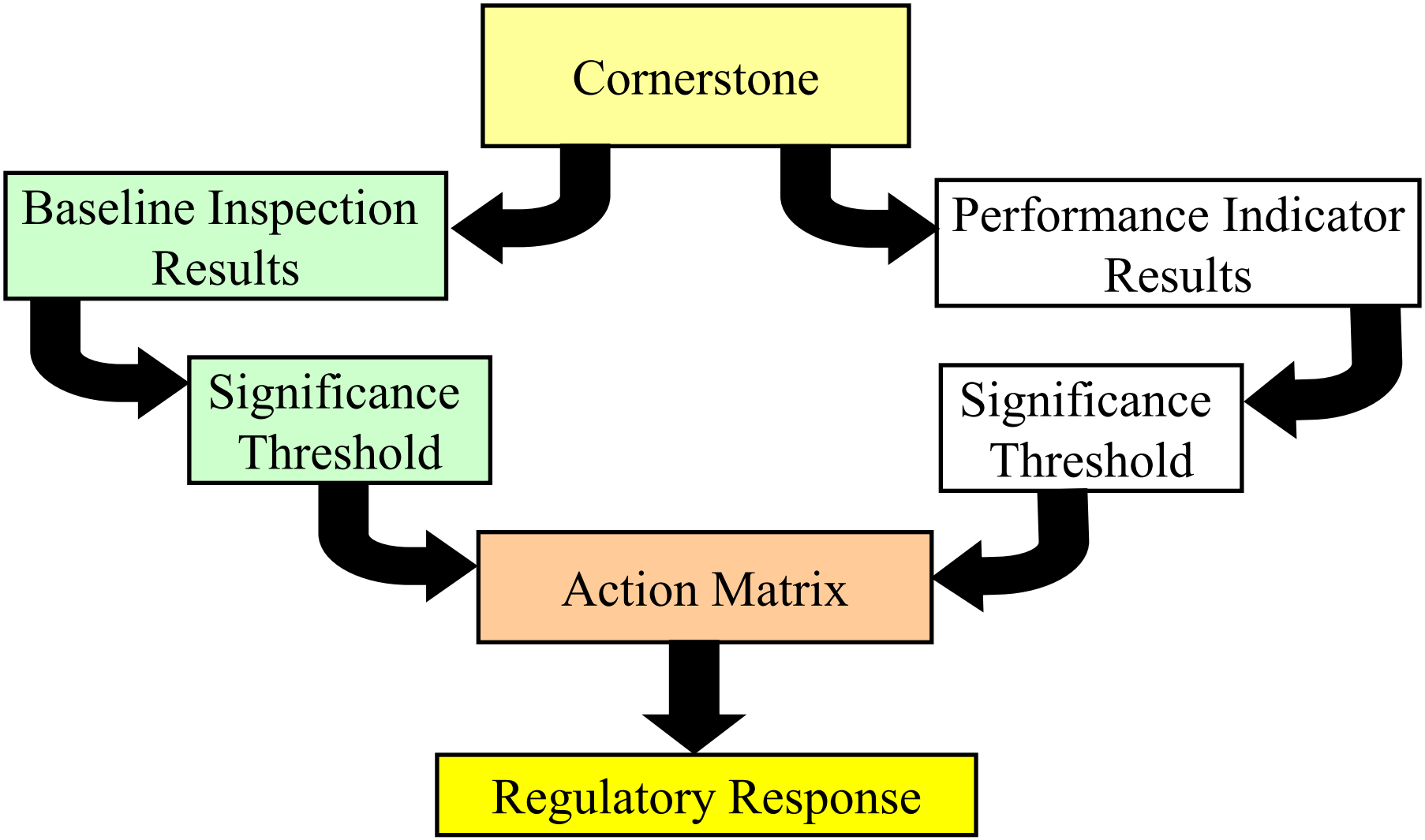

SDP Guidance

- Implementation Guidance in IMC 0609, "Significance Determination Process," and IMC 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations"
- Appendix A and a few others use risk insights to inform regulatory response. Several other SDPs are more deterministic
- Risk thresholds are a function of changes in core damage frequency (CDF) and large early release frequency (LERF) against a plant's baseline risk
- Appendix M used when risk methods and tools are not available or appropriate to provide reasonable and timely estimates of safety significance

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Technical Basis and Examples of Integrated Risk-Informed Approach Using Qualitative Measures

Jeff Circle

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Objectives

- Present the staff proposed response to SRM-SECY-12-0081 in developing qualitative measures (deterministic backstops)
- Discuss objectives and considerations in developing a concept
- Discuss specific features of qualitative measures
- Show one of the specific examples of uses of qualitative measures within the context of the existing Reactor Oversight Process (ROP) and new reactor designs

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Background

- SRM-SECY-12-081 instructed the staff to provide "a technical basis for the staff's proposal for the use of *deterministic backstops*, including examples"
- In response, the staff has replaced the term "deterministic backstops" with "qualitative measures," which more accurately depicts the intent of the original proposal in SECY-12-081 and the proposed approach as described in the draft paper

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Staff's Objectives and Considerations

- Produce a methodology representing one possible way in which such a process can be developed to augment assessment of ROP Significance Determination Process (SDP) findings
- Easily understood and traceable technical basis
- Conceptual in nature as an illustrative example
- Can be applied to new reactors and the existing operating fleet
- Consistent with NTTF Recommendations 1 and 12 and will be coordinated with those efforts

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Consistency

- **The concept needs to also follow..**

Principles of Good Regulation	ROP Goals
Independence	Objectivity
Openness	Risk-informed
Efficiency	Predictability
Clarity	Understandability
Reliability	

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Technical Bases

- PRA Policy Statement of 1995
- Regulatory Guide (RG) 1.174, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis”
- SECY-98-144 (Revision 1), “White Paper on Risk-Informed, Performance Based Regulation”
- SECY-99-007A, “Recommendations for Reactor Oversight Process Improvements (Follow Up to SECY-99-007)”
- NUREG-1860, “Feasibility Study For a Risk-Informed and Performance-Based Regulatory Structure for Future Plant Licensing”

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Concept Development

- ROP-SDP is a risk-informed process to evaluate licensee performance deficiencies in order to allocate inspection resources
  - Has a ***quantitative*** core damage and large early release frequency aspect
  - Has a ***qualitative*** deterministic aspect
  - Both should be considered together to arrive at a determination
- Quantitative part of the SDP is well defined
  - End state color bands based on thresholds of increases in
    - Core Damage Frequency (ΔCDF) and
    - Large Early Release Frequency (ΔLERF).
  - Detailed methodologies contained in IMC-0609 and guidance for analysts contained in the Risk Assessment Standardization Project (RASP) Manual
- Qualitative guidance should be as well defined

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Integrated Approach

- Develop a set of qualitative elements
  - Consider adapting traditional deterministic elements
  - Evaluate each element by a defined simple "*impact rating*"
  - Impact ratings are arbitrarily defined for this concept
- Use a structured approach
  - Simplify it for all stakeholders to use and reference.
  - Use of a decision tree or table
  - Simplify impact rating rules to avoid ambiguity
  - Consider applying limited recovery credit outside of the quantitative scope
- Arrive at a single qualitative rating
- Apply and aggregate qualitative rating together with quantitative result
- Use a table to arrive at a color band assessment

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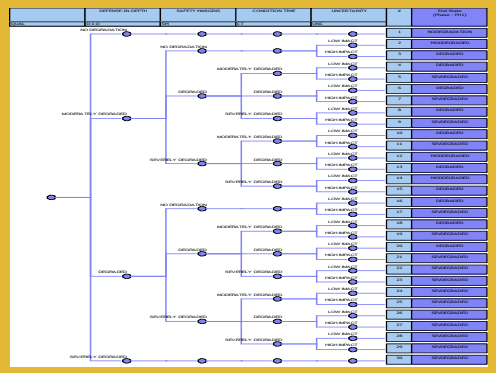
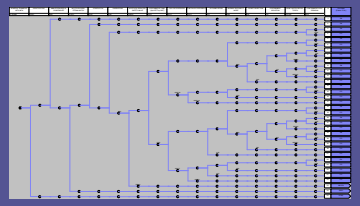
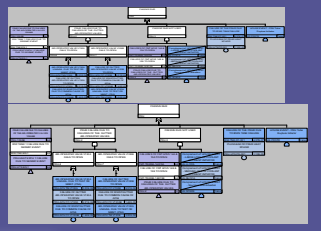
Framework of Integrated Approach



Qualitative Risk Evaluation





Quantitative Risk Evaluation

Aggregate Qualitative Rating

Final Determination Table

ΔCDF (CCDP normalized to 1 year) →	Δ_{CDF} <10^{-6}	$10^{-6} \leq \Delta_{CDF} < 10^{-5}$	$10^{-5} \leq \Delta_{CDF} < 10^{-4}$	$\Delta_{CDF} \geq 10^{-4}$
ΔLERF (CLERP normalized to 1 year) →	Δ_{LERF} <10^{-7}	$10^{-7} \leq \Delta_{LERF} < 10^{-6}$	$10^{-6} \leq \Delta_{LERF} < 10^{-5}$	$\Delta_{LERF} \geq 10^{-5}$
Qualitative Rating ↓				
Negligibly Degraded	Green	Green	White	Yellow
Moderately Degraded		White	Yellow	Red
Degraded	White	Yellow	Red	Red
Significantly Degraded	Yellow	Red	Red	Red

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Development of Elements of Qualitative Measures

- Defense-in-Depth
- Safety Margins
- Condition Time
- Qualitative Credit

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Defense-in-Depth

- Successive levels of protection so that health and safety will not wholly depend on any single element of:
  - Design
  - Construction
  - Maintenance
  - Operation
- Can be viewed as individual barriers of potential accident mitigation
- Various definitions and references of specific examples of defense-in-depth contained within Title 10 of CFR
- Further definition refinement will be addressed by the Near-term Task Force as part of Recommendation 1

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Defense-in-Depth Evaluation Criteria

Number of Defense-in-Depth Barriers Lost or Impacted by the Finding	Impact Rating
None	Negligibly degraded
Impact on any barrier without a complete loss of that barrier	Moderately degraded
Complete loss of only one barrier	Degraded
A loss of more than one barrier	Significantly degraded

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Safety Margins

- RG 1.174 considers as those factors applied to system engineering design parameters
  - Accounts for uncertainty in calculations
  - Fulfilling requirements for licensing or design bases.
- Margins are used for licensing purposes and the limit falls below the ultimate capacity of a system, structure, or component
- In the context of the paper, the licensing limit is chosen as the maximum value
- Only safety margins for non-failed barriers of defense-in-depth will be evaluated for additional impact
  - Avoids “double-counting” of the combined impacts of safety margins and defense-in-depth
  - Any further erosion of safety margins for these intact barriers, as well as for systems used to mitigate the loss of these barriers, is qualitatively considered.

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Safety Margin Evaluation Criteria

Impact of Safety Margin to Remaining D-I-D Barriers	Impact Rating
No lost margin	Negligibly degraded
Some margin lost	Degraded
At the licensed threshold	Significantly degraded

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Condition Time

- Evaluated in comparison with the plant's technical specification outage time
- Condition time differs from exposure time which is a parameter used in the SDP:
  - Exposure time is determined depending on the type and characteristic of performance deficiency
  - Guidance for computing exposure time contained in the RASP manual

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Condition Time Evaluation Criteria

Condition Time	Impact Rating
Less than the maximum outage time allowed in the technical specifications	Negligibly degraded
From the maximum outage time to twice the maximum outage time allowed in the technical specifications	Degraded
More than twice the outage time allowed in the technical specifications	Significantly degraded

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Qualitative Credit

- A risk-informed measure to credit operator and recovery activities not normally covered in the quantitative analysis
- Can include actions without formal procedures as directed by written guidance or personnel at the Technical Support Center during accident conditions
- Should have the ability to potentially lower the severity of a finding by a color band
  - Credit is limited by the high degree of uncertainty inherent in this type of action
  - Most recoveries are already covered in the quantitative analysis

Qualitative Credit Evaluation Criteria

Qualitative Credit	Impact Rating
Staged and tested equipment with sufficient guidance for operation which hasn't been credited in the quantitative analysis.	Credit
Otherwise	No credit

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Overall Qualitative Rating

- The impact ratings are applied to a table or decision tree
- Developed in the Commission paper as a conceptual example
- The result will be the qualitative rating, which is applied with the quantitative rating shown in the following table to yield the color band of the SDP finding

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Color Threshold Table

ΔCDF (CCDP normalized to 1 year) →	$\Delta_{CDF} < 10^{-6}$	$10^{-6} \leq \Delta_{CDF} < 10^{-5}$	$10^{-5} \leq \Delta_{CDF} < 10^{-4}$	$\Delta_{CDF} \geq 10^{-4}$
ΔLERF (CLERP normalized to 1 year) →	$\Delta_{LERF} < 10^{-7}$	$10^{-7} \leq \Delta_{LERF} < 10^{-6}$	$10^{-6} \leq \Delta_{LERF} < 10^{-5}$	$\Delta_{LERF} \geq 10^{-5}$
Qualitative Rating ↓				
Negligibly Degraded	**Green**	**Green**	**White**	**Yellow**
Moderately Degraded		**White**	**Yellow**	**Red**
Degraded	**White**	**Yellow**	**Red**	**Red**
Significantly Degraded	**Yellow**	**Red**	**Red**	**Red**

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Examples Using Integrated Approach

- Criteria for Choices
  - Derived from experience with findings encountered in the existing operating fleet
  - Use some of the tabletop exercise results of SECY-10-0121 and described in SECY-12-0081
  - Show how quantitative and qualitative assessments work together
- Quantitative Analysis
  - Used Simplified Plant Analysis Risk (SPAR) models developed by contractor (INL) for different new reactor NSSS types
  - Evaluated ΔCDF only
- New Reactor NSSS Considered
  - United States Advance Pressurized Water Reactor (USAPWR)
  - AP1000 – PWR
  - Advanced Boiling Water Reactor (ABWR)

Loss of One TD EFW Pump For The USAPWR

- Description of Emergency Feed Water (EFW) System
  - Removes decay heat through Steam Generators
  - Standby mode and operated during conditions when normal feedwater is unavailable
- Performance Deficiency
  - Improper testing and maintenance results in unavailability of EFW pump A (RPP-001A) until detected
  - Two cases developed with and without qualitative credit
  - Three month failure condition leading up to discovery
  - Although inspected and found available, an extent-of-condition existed for other pumps which had the potential to render other defense-in-depth elements unavailable
- Quantitative Risk Analysis
  - USAPWR SPAR model quantification yielded ***7.7 x 10^{-6} per year***
  - Numeric ***WHITE*** finding

USAPWR TD EFW Pump Qualitative Measures

Qualitative Element	Degradation or Credit	Impact Rating
Defense-in-depth (D-I-D)	Since EFW pump impacts D-I-D but, doesn't cause a complete loss of barrier	Moderately Degraded
Safety Margins (SM)	Due to the nature of the performance deficiency for this example, a potential extent-of-condition exists which might impact SM for intact elements but, below regulatory limits of the margin	Degraded
Condition Time (CT)	More than twice the allowable outage time in technical specifications	Significantly Degraded
Qualitative Credit (QC) – Case 1	Licensee presented a portable pump as a possible recovery	Credit
Qualitative Credit (QC) – Case 2	Licensee has no other means of recovery	No Credit

USAPWR TD EFW Pump Overall Rating

Case	Qualitative Rating
1 –Qualitative Credit	Moderately Degraded
2 – No Qualitative Credit	Degraded

Case	Overall Color Band
1 – Qualitative Credit	WHITE
2 – No Qualitative credit	YELLOW

7.7 x 10^{-6} per year

ΔCDF (CCDP normalized to 1 year)	$\Delta_{CDF} < 10^{-6}$	$10^{-6} \leq \Delta_{CDF} < 10^{-5}$	$10^{-5} \leq \Delta_{CDF} < 10^{-4}$	$\Delta_{CDF} \geq 10^{-4}$
ΔLERF (CLERP normalized to 1 year)	$\Delta_{LERF} < 10^{-7}$	$10^{-7} \leq \Delta_{LERF} < 10^{-6}$	$10^{-6} \leq \Delta_{LERF} < 10^{-5}$	$\Delta_{LERF} \geq 10^{-5}$
Qualitative Rating				
Negligibly Degraded	Green	Green	White	Yellow
Moderately Degraded		White	Yellow	Red
Degraded	White	Yellow	Red	Red
Significantly Degraded	Yellow	Red	Red	Red

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Future Developmental Considerations

- Avoid double counting the qualitative measures with respect to the quantitative analysis
- Develop guidelines for application of qualitative credit
- The number of qualitative elements and impact ratings to define and use
- Accounting for scoping changes of SSCs in and out of technical specifications
- Develop framework for the impact and overall qualitative ratings
- Accounting for uncertainty

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Conclusions

- The conceptual integrated risk-informed approach using qualitative measures is an appropriate means to identify the potentially significant performance issues that would not otherwise be revealed by the risk calculations to ensure an appropriate regulatory response
- The proposed integrated risk-informed approach would provide a clear and efficient way of ensuring reliable and predictable regulatory responses within the existing ROP framework, consistent with the principles of good regulation
- Further development is warranted

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Technical Evaluation of Relative Risk Measures and Reexamination of Pros and Cons

Eric Powell

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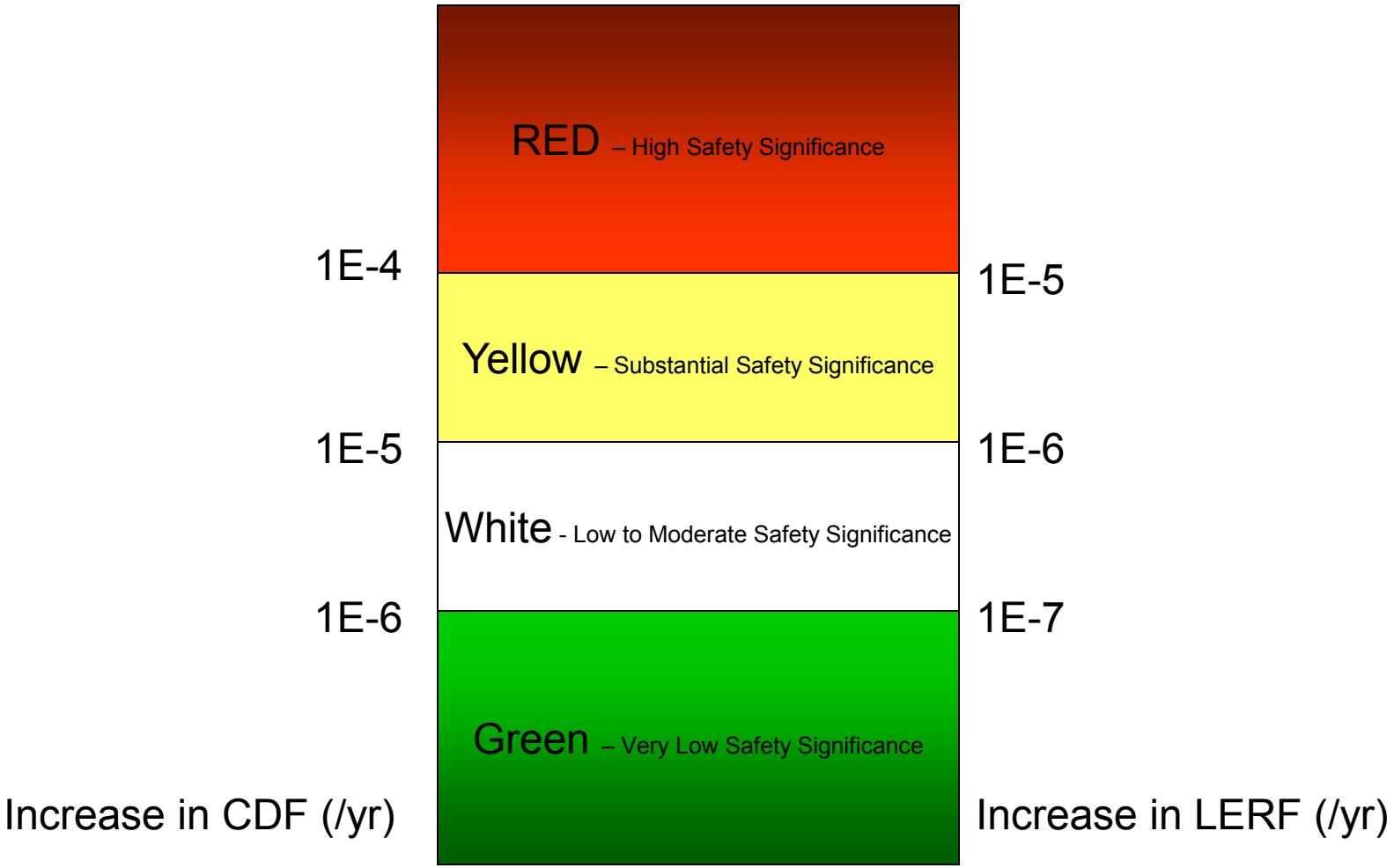
Background

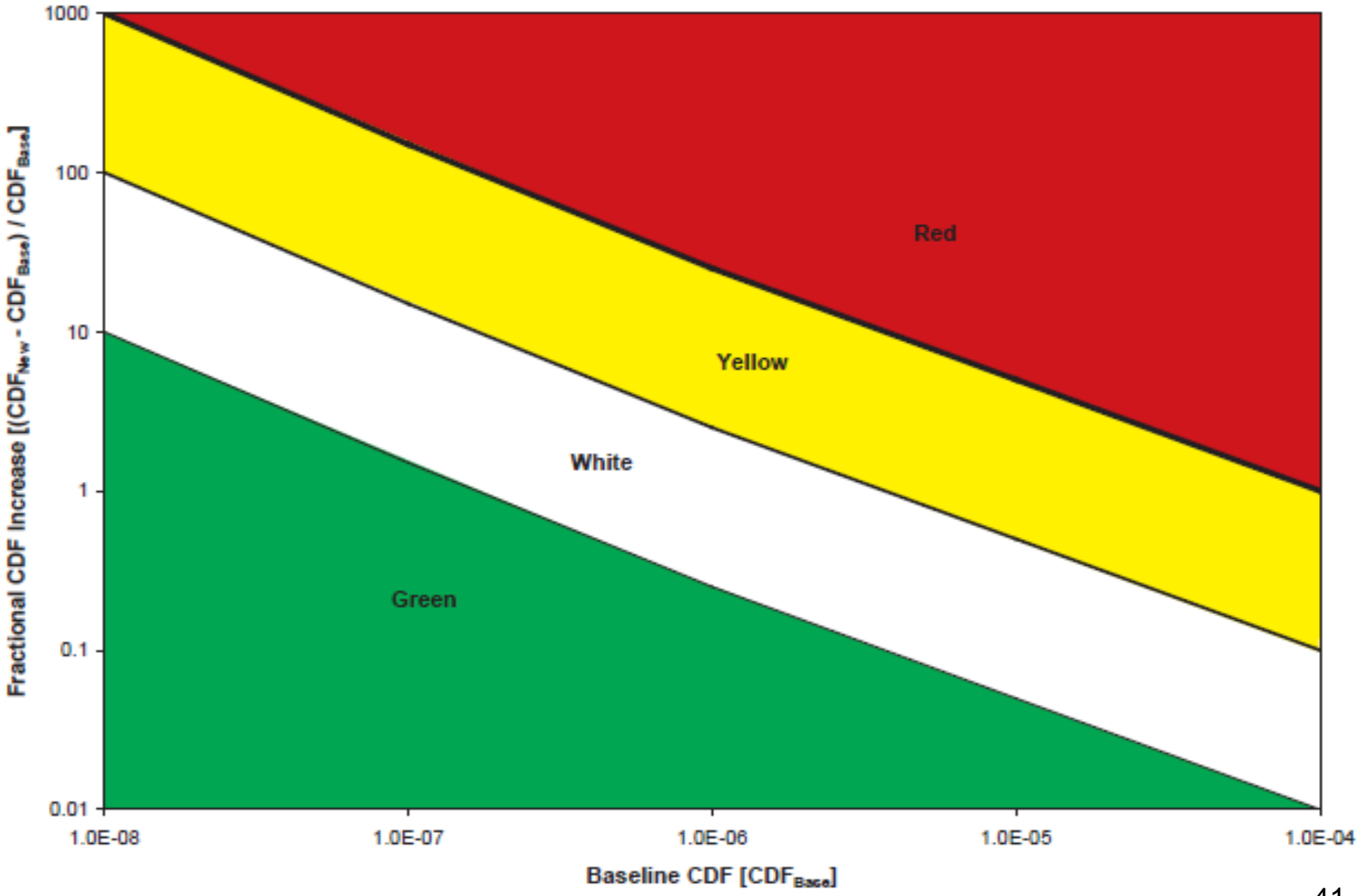
- SRM-SECY-12-0081, “Risk-Informed Regulatory Framework for New Reactors”
  - Additional consideration to the use of relative risk metrics or other options
  - Perform a technical evaluation of the use of relative risk measures
  - Reexamination of the pros and cons listed in the staff’s 2009 white paper

Background (cont.)

Current SDP Thresholds



Relative Risk Approach – ACRS Recommendation



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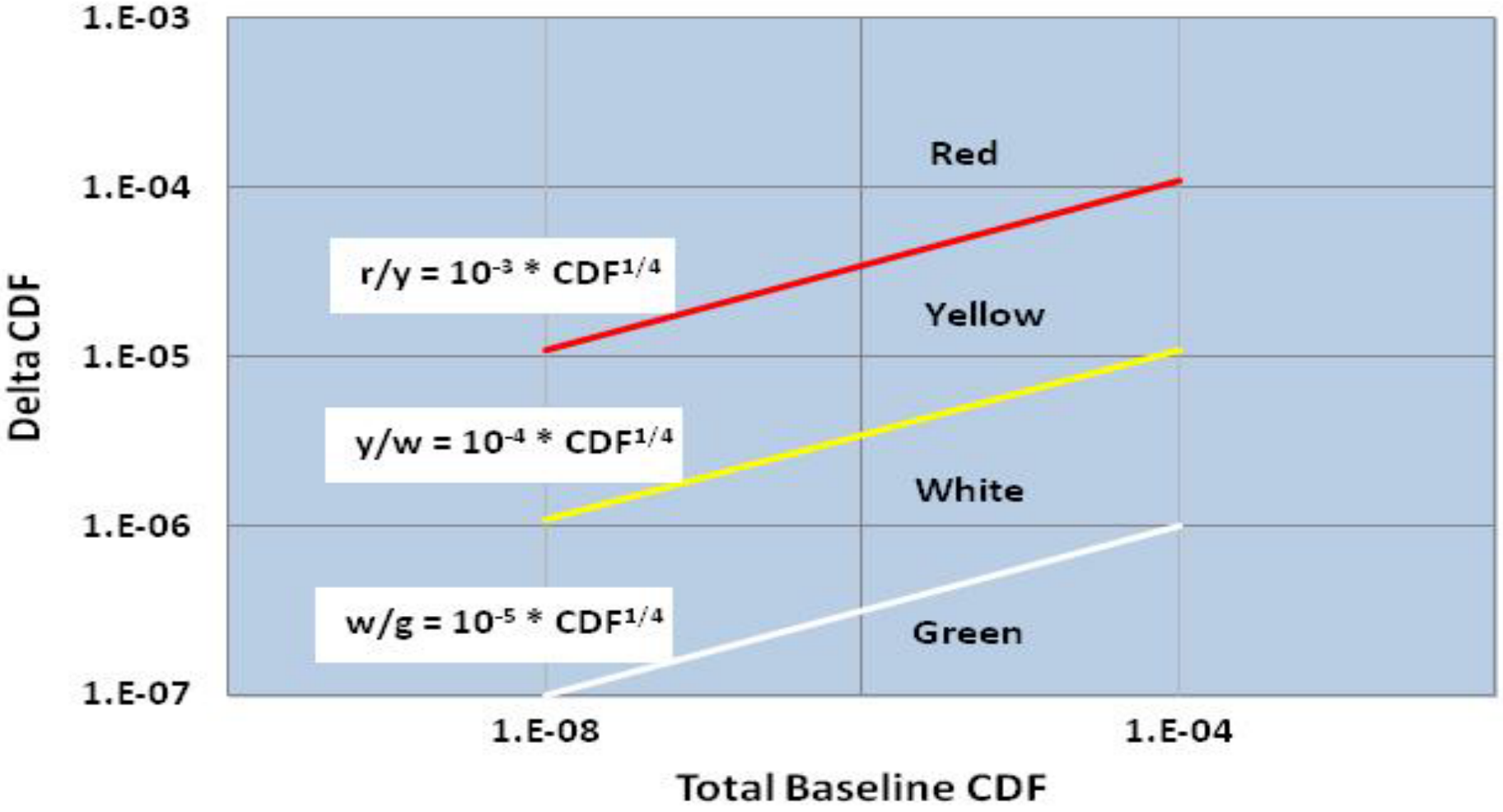
Relative Risk Approach – ACRS Recommendation Converted to ΔCDF (y-axis)



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Relative Risk Approach

- Uses the total baseline CDF (x-axis) and the ΔCDF (y-axis) for a plant to determine the significance of an inspection finding using sloped lines for the thresholds
- Concept behind this approach is that the lower the baseline CDF of a plant, the lower the ΔCDF value, or larger fractional change, necessary for increased significance of a finding
- Significance of a finding would be relative to the baseline CDF value, instead of the current approach of absolute thresholds which do not change given a particular plant's baseline CDF

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Results of Applying Relative Risk Approach

Design	Example	Exposure Period	ΔCDF (/yr)	Model	2011 Tabletop Outcome	Applying Purely Relative Threshold	Applying Relative Threshold w/Seismic
ABWR	HPCF pump fails	23 days	1.4E-8	SPAR			
		1 year	2.2E-7				
	Both HPCF fail due to common cause	23 days	4.8E-8	SPAR			
		1 year	7.7E-7				
US-APWR	One TDEFW pump fails	1year	2.2E-5	SPAR			
		1year	3.4E-6	PRA importances (internal events)			
		1year	3.4E-6	MHI PRA (internal fire and flooding)			
	Both TDEFW pumps fail due to common-cause	1year	4.4E-4	SPAR			
		1year	3.4E-5	PRA importances (internal events)			
		1year	8.8E-6	MHI PRA (internal fire and flooding)			
ABWR	RCIC pump unavailable	1 year	4.1E-7	SPAR			
	RCIC pump and both HPCF pumps unavailable	1 year	1.6E-6	SPAR			
US-APWR	One MDEFW pump and one TDEFW pump unavailable due to lost suction source	1 year	1.3E-4	SPAR			
		1 year	7.7E-5	MHI PRA (internal fire and flooding)			
U.S. EPR	One train of EFW unavailable due to lost suction source	1 year	7.7E-7	Areva PRA			
AP1000	PXS-V121A fails to remain open due to disk-stem separation	295 days	9E-5	SPAR			
		1 year	1.1E-4	SPAR			
US-APWR	RV head corrosion (increase medium and large LOCA frequencies)	1 year	1.4E-7	SPAR			
AP1000		1 year	1.2E-6	SPAR			

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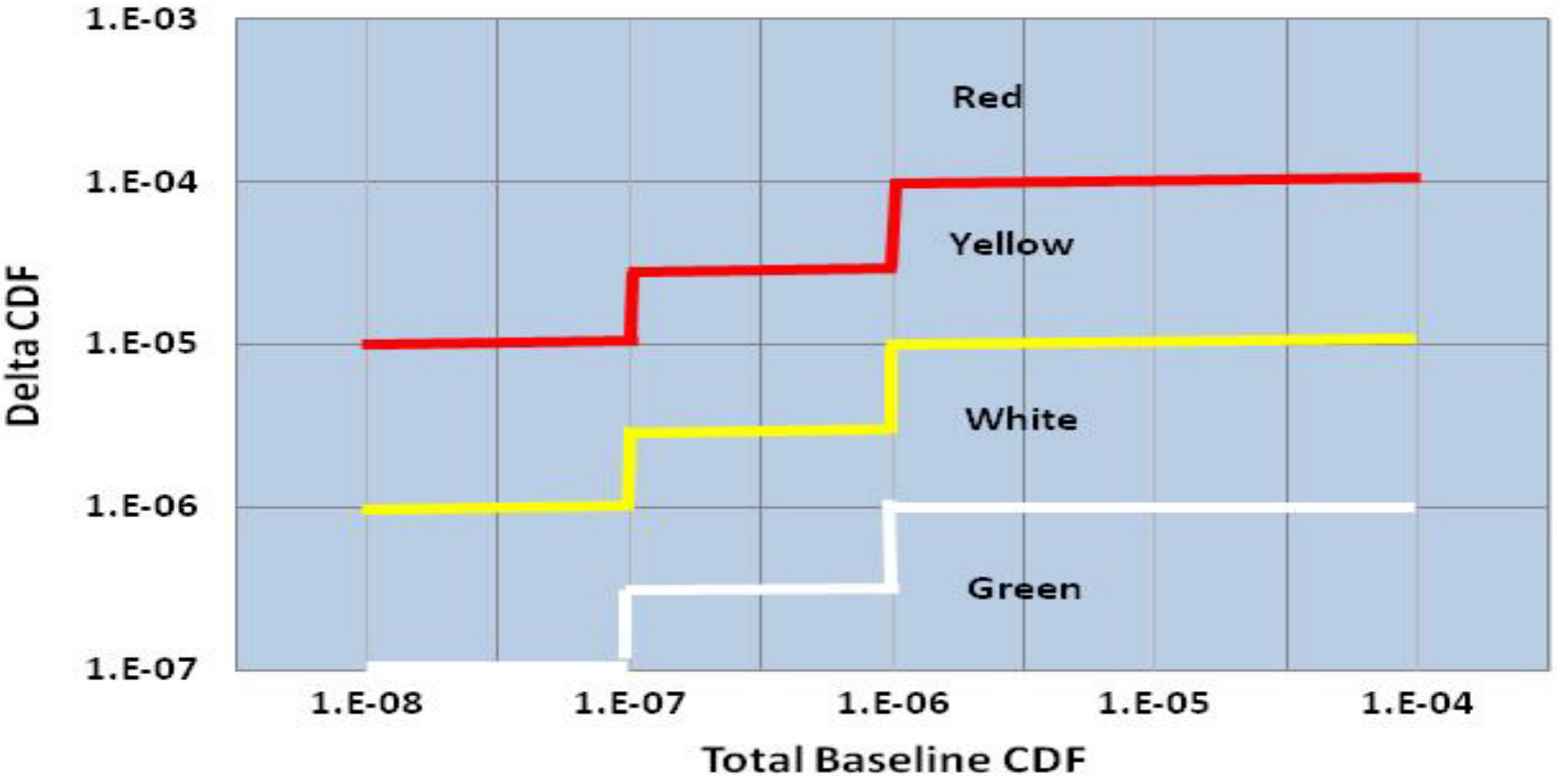
Technical Evaluation of Relative Risk Approach

- Staff took the scenarios from the 2011 tabletops and applied the relative risk thresholds approach
- The result was an increase in the significance (e.g. regulatory response) of some findings compared to the existing approach
- Baseline CDFs for new reactors that included seismic estimates were examined because new reactors' baseline CDFs will include internal and external events (e.g., seismic, flooding, and fires), and it is believed that the CDF values for new reactors could be dominated by external events, particularly seismic events
- Increasing the baseline CDF values for the new reactors by an estimated seismic CDF resulted in an expected decrease in the significance of some scenario findings

Staircase Thresholds Approach



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Staircase Thresholds Approach (cont.)

- Uses a step function with the total baseline CDF (x-axis) and the ΔCDF (y-axis) for a plant to determine the significance of an inspection finding using the staircase lines for the thresholds
- A staircase function is a concept that simplifies the selection of thresholds by not having to use an algorithm, like the relative approach, to calculate the threshold as a function of baseline CDF
- This approach has very acute cliff effects that have very negative implications
  - It is possible that a licensee could calculate total baseline CDF just to the right of the cliff and lessen the chance of non-green findings by increasing the thresholds
- Therefore, the staff does not view this approach as a viable option

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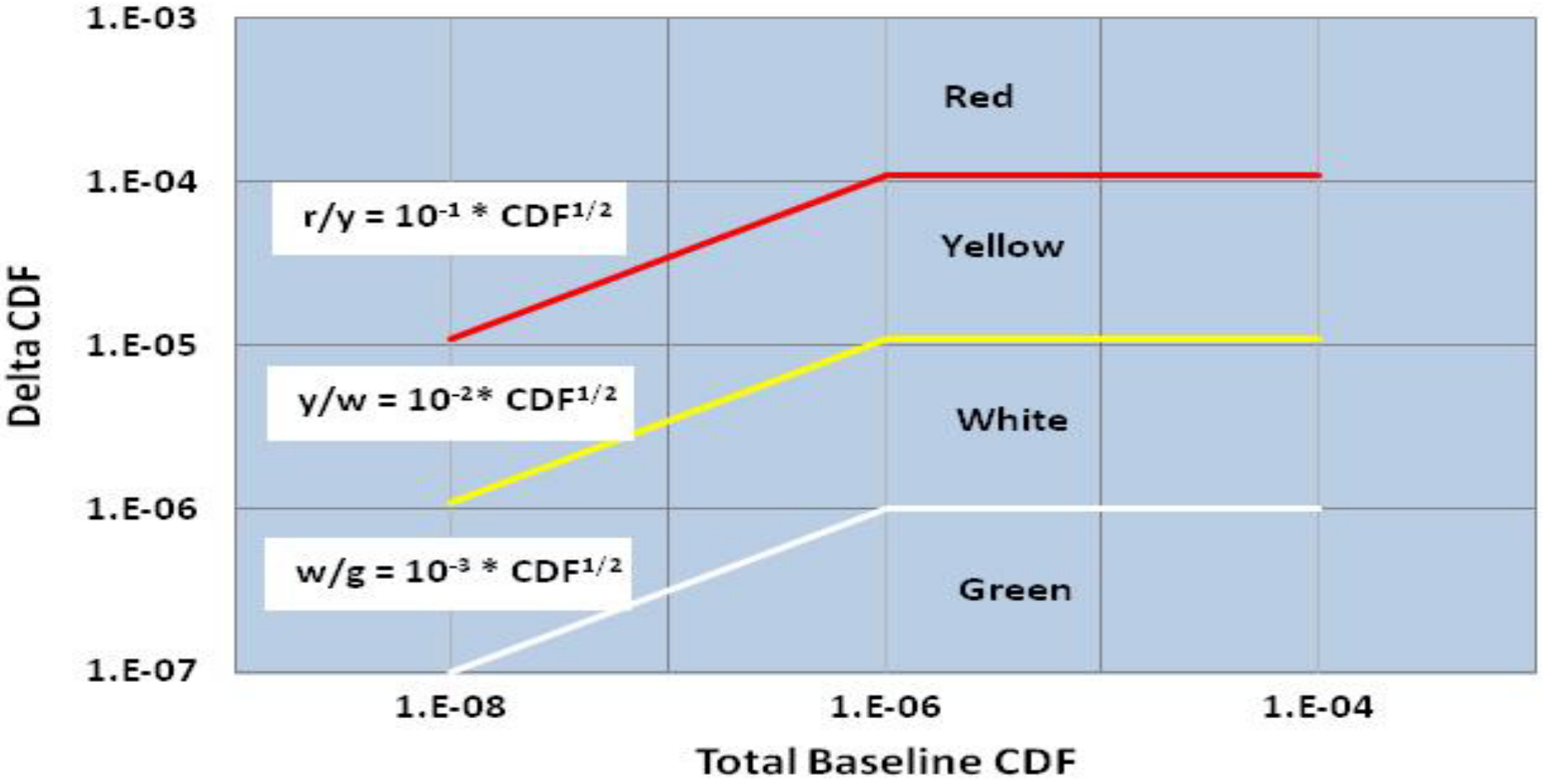
Hybrid Thresholds Approach



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Hybrid Thresholds Approach (cont.)

- Uses the total baseline CDF (x-axis) and the ΔCDF (y-axis) for a plant to determine the significance of an inspection finding using the hybrid (sloped and flat) lines for the thresholds
- This approach combines the relative risk thresholds with the existing thresholds, with the transition happening at a baseline CDF of 10^{-6}/year on the x-axis
- If the new reactors' total baseline CDF values are greater than 10^{-6}/year there would be no benefit to implementing the hybrid thresholds approach, because it would yield the same results as the existing approach given that the thresholds would be identical
- Therefore, the staff does not view this approach as a viable option

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Reexamination of the Pros and Cons

Some of the more significant pros to a relative risk approach for new reactors that were discussed during the public meetings included:

- Preserves the Commission's stated expectation to maintain the enhanced safety margins for new reactors, while providing greater operational flexibility than current reactors
- A single methodology could be adapted for all operating and new reactors

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Reexamination of the Pros and Cons (cont.)

Some of the more significant cons to a relative risk approach for new reactors that were discussed during the public meetings included:

- Concerns with implementation depending on how baseline CDF is defined
- Difficulty articulating the potential differences in regulatory approach for operating and new reactors
  - If applied only to new reactors, operating and new reactors would have different SDP finding thresholds
- Potential to overly infringe on the operational flexibility afforded the safer and more robust new reactor designs

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Reexamination of the Pros and Cons (cont.)

- Complexity in developing, documenting, and implementing a relative risk approach
- Potential to inadvertently focus licensee and staff attention on relatively insignificant issues as far as overall plant safety is concerned
- Resource-intensive for both NRC and the licensees to develop accurate, plant-specific broad-scope PRA models
  - If applied to operating reactors in addition to new reactors then the NRC would need to develop and use a broader scope PRA that addresses internal and external hazards for all plants
  - Licensees are likely to also want to develop their own plant-specific broad-scope PRAs to use in discussions with the NRC regarding SDP evaluations and outcomes

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Conclusions

- The relative risk approach may potentially have merit
- However, the cons of the relative risk approach outweigh its pros
- Therefore, the staff does not view this approach as a viable option

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Appropriateness of Existing Performance Indicators and Thresholds

Mike Balazik

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Background

- Mitigating Systems Performance Index (MSPI) evaluated in SECY-12-0081, “Risk-Informed Regulatory Framework for New Reactors”
  - MSPI indicators are risk-informed
  - Determined to be ineffective in determining an appropriate regulatory response for active new reactor designs
- Remaining PIs not evaluated in SECY-12-0081
- SRM-SECY-12-0081 directed the staff to provide discussion of the appropriateness of existing performance indicators (PIs) and related thresholds for new reactors

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Performance Indicator Program

- Provides a broad sample of objective data to assess reactor facilities performance in each cornerstone area
- Along with inspection findings, serve as inputs to ROP assessment process and additional inspection efforts
- Performance indicator data voluntarily collected by reactor facility, reported to NRC on a quarterly basis
- Objective thresholds establish the level of regulatory engagement appropriate to reactor facility performance in each cornerstone area
- Inspection to verify performance indicator data

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Performance Indicator Program

- IMC 0608, “Performance Indicator Program”
- IMC 0308, Attachment 1, “Technical Basis for Performance Indicators”
- NEI 99-02, “Regulatory Assessment Performance Indicator Guideline”
  - Industry Reporting guidance
  - Encourages industry participation in ROP
  - Accepted by NRC in Regulatory Issues Summary
- FAQ process & public ROP working group meetings used to clarify PI reporting guidance

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PI Performance Bands

Green: performance within an expected performance level where the associated cornerstone objectives are met

White: performance outside an expected range of nominal utility performance but related cornerstone objectives are still being met

Yellow: related cornerstone objectives are being met, but with a minimal reduction in the safety margin

Red: significant reduction in safety margin in the area measured by the performance indicator

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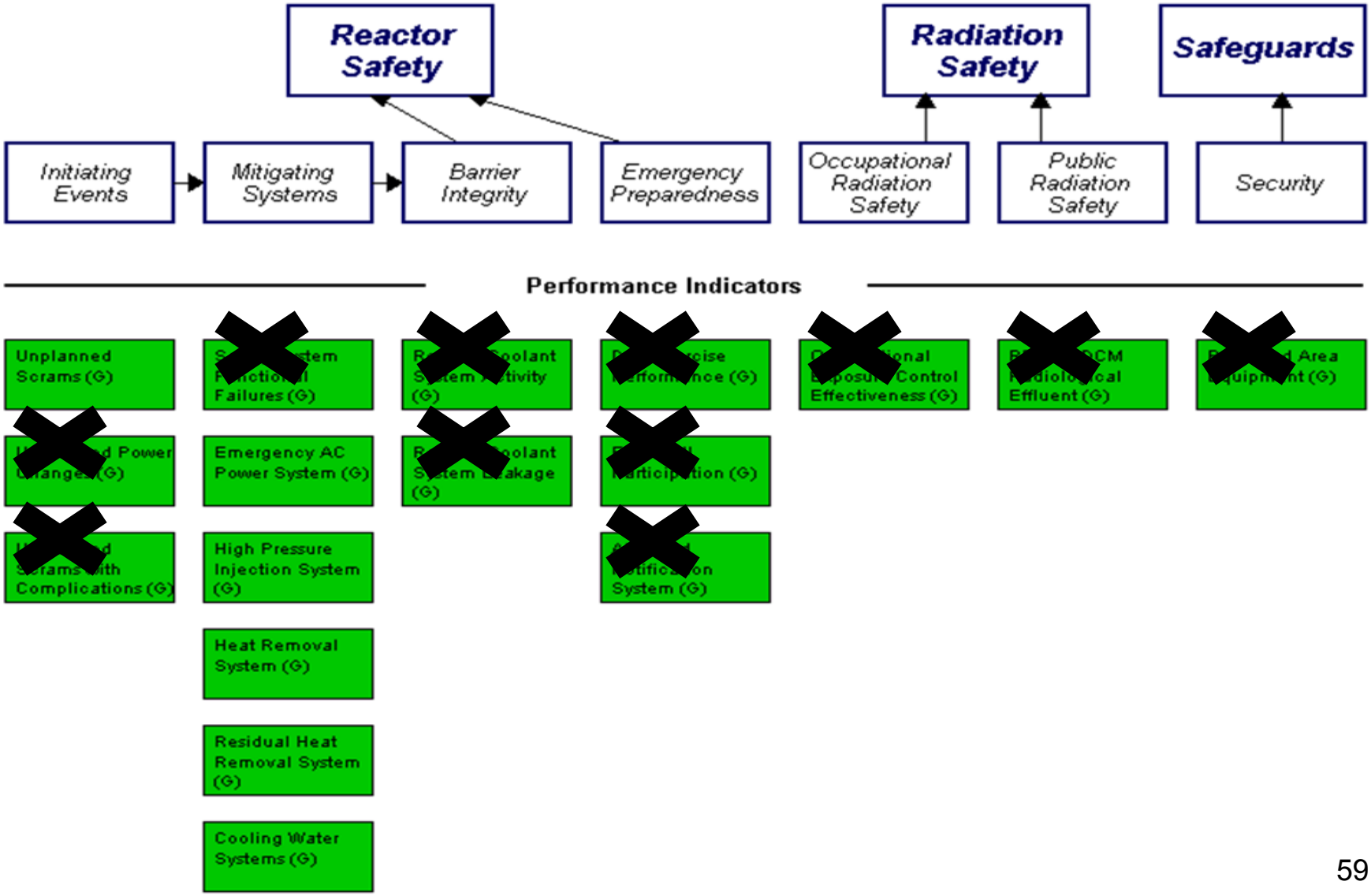
Performance Indicators



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Risk-Informed vs. Deterministic

- Many of PIs are not directly risk-informed, but based on regulations and standards that would also apply to new reactor designs
- PIs directly related to risk
  - Mitigating Systems Performance Index (5)
  - Unplanned Scrams per 7,000 Critical Hours
- Remaining PIs and thresholds are more deterministic
  - Thresholds based on industry performance and agreed upon by experts (industry and NRC)

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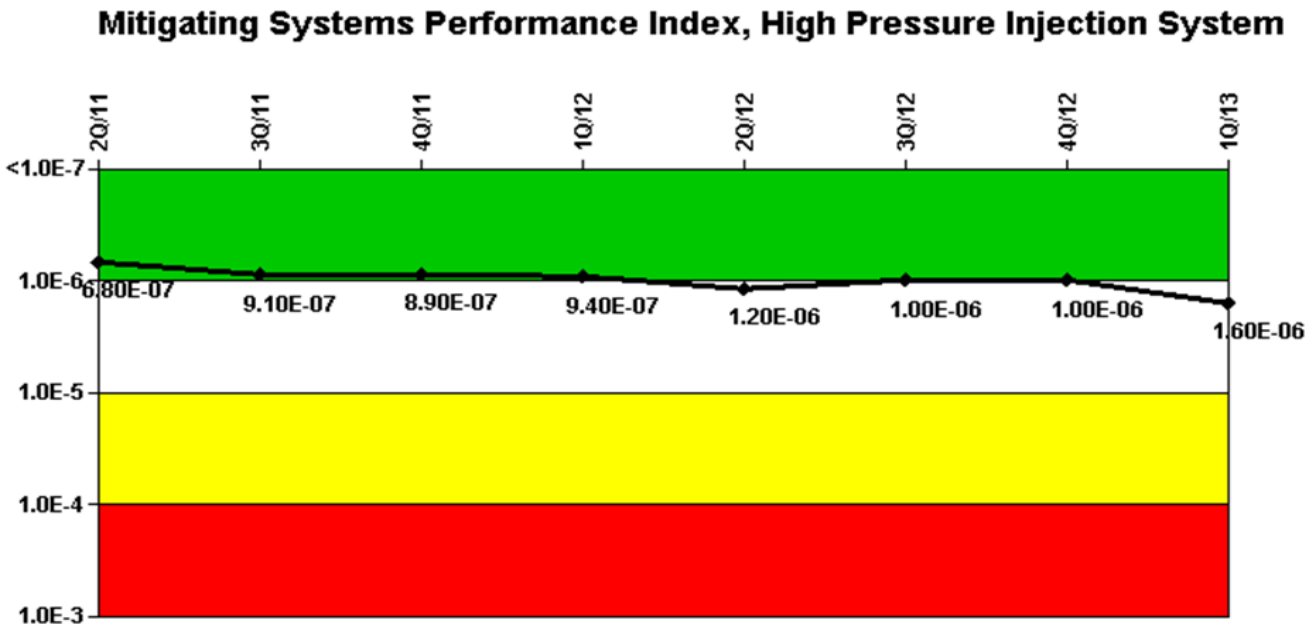
Risk-Informed PIs

- Mitigating Systems Performance Index
  - Measures readiness of systems to perform their safety function (availability and reliability)
    - High Pressure Injection
    - Heat Removal
    - Residual Heat Removal
    - Emergency AC Power
    - Support Cooling Water
- Unplanned Scrams per 7,000 Critical Hours
  - Measures the rate of scrams/year and provides an indication of initiating event frequency
  - Normalized to 7,000 critical hours (80% capacity factor)

MSPI Example

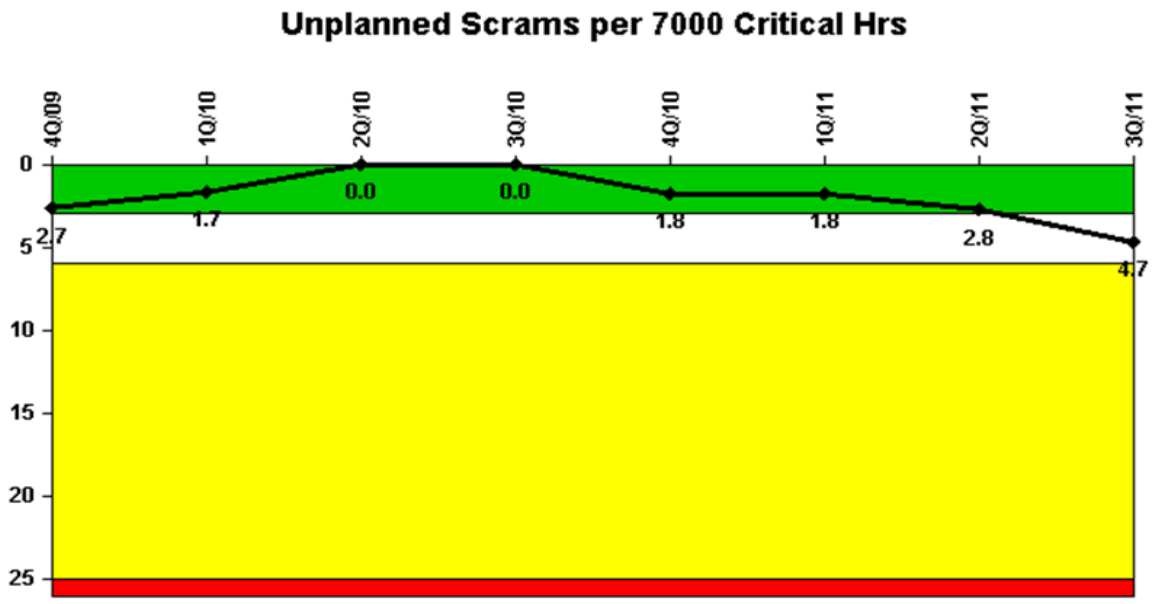


Thresholds: White > 1.00E-6 Yellow > 1.00E-5 Red > 1.00E-4

Notes

Mitigating Systems Performance Index, High Pressure Injection System	2Q/11	3Q/11	4Q/11	1Q/12	2Q/12	3Q/12	4Q/12	1Q/13
UAI (ΔCDF)	2.07E-07	3.20E-07	3.04E-07	3.92E-07	4.76E-07	4.45E-07	4.72E-07	6.75E-07
URI (ΔCDF)	4.72E-07	5.91E-07	5.90E-07	5.52E-07	7.26E-07	5.50E-07	5.50E-07	9.35E-07
PLE	NO	NO	NO	NO	NO	NO	NO	NO
Indicator value	**6.80E-07**	**9.10E-07**	**8.90E-07**	**9.40E-07**	**1.20E-06**	**1.00E-06**	**1.00E-06**	**1.60E-06**

Scrams PI Example



Thresholds: White > 3.0 Yellow > 6.0 Red > 25.0

Notes

Unplanned Scrams per 7000 Critical Hrs	4Q/09	1Q/10	2Q/10	3Q/10	4Q/10	1Q/11	2Q/11	3Q/11
Unplanned scrams	0	0	0	0	2.0	0	1.0	2.0
Critical hours	2209.0	2159.0	2184.0	2208.0	1022.1	2159.0	2155.8	2141.4
Indicator value	**2.7**	**1.7**	**0**	**0**	**1.8**	**1.8**	**2.8**	**4.7**

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Evaluation of PIs

- Mitigating Systems Performance Index
  - Application evaluated in SECY-12-0081, “Risk-Informed Regulatory Framework for New Reactors”
  - Ineffective in determining an appropriate regulatory response for active new reactor designs
  - Meaningful MSPI may not even be possible for passive systems using the current formulation of the indicator
- Unplanned Scrams per 7,000 Critical Hours
  - CDF sensitivity studies conducted to inform initial threshold setting
  - Conservative thresholds set for existing fleet
  - Existing thresholds of performance bound lower risk of new reactors

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Conclusions

- Mitigating Systems Performance Index
  - Alternate PIs could be developed or additional inspection could be used for new reactors
- Unplanned Scrams per 7,000 Critical Hours
  - Can be applied to new reactor designs
  - Threshold values are set conservatively and will account for lower risk of new reactors
- Unplanned Scrams with Complications
  - Need to define complicated scram in PI reporting guidance
- Remaining PIs can be applied to new reactor designs to determine an appropriate regulatory response

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Conclusions and Recommendations to the Commission

Ron Frahm

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Staff Conclusions

Integrated Risk-Informed Approach

- The conceptual integrated risk-informed approach using qualitative measures is an appropriate means to identify the potentially significant performance issues that would not otherwise be revealed by the risk calculations to ensure an appropriate regulatory response
- The proposed integrated risk-informed approach would provide a clear and efficient way of ensuring reliable and predictable regulatory responses within the existing ROP framework, consistent with the principles of good regulation

Staff Conclusions (cont.)

Relative Risk Approach

- The significant challenges in the development and implementation of a relative risk approach appear to significantly outweigh the benefits
- The staff does not consider this approach a viable option
- If the staff were to develop and implement a relative risk approach, the structured integrated risk-informed approach would likely still be needed to address
  - defense-in-depth (particularly barrier integrity)
  - degradation of passive components

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Staff Conclusions (cont.)

Appropriateness of Performance Indicators

- Many of the PIs are based on regulations and standards that also apply to new reactor designs
- Some PIs in the Initiating Events and Mitigating Systems cornerstones warrant further analysis to fully develop appropriate PIs, thresholds, or guidance for new reactor applications

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Staff Recommendations

- **Recommendation 1**: Commission approves the staff's plans to further develop the qualitative measures used to supplement the risk evaluations and the integrated risk-informed approach to ensure an appropriate regulatory response to performance issues for new reactor designs
- **Recommendation 2**: Commission approves the staff's plans to further analyze the current PIs and thresholds and develop appropriate PIs and thresholds for new reactor applications to address any shortfalls to ensure that all cornerstone objectives are adequately met

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Next steps

- Public meeting to solicit feedback in August
- Full ACRS meeting on September 5-6
- Finalize Commission paper based on ACRS and stakeholder feedback
- SECY due to be issued in mid-October

SOUTHERN COMPANY

Utility Perspective on New Plant ROP

Jeff Gasser

Southern Nuclear, Executive Vice-President, Vogtle

SNC Perspective

- SNC recognizes the NRC's role in monitoring plant performance.
- SNC agrees that it is important to prevent erosion of safety gains.
- SNC believes that relative risk does not meet the full intent of the Reactor Oversight Process.
- SNC does not consider the Reactor Oversight Process to be the appropriate tool to prevent erosion of safety gains.
- SNC believes the Part 52 required PRA models and their required updates and upgrades will provide effective insights regarding any potential performance-induced erosion of safety gains.

NUREG 1649: Reactor Oversight Process

The oversight process calls for:

- Focusing inspections on activities where the potential risks are greater.
- Applying greater regulatory attention to nuclear power plants with performance problems, while maintaining a normal level of regulatory attention on facilities that perform well.
- Using objective measurements of the performance of nuclear power plants.
- Giving both the public and the nuclear industry timely and understandable assessments of plant performance.
- Responding to violations of regulations in a predictable and consistent manner that reflects the potential safety impact of the violations.