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PUBLIC NOTICE
BY THE
UNITED STATES NUCLEAR REGULATORY COMMISSION'S
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

NOVEMBER 21, 1996

The contents of this transcript of the proceedings of the United States Nuclear Regulatory Commission's Advisory Committee on Reactor Safeguards on NOVEMBER 21, 1996, as reported herein, is a record of the discussions recorded at the meeting held on the above date.

This transcript has not been reviewed, corrected and edited and it may contain inaccuracies.

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

PROBABILISTIC RISK ASSESSMENT SUBCOMMITTEE

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THURSDAY

NOVEMBER 21, 1996

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ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 8:30 a.m., George Apostolakis, Chairman, presiding.

COMMITTEE MEMBERS:

GEORGE E. APOSTOLAKIS	Chairman
JOHN J. BARTON	Member
MARIO H. FONTANA	Member
THOMAS S. KRESS	Member
DON W. MILLER	Member
DANA A. POWERS	Member
ROBERT L. SEALE	Member
WILLIAM J. SHACK	Member

ACRS STAFF PRESENT:

MICHAEL T. MARKLEY

ACRS FELLOW PRESENT:

RICHARD SHERRY

ALSO PRESENT:

BOB CHRISTIE

BOB JONES

GARY HOLAHAN

TOM KING

MARK CUNNINGHAM

DICK WESSMAN

TONY PIETRANGELO

A-G-E-N-D-A

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P-R-O-C-E-E-D-I-N-G-S

(8:36 a.m.)

CHAIRMAN APOSTOLAKIS: The meeting will now come to order. This is the first day of the meeting of the ACRS Subcommittee on Probabilistic Risk Assessment. I am George Apostolakis, Chairman of the Subcommittee. ACRS Members in attendance are: John Barton, Mario Fontana, Thomas Kress, Don Miller, Dana Powers, Robert Seale, and Bill Shack.

ACRS Senior Fellow in attendance is: Richard Sherry. The purpose of this meeting is to continue our discussion of the NRC staff's approach to codify risk-informed, performance-based regulation through development of Standard Review Plan, (SRP) sections and associated regulatory guides.

The Subcommittee previously met to discuss these matters on October 31 - November 1, 1996. The Subcommittee will gather information, analyze relevant issues and facts, and formulate proposed positions and actions as appropriate, for deliberation by the full Committee.

Michael T. Markley is the Cognizant ACRS Staff Engineer for this meeting.

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* on November 13, 1996.

A transcript of the meeting is being kept and will be made available as stated in the *Federal Register* Notice. It is requested that speakers first identify themselves and speak with sufficient clarity and volume so that they can be readily heard.

We have received no written comments. However, we have received a request from Mr. Bob Christie of Performance Technology for time to present his views on NRC review of licensee submittals for risk-informed, performance-based regulation. He provided a document entitled, "Call to Action: Pilot Programs for Performance-Based Regulation", which was forwarded to all members of the ACRS.

We will proceed with the meeting and I call upon Mr. Christie to begin.

MR. CHRISTIE: My name is Bob Christie, the owner of the firm Performance Technology of Knoxville, Tennessee. I am here today to provide a few comments on performance-based regulations.

I really appreciate the ACRS staff's efforts to get me here and the ACRS members to let me have some discussions on this.

This is a continuation of the presentation I

made back in June when we were talking about performance-based regulation and the testing of stand-by equipment for which I think most of you were present at that meeting.

Before I proceed, just as I did in the last meeting, I would like to tell you what we are going to try to talk about in the time we have available.

I would like to define what is performance-based. Figure out somewhere in here, if you are going for performance-based regulation, what are your units of measure, how do you get criterion for acceptance, what is the role of probabilistic risk assessment in this, and try to provide some examples of what we have.

SLIDE CHANGE

MR. CHRISTIE: This same slide I used back in June says performance-based, so you asked the questions, what do we mean? How do we measure? What is the current level? What is acceptable? How do we monitor and trend?

Those are the questions that I ask whenever people tell me they are trying to worry about performance-based.

It says the elements that I consider in performance-based, you have to have measurable parameters, you have to have objective quantitative criteria to define what is acceptable. You have to allow flexibility for whoever it is that is doing the work to achieve the

performance levels that you want. You absolutely must have, and again I emphasize this, the monitoring process to determine what is the performance and where you are at. And then hopefully, through the process, you come up with some cost-effective corrective action.

MEMBER KRESS: Is it on purpose, Bob, that the word risk doesn't show up in there on that slide anywhere?

MR. CHRISTIE: Yes. Again, this is performance.

MEMBER KRESS: Right.

MR. CHRISTIE: You know again, this would be for anything. A lot of people think of this in terms of cost-benefit analysis, which would be another term for it. It is along the same line.

If you are going to do performance-based regulations, what is the objective?

To the best of my knowledge, the objective of regulations with respect to nuclear power plants is to provide adequate protection to the public health and safety. That is your objective.

MEMBER KRESS: What does that mean?

MR. CHRISTIE: Excuse me?

MEMBER KRESS: What does that mean?

MR. CHRISTIE: Well, that is the next thing. What does it mean? All right.

MEMBER KRESS: Sorry, I didn't read ahead.

MR. CHRISTIE: Okay. The only thing that I can tell you, it means different things to different people, it means to me adequate protection to the public health and safety as defined in the 1986 policy statement of Nuclear Regulatory Commission as far as the safety goals for the operation of nuclear power plants. That is what it means to me.

CHAIRMAN APOSTOLAKIS: I don't think the staff agrees with you.

MR. CHRISTIE: Excuse me?

CHAIRMAN APOSTOLAKIS: I don't think the staff agrees with you.

MR. CHRISTIE: Absolutely not.

CHAIRMAN APOSTOLAKIS: Oh.

MR. CHRISTIE: Absolutely not. That is another thing that we are going to talk about. You are right.

CHAIRMAN APOSTOLAKIS: If a licensee came to you and all they showed was that the core damage frequency was less than 10^{-4} per year and the QHOs are met and showed you nothing else, would you say that the public safety has been adequately protected without looking at anything else?

MR. CHRISTIE: If I had what I considered to

be, in acceptable units of measure and a defined program that resulted in acceptable measurement of the quantitative health objectives, then I would say that is sufficient to define adequate protection of public safety and health.

CHAIRMAN APOSTOLAKIS: Now when you say if, you mean there is a way of doing that and you just want to be sure that that particular licensee did it, or is this an idealized situation where we have all the tools we need?

MR. CHRISTIE: No, I think it is a situation where it is possible to do it and can be done, we have the tools and we can do it.

CHAIRMAN APOSTOLAKIS: Okay.

MR. CHRISTIE: Okay? All right.

In the safety goals in 1986, as they defined them when comments were being made, it consisted of two parts, the qualitative part which said that you have an individual goal and that you also have societal risks, and these are met.

To the best of my knowledge, the only thing that we haven't done is I don't think we do a lot of work when we compare the risk of nuclear power plants to the risk of generating electricity by other means.

But we do do the significant additional risks

to life and health.

We have what are known as the one per cent rules and it just says that the risk to an average individual in the vicinity of a nuclear power plant should not be greater than .1 per cent of their accidental fatality rate and also the risk to the population should not be more than .1 per cent of all latent cancer fatalities that exist in the population.

Now to get a flavor for that.

MEMBER KRESS: Did those numbers just come out of the air?

MR. CHRISTIE: Excuse me?

MEMBER KRESS: Did they pull those numbers right out of the air, .1 per cent?

MR. CHRISTIE: Yes. I served on the Atomic Industrial Forum subcommittee on probabilistic risk assessment and we recommended one per cent. There were other people who recommended other numbers.

It finally ended up at .1 per cent. I am not sure that there was a detailed analysis for that.

MEMBER KRESS: I don't think there can be. It almost has to be subjective.

MR. CHRISTIE: It is a judgement call, Tom, I agree.

Okay, to get an idea of what the numbers mean,

the .1 per cent and this was used back in 1986 when we were doing this, there were approximately 100 thousand accidental deaths in a population of approximately 200 million people and that is about one in two thousand per year.

Latent cancer fatalities is approximately 400 thousand cancer deaths in a population of about 200 million and this equates to about one in five hundred.

So, that is what the rates were and you have to multiple this by the .1 per cent or the 10^{-3} number to come up to where we are at.

It is interesting to me now that recently that there has been some indication that the latent cancer fatality rate int he United States may be dropping because of the people who have stopped smoking.

I have heard some numbers, for instance, that the latent cancer fatality rate in the United States may drop as much as 15 per cent in the next couple of years which is something that we will have to consider when we are doing the work.

MEMBER KRESS: Does that mean that the safety goals change ever year?

MR. CHRISTIE: It would mean that our safety goals would change, that is correct.

What our acceptance limits would be by pegging

it at the .1 per cent means that you have to know what the background is.

We have got these, we have had them for ten years, we don't use them; it is just a fact of life.

The reason that we don't use them is because we have a tough time in measuring them. The tools for the measurement is the probabilistic risk assessment.

Now, one of the things that we found in the probabilistic risk assessments are that basically the public health risk for nuclear power plants comes from the fission products in the core. This is a major finding that was really pretty spectacular. I think got a WASH 1400 and the best of my knowledge it has not been invalidated ever since.

We have gone through a whole generation of probabilistic risk assessment all the way from WASH 1400 up to today's individual plant examinations.

We have had the Zion-Indian Point hearings, we have had the NUREG-1150 plants, we have plenty probabilistic risk assessments.

MEMBER POWERS: None of these risk assessments seem to be at all comparable to the safety goal.

MR. CHRISTIE: We are going to talk about that, okay?

You are right, that so far, to the best of my

knowledge, up until this summer, it was very difficult for us to get a correlation to the safety goals, the quantitative health objectives.

MR. POWERS: But you never will.

MR. CHRISTIE: That is something that we need to talk about, okay?

If again, that public health risk is tied up in damage to the core, we have got another set of conclusions that we have reached out of the probabilistic risk assessments that basically go along the following.

The risk from each individual plant is very plant-specific. It is absolutely tied up in that plant. There is no such thing as a generic risk, as far as I can tell.

We find that most of the risk is either tied up in transient small LOCAs, small events, that happen. These are the kind of initiating events that occur which are followed by multiple failures.

That is basically what the probabilistic risk assessments are telling us.

We have transient or small LOCAs that happen with fairly decent amount of frequency and we get multiple failures.

We have programs like the accident sequence precursor programs that track this kind of phenomenon and

we have done what I consider to be a pretty acceptable job of keeping track of these kinds of phenomenon in the United States.

We do keep track of transients, we do keep track of the response of the plants to these transients and we do notice that we still have events like transients and multiple failures and you go down the accident sequence precursor path and you predict a probability of failure.

We have not lost a core since Three Mile Island, which I think speaks well for the people who have been paying attention.

We used to define plants in terms of safety and non-safety. We generally don't do that risk assessment anymore. We realize that the "non-safety" pieces of equipment are as important to the plant if not more important than the "safety" pieces.

If we do any breakdown of the plant as far as probabilistic risk assessment is concerned, we bust it in the front line support. That is generally the only thing we have.

Absolutely, beyond all shadow of doubt, we have come to the realization that the human beings interact with the plant and the human beings get you into trouble and the human beings get you out of trouble. They

must be explicitly considered in any probabilistic risk assessment. And again, I think we do a good job of that, much better than we did prior to Three Mile Island.

One of the other things we have learned to do with probabilistic risk assessment is we have learned to rank order things in terms of importance.

This is one that I particularly use in the course of my career, and I've been doing this for about 18 years. I think it is one of the best.

It says that if your risk is tied up in the core damage frequency, one of the ways of measuring a change in core damage frequency is you can equate it to the Fussel-Vesily importance factor which is generated by your baseline probabilistic risk assessment and the ratio in the change of the system or the top event failure probability.

This gives you a potential for rank ordering things with respect to core damage frequency which I find to be very useful when we are doing the plants.

Now, let's start addressing the problem that Dr. Powers came up with; can this be done?

The first thing you can do if you have your probabilistic risk assessment already done you can rank order everything. This is a table from the Fermi plant which basically rank orders everything in respect to

Fussel-Vesily.

MEMBER POWERS: It's this, "I've already got my probabilistic risk assessment done."

MR. CHRISTIE: Right.

MEMBER POWERS: The ones that I have seen don't recognize things like sabotage risk, shutdown sorts of things, yet I don't see anything in the safety goal that says I don't have to worry about these.

MR. CHRISTIE: I am not saying you don't; you do. I am just saying that you do have probabilistic risk assessments, some of which include more things than others. Some include things like external events. None of them, to the best of my knowledge, include sabotage.

But some do include external events like Zion-Indian Point. You do have some that include consequence analysis. It just varies.

I am just saying to you that you do have these probabilistic risk assessments, you can rank order things.

We have learned quite at bit in the past 15 years since we have been seriously using probabilistic risk assessments to address problems at the plant, and we have these techniques.

They are all lacking in some way; I'll be the first one to admit it. But we do have them.

MEMBER KRESS: That rank order would be plant-

specific?

MR. CHRISTIE: Absolutely.

MEMBER POWERS: Well, I think it would also sophistication-specific, too.

MEMBER KRESS: Sophistication of your CA probabilistic risk assessment.

MEMBER POWERS: If I restrict my probabilistic risk assessment to look only at accidents initiated by pipe breaks I get a rather different conclusion than one that looks at a whole range of initiators and I get a different conclusion if I look at seismic shutdown, sabotage. Yet the safety goal seems to have no restrictions on it.

MR. CHRISTIE: And I don't think it should. My point is you can rank order these things, you can do an evaluation since the plants are all operating, you can get very plant-specific data for this.

MEMBER KRESS: The point of my earlier question about the .1 per cent being pulled out of the air could very well mean that the intention was not to include sabotage, although it doesn't specifically say that.

MEMBER POWERS: I'd love to track this logic.

MEMBER KRESS: If it is an arbitrarily number, pulled out of the air, it could be arbitrarily inclusive or exclusive of anything. I actually do interpret to

mean, not including sabotage but including all the other things, external and internal events.

MR. KING: Mr. Chairman?

MEMBER POWERS: Where is it that you grab ahold of this?

MEMBER KRESS: Well, you can read that is some of the words.

MEMBER POWERS: Well, I suppose I could read anything into the words if I wanted to stretch my imagination. I am just wondering how you read it into those words.

MEMBER KRESS: Well, I don't know. But I have come to believe that was the case.

MR. KING: Tom King from the staff. I just wanted to clarify the safety goal policy explicitly excludes sabotage.

MEMBER KRESS: Yes, that is what I thought.

MR. KING: It states that specifically.

CHAIRMAN APOSTOLAKIS: Also, I think it is a bit unfair that these goals were pulled out of the air.

MEMBER KRESS: Well, that is true; there was some basis behind them, like what would be a realistic number, what would be acceptable.

CHAIRMAN APOSTOLAKIS: You compare with existing risks.

MR. CHRISTIE: Okay. You know, again --

CHAIRMAN APOSTOLAKIS: What happened to the previous slide?

SLIDE CHANGE

MR. CHRISTIE: It is just the rank order.

CHAIRMAN APOSTOLAKIS: So, the message is that we can just rank order?

MR. CHRISTIE: No, we can pay attention to important systems in rank order.

CHAIRMAN APOSTOLAKIS: Yeah.

MR. CHRISTIE: We do have some value for Fussel-Vesily, whatever you want to use as the importance measure. You can go in and do evaluations of the systems, find out what their variations are and so on and so forth.

MEMBER KRESS: Is that going to be part of your performance measures?

MR. CHRISTIE: Sure. Absolutely. Same thing we talked about last time.

CHAIRMAN APOSTOLAKIS: I didn't hear anything about dominant accident sequences. Are we forgetting about them and going on to Fussel-Vesily?

MR. CHRISTIE: No. I am just saying to you, this is a means of going into a probabilistic risk assessment, picking the things that are your dominant initiating events, dominant systems. and rank order them,

okay?

CHAIRMAN APOSTOLAKIS: Okay.

MR. CHRISTIE: What we can do if we rank order them and determine which are the important ones, we can go in and do a detailed evaluation.

For example, reactor core isolation cooling at Fermi 2 which shows up as being of high importance as far as Fussel-Vesily is concerned and it also has a wide variation in its performance in actuality if you look at the performance that we monitor from reading the control room logs.

MEMBER KRESS: What are you plotting there?

MR. CHRISTIE: The same thing as before.

MEMBER KRESS: We have short memories.

MR. CHRISTIE: I had this thing called conditional probability which says if you have a piece of stand-by equipment it has to do three things.

It has to be in a position where it can start, called stand-by available; it has to start; it has to run for x number of hours.

MEMBER KRESS: This is conditional probability that it will perform the intended function?

MR. CHRISTIE: Yes, absolutely.

Like I said, we keep track of these.

If we do that and we look at the important

systems and do a good job, we can take the variations in the important systems, put it back into the probabilistic risk assessment and trend the core damage frequency as a function of time.

This is just something that you can do and we have done it at a number of plants. You can see trends, weekly, monthly, whatever you want.

MEMBER KRESS: What is causing this to go down? Reliability?

MR. CHRISTIE: Reliability of the important systems, as determined.

MEMBER KRESS: As determined --

MR. CHRISTIE: By the baseline probabilistic risk assessment, by their actual performance.

MEMBER KRESS: By their actual performance.

CHAIRMAN APOSTOLAKIS: Why is it going down?

MR. CHRISTIE: It is going down because systems such as RCIC are going up in performance, the conditional probability is getting better over time.

CHAIRMAN APOSTOLAKIS: But if you look at the next slide, would you say it is going down?

SLIDE CHANGE

MR. CHRISTIE: The long term core damage frequency, as far as we can tell from the systems that have a high Fussel-Vesily and a wide variation of

performance, is going down.

CHAIRMAN APOSTOLAKIS: But this one, in particular, to me doesn't look like it is going down.

MR. CHRISTIE: That is a long term trend and it is definitely going down.

CHAIRMAN APOSTOLAKIS: Normalized to what?

MR. CHRISTIE: Normalized to some value; in this case I think it is the average performance value that came out of the IPE. It can be normalized to anything.

The next step that has to be done, which I had never seen done before this summer, --

CHAIRMAN APOSTOLAKIS: And these are mean values?

MR. CHRISTIE: Yes, these are mean values.

CHAIRMAN APOSTOLAKIS: Okay.

MR. CHRISTIE: The next step that has to be done is you go in and do the consequence modeling. We did the identification of important systems, we figured out their variation, put them back in the core damage frequency and now we are going to put them in the consequence modeling.

So, use codes like MACCS. It just says give me the plant damage states, population density, meteorology, evacuation schemes, et cetera.

I have not done this in actual fact for the

Fermi 2 plant. This summer, this was done for an actual plant in the United States, and for those of you who went out to Utah to the exhibit area, you saw the curve.

I took the knowledge that I had from the NUREG 1150 plants and this is my tentative curve for where you stand with respect to the individual value for the public health risk for the Fermi 2 plant based on that limited picture that you saw that we are looking at.

MEMBER KRESS: You used the actual plant meteorology and populations?

MR. CHRISTIE: I did not. It was done for a real plant this summer, but I didn't do it for Fermi 2.

MEMBER KRESS: How did you arrive at that number, then?

MR. CHRISTIE: This is just my estimate based on having done this for about 15 years.

MEMBER KRESS: You have some rule of thumb of what the consequences might be?

MR. CHRISTIE: Sure.

MEMBER KRESS: Okay.

MR. CHRISTIE: You got the 1150 work which shows you where you stand with respect to the individuals. You know that they did it for Grand Gulf and Peach Bottom.

So you have to take it into account, then you look at the variation, the core damage frequency, and you

come up with the estimation of where you stand.

MEMBER KRESS: Does this probabilistic risk assessment have seismic and fires?

MR. CHRISTIE: No.

MEMBER KRESS: It was just internal events?

MR. CHRISTIE: Just internal events.

CHAIRMAN APOSTOLAKIS: Did you also do a similar thing for the core damage frequency objective? Did you have a line like that in your previous slide?

MR. CHRISTIE: I am talking about the quantitative health objective, okay?

CHAIRMAN APOSTOLAKIS: Okay.

MR. CHRISTIE: And this is what I thought it would turn out to be to societal.

In general, so far, with the values that we use, the one in five hundred for the latent cancer fatality rate, it seems to be easier to meet the latent cancer fatality goal than to meet the individual, as far as we can tell.

We are about two orders of magnitude away from the quantitative health objectives, as far as we can tell.

MEMBER KRESS: What is the wiggly line at the bottom?

MR. CHRISTIE: You got a baseline value that comes out of the IPE.

MEMBER KRESS: Is this time?

MR. CHRISTIE: This is time. I am sorry. In my rush to get this done --

And there are real curves for real plants that exist in the United States.

From what I can see, this one is a decreasing trend. The one that we really did might possibly have an increasing trend.

We are talking about uncertainties and I will tell you the truth and it is an area where we have to do a lot of work, but the reality is that they have always existed. We just never quantified it until the probabilistic risk assessments came along.

You can trend them if you do a good job. It is my belief that if you do a good job when you trend them, they will get smaller.

As an example, I would like to use that RCIC that we have at Fermi. When I first started collecting data in January, 1991, arbitrary, et cetera, et cetera. Tried four times, work free. Mean value, 75 per cent. But the uncertainty bands were as high as they can get.

But over about five years of data collection we are now up into the 40 and 50 times, we still had only the one failure to start. We have had six actual, non-test actuations and it started ever time.

So, the uncertainty bands on this piece of equipment, as far as the probability of starting, have gotten very much smaller because of the way we have trended it, kept track of it and so on.

MEMBER KRESS: Now this would quantify uncertainties in the probabilistic risk assessment inputs but it doesn't quantify the uncertainties in how good the probabilistic risk assessment is.

MR. CHRISTIE: Absolutely. And you can do the same thing for time, maintenance, stand-by availability, probability of run, and you can shrink your uncertainty bands if you do a good job.

The thing that I want to point out is, these things are always there. These uncertainties have been there since time immemorial and we haven't been paying attention to them.

MEMBER KRESS: But they tend to be overwhelmed by the uncertainties in the way probabilistic risk assessment treats phenomena.

MR. CHRISTIE: I really don't know that because anybody is putting it down and saying this is how much is do to this, how much is do to that.

MEMBER KRESS: well, NUREG 1150 tried to do that and they concluded that mostly uncertainties are in phenomena.

MR. CHRISTIE: Again, what are we going to do?

Your point is, how do we know when we get the right answer?

We have to pay attention to actual events. We have got to learn from Three Mile Island, from the accident sequence precursor program.

The next best set of things we can do is the test results. We run an awful lot of surveillance and this is what I talked about in June. I don't think we do a good job on it.

The third thing I think we can do a better job on is getting consensus of experts. We heard from Bob Budnitz out is Salt Lake City that as far as earth quakes are concerned, it seems that now there is a consensus of experts on how to deal with them.

We have got to do a better job.

Now, as my mother said to me many times during my life, "Hey, Bob, if you are so smart, why aren't you rich?"

MEMBER KRESS: What is the answer?

MR. CHRISTIE: The correlation is that I am not so smart and there are certain things going on in the world that I have no control over.

For instance, what are the rewards for the staff of a nuclear power plant to go to a performance-

based regulation as I identified here?

As far as I can tell, there is only one reward. They believe they might get a more cost effective position. But all the probabilistic risk assessment is going to do is add another layer of burden to their position. They don't see that it is going to help them.

CHAIRMAN APOSTOLAKIS: Why not?

MR. CHRISTIE: It's just not there.

CHAIRMAN APOSTOLAKIS: So how can they not see it if it's not there?

MR. CHRISTIE: Look at the six step process they have for going through the standard review plan.

CHAIRMAN APOSTOLAKIS: This new one?

MR. CHRISTIE: Yeah. The second step in the thing is go through the whole deterministic process.

CHAIRMAN APOSTOLAKIS: But that is not the law yet.

MR. CHRISTIE: I am just saying they look at what is going on. If you take the standard review plan and look at the piece that says this is the criteria, there is a whole laundry list of things they are going to have to do.

There is a double failure rule, a triple failure rule.

CHAIRMAN APOSTOLAKIS: That hasn't been

discussed yet.

MR. CHRISTIE: But you have got to remember this is what they see.

CHAIRMAN APOSTOLAKIS: I really wasn't --

MR. HOLAHAN: The standard review plan is available in a PDR, at least the previous draft. The more recent draft we sent to the committee is not in the PDR yet.

MEMBER KRESS: Bob, there is a problem; transitions.

There seems to be some thought that going to this type of system might be an improvement, but how do you get from here to there.

MR. CHRISTIE: Sure. But you see, the second question I asked about what are the rewards for the staff to go to performance-based regulation, and my answer is that I don't see any.

MEMBER KRESS: Well, they have a more rational basis to make decisions.

MR. CHRISTIE: Not to them. They don't like probabilistic risk assessment.

MEMBER KRESS: Well, I don't think you can lump them all together. I think if you ask Gary over here he would probably way it is a pretty good tool.

MR. CHRISTIE: I hear that. But I have been

dealing with this industry for about 20 years and have been a probabilistic risk assessment analyst for over 18 years and I see the same problems today that I saw in 1980.

I worked on the writing of the probabilistic risk assessment procedures guide, joint effort, industry, et cetera. I am hearing the same arguments that I heard back in 1980.

MEMBER KRESS: Can't trust them because the uncertainties are too big and they are not complete, is that the argument?

MR. CHRISTIE: I don't think that the Nuclear Regulatory staff sees the probabilistic risk assessment as a better basis for decisions.

I see that they have a belief in their culture, they are more concerned about having more regulations rather than less regulations. They are not interested in performance-based regulations.

When we get out a draft standard review plan we are seeing, instead of single failure rules, now we got a combination of double failure, triple failure, et cetera.

This is what they are comfortable with, the culture that they have been brought up in and it is how they assure safety.

MEMBER KRESS: Well, I think their primary concern is health and safety.

MR. CHRISTIE: Right. We are all well-meaning and good intentioned people. But the glasses that they see the world through are not the glasses I see the world with.

But I can't think of a reward. I see it as an adversarial relationship between the utilities and the thing. The morale now in the nuclear industry is low and falling.

There is not anyone that I think sees the nuclear business as a career builder. I wouldn't recommend anyone go into the nuclear engineering field in the United States.

Clearly, if the regulatory process becomes more efficient, regulatory people will lose jobs.

So you have got impediments to this thing. But you do have some building blocks like NRC safety goals. We got quantitative health objectives.

MEMBER KRESS: Does that seem to agree with what you mentioned earlier, Dana?

MEMBER POWERS: Well, if you go through the insights program you come away with a strong conclusion, I think, that indeed you have a lot of people who can do a probabilistic risk assessment; they don't agree very well

on how to do it.

There is a tremendous diversity in how you treat these things, even to the points of this rank ordering business, models, descriptions, scenarios are all different for plants that look, from the outside, like very similar plants.

You couple that with the fact that we are just dealing with a very narrow part of the risk base that the plant sees, you come away with kind of an uncomfortable feeling that there is a need for a greater codification of what goes on here.

MR. CHRISTIE: The other thing that we have is over 2,000 years of reactor years of experience. It has told us a lot of things that we are not taking advantage of.

The first part of our history with the lightwater reactors, we had one core damage event in 400 reactor years.

We have now gone over 1500 reactor years without another one. It has to indicate something. Somebody is doing something right.

This is where I think the people at the plant are really paying attention.

The thing that we don't address is how do we compare our models to the actual data? How do we get the

surveillance testing that we do in concordance with what really happens out there in the real world. How do we get the experts together.

MEMBER POWERS: Why would we want to do this if existing systems are so successful?

MR. CHRISTIE: The existing system is not successful.

MEMBER POWERS: You just told me that everything was much better. Fifteen hundred operating years without damaging a core.

MR. CHRISTIE: Where are the profits from the well-run nuclear electric generating stations in the United States? Are they building new nuclear electric generating stations? How many have we canceled in the last ten years? We are not in good shape. We are a dying industry.

Look at this curve. I went two weeks ago to an ASME joint electric power conference in Houston, TX.

Basically, that conference was natural gas. There was a session called making nuclear competitive in today's environment. No one showed up for the session.

See that curve, the combustion turbine/combined cycle? A Westinghouse person said that they would sell, competitive market, combustion turbine, modular 230 megawatt electric with an thermal efficiency

of 58 per cent, and they would have it on line for you in six months. The cost of it would be about $25.00/megawatt hour.

MEMBER KRESS: Natural gas?

MR. CHRISTIE: Natural gas.

MEMBER MILLER: That is true worldwide.

MR. CHRISTIE: Right. And General Electric and Westinghouse are running full bore with these combustion turbines. And approximately 70 per cent of them are being sold overseas.

And every utility in the United States is going overseas, the ones that are making money. That is where the money is going.

It is not going to build new nuclear power facilities in the United States.

MEMBER BARTON: Bob, I think part of the problem here is not just the cost, I think it is technology. Nuclear and fossil generated electricity is really an old technology and what you are seeing here is new generation combustion turbines with much higher efficiencies which really lead to the lower costs.

MR. CHRISTIE: Right. Where is our 20 years of experience? Can we get more efficiencies out of our fuel? Absolutely. Are we doing it? No. It is very hard to do.

But did we devote millions of dollars to make ourselves more efficient and more cost effective?

I talk to a lot of people, nuclear power plants, strange, some of the people at the Nuclear Regulatory Commission even talk to me still. They are tremendous people with unbelievable talents, they just claim that the system boxes them in to this corner.

CHAIRMAN APOSTOLAKIS: Who is they?

MR. CHRISTIE: They are the staff members of the Nuclear Regulatory Agency, the ones that I deal with personally.

I don't know how to change what we are doing. I think it will be do or die when we get deregulated. You can be a Pan AM an Eastern or you can be a Delta or United.

You just have to keep it simple. I would use the quantitative health objectives; you can plot and trend them.

This is real life. At a real plant in the United States today, plants are swinging up and down as far as the quantitative health objectives, easily factors of two. And we are worrying about .1 per cent of a core damage frequency.

We just don't look at it and that is my problem. That is what bothers me.

I sat in on the last meetings and as far as I can tell, somebody is waiting for the utilities to take the initiatives in this field. They have already taken the initiatives; the money is going elsewhere.

I made a recommendation in Utah and also to the Nuclear Regulatory Commission when they asked for comments on strategic assessment, that we get two pilot programs going using this kind of material to make decisions.

I'll ask you the same question I asked in Utah. How many people in this room believe that in the next ten years, a new commercial nuclear power plant will be ordered in the United States and be online?

There were two other people in Utah out of 90 who raised their hands.

MEMBER MILLER: Did you raise your hand?

MR. CHRISTIE: I did. I believe it. Because I believe that when deregulation goes, the utilities will become very cost effective. I believe the nuclear power plants are cash cows when run well.

They will realize that they can either go with the fuel which depends on the natural gas and its price fluctuations or I can buy a nuclear plant and eliminate the fluctuations.

MEMBER MILLER: With the current design?

MR. CHRISTIE: Whatever they are selling to the Japanese and the Koreans. It is not the current design.

These people seem to be able to buy one from either Westinghouse or Hitachi or whoever, online in less than four years. You can make money doing that.

CHAIRMAN APOSTOLAKIS: We have a lot of ground to cover today.

Thank you, Bob.

MR. HOLAHAN: Good morning. I'm Gary Holahan, and Tom King and I, with the help of Bob Jones and Mark Cunningham, are going to start off the presentations.

I guess I'd like to, before going into the presentation, have just a few observations on Bob Christie's remarks. I guess I'm personally a little more optimistic than Bob Christie is, but I think his views are not unique. I think he's right in that his views represent at least partly what the industry is thinking on the subject.

There is a lot of uncertainty and in many areas there's a lot of pessimism in the industry about where we're going and what this all means to them. So I think, you know, we are pursuing these issues with the knowledge that there is, at least a skeptical industry and probably a skeptical public, about where we're going and

what we're going to achieve.

But I do think that we're making progress towards changing the culture and changing the approach of the agency in that it will be reflected in the industry activities in the future.

I'd like to say that we not only continue to talk about Christie, we actually listen to him. So I think he's -- I guess we'll continue to do that, too.

We're just going to cover, in the first presentation, a general overview of why we're here today and what we're going to try to accomplish in the next couple of days. And then looking at the agenda, we'll go into a discussion of the general reg guides and SRPs, and then into the application-specific documents.

I guess firstly I'd say, we're really here to continue what we've found to be a constructive dialogue with the committee. It's been a working process that's I think, hopefully served both groups well. When I look at the draft versions of the reg guide and the SRP that were sent to the committee a week or so ago, I see that it's different from the previous drafts; I hope the committee sees it also. And that many of the things that we talked about, many of the suggestions from the committee I think, are reflected in those documents.

We talked about changing the 6-step process to

have a more integrated PRA and traditional engineering process based on some key safety principles. And I think you'll see that the documents are restructured in that way.

I think the documents are simplified from the previous drafts and I think we're continuing to move in that direction as we make additional changes.

I think we're moving in the direction and we're doing a better job of clarifying how qualitative and quantitative insights on the PRAs can be used in the processes.

And this might be a good point to cover, you know, where we are in the process, because we are continuing to work on the draft documents. We've had a number of meetings, you know, continuing series with the ACRS, but we've also met three times with the CRGR; we have a meeting with the NRC office directors next week; and we're continuing to, I think, make improvements and clarifications in the documents.

Now, I know that makes it difficult on the committee because you're being asked to comment on a changing process, but I think that's the nature of the work that we've been given. Unfortunately, you have a choice: either you get one version and it's sort of a pass/fail test, but I think what we're really in is in a

constructive process of improving a document.

So the advantage of that is, I think the staff has been receptive to revising the document based on the committee's -- or, individual views from the committees and subcommittees. But that also means that you have to be a little bit indulgent with us because it means that the documents are in a formative stage.

So not only did we send you a second draft about a week ago, I think there were some other refinements that we're going to talk about in the next two days that we'll want you to see in another revision, hopefully early next week. And there will probably be, you know, some changes after that as well.

So for today we will discuss the current versions of the reg guides and standard review plans with a little more emphasis on the things that have changed from our last meeting; then I think we'll have, really the first time through with the application-specific graded QA in-service testing and tech spec, reg guides, and SRPs. And we're going to identify what we think our major issues and additional work that's going on.

CHAIRMAN APOSTOLAKIS: Gary?

MR. HOLAHAN: Yes?

CHAIRMAN APOSTOLAKIS: In one of our letters, I think it was six months or more ago, we made a

recommendation that there was a need to develop a philosophy of how to approach this new risk-informed and performance-based way of doing business. And I think the principles that the guys put down on paper -- and I see there is a viewgraph representation by Mark and Bob on that --

MR. HOLAHAN: Yes.

CHAIRMAN APOSTOLAKIS: -- maybe these principles can serve as a good basis for us to talk a little bit about philosophy. But I would like to have some time -- and maybe that time is now, right after your presentation, or maybe when Bob and Mark start theirs -- to really talk about the general approach we want to take, without necessarily discussing specifics that are in various reg guides.

And as I say, these principles, I think, are a good starting point. And I think if we develop that philosophy it will be easier than to discuss the details and make sure that there is some consistency among these documents.

So, do you think that will be something to do, and when?

MR. HOLAHAN: Yes. Let me suggest that Tom and I finish the introductory remarks, but before Bob and Mark start, because I think once they start there'll be a

tendency to sort of go through the document on a section-by-section basis. So sort of at the end of the, why are we here introduction, I think would probably be the best time to do it.

CHAIRMAN APOSTOLAKIS: And maybe we can use their first viewgraph because they have listed the principles.

MR. HOLAHAN: Yes.

CHAIRMAN APOSTOLAKIS: So at least as a basis. Okay, good.

MR. HOLAHAN: Okay, fair enough.

CHAIRMAN APOSTOLAKIS: If the members agree, I hope.

MEMBER KRESS: Yes, that sounds like a good idea.

MR. HOLAHAN: In terms of a process for finalization of the guidance, what we're really aiming at is draft documents for comment by the end of the year. Which means completing ACRS and CRGR reviews of the draft documents, making -- I think there will probably be one and possibly two rounds of revisions between now and mid-December -- but getting a set of draft documents for public comment to the EDO in mid-December; hopefully to have the EDO forward them to the Commission and then let the Commission decide about putting them out for a comment

period.

And that will -- I'm not going to go through this in detail, but you'll see that there's a -- sort of the long-term piece of this process is, after you get it out for public comment, and obviously we've asked for public comments because we want to hear what people have to say and we'll go into a comment resolution and refinement process.

And then hopefully in the fall of '97, we'll be back to talk to the ACRS and other interested groups about resolving comments and, you know, finalizing the documents.

Now, there are a couple of, what we call working issues, and these are areas in which we see that substantive changes need to be made and are being worked on with respect to the reg guides and SRPs. And I think the way this is working out, the most fundamental issues are in the general regulatory guide.

All of the other documents I think, are playing a subsidiary role. The actual, you know, guidelines for decision making and processes are first set out in the general reg guide, and that's really where most of the fundamental issues are. And then conforming changes need to be made in all the other places.

So there are a couple of things that are going

on that are not reflected in the version of the reg guide and SRP that the committee was given about a week ago.

We're continuing to work on the treatment of large early release frequency, and that's in part because we've tried to use, not only the safety goal health objectives, but also other staff guidance documents like the regulatory analysis guidelines, and to come up with decision criteria that are consistent with a number of things we've done in the past.

And that's not so easy to do. There's sort of a range of results for which the staff has said, a backfit may be appropriate or the value is so low that it's, you know, below the concerns in that safety goal. And I think that's an area that we need to make some improvements in what we've sent. So we're working on that, and I think there'll be some discussion of that a little later.

One of the other things we've done is some restructuring of the reg guide, the SRP, and NUREG-1602. And what we've done in terms of restructuring is to move the actual guidance and staff positions up into the reg guides and the standard review plans, so that the NUREG report doesn't really have staff positions and guidance and decisions that are different from the reg guide and the SRP. It really makes the NUREG more of a reference document and not a document where the staff would take

positions.

I think we're also working on some -- yes?

CHAIRMAN APOSTOLAKIS: Is this committee going to review that report at some point?

MR. HOLAHAN: Well, we gave the report to the committee --

CHAIRMAN APOSTOLAKIS: I know.

MR. HOLAHAN: Right.

CHAIRMAN APOSTOLAKIS: But there is no time in here, in the agenda, that --

MR. HOLAHAN: And I think --

CHAIRMAN APOSTOLAKIS: I take that back. It's there. I thought it wasn't.

MR. HOLAHAN: I think the role of the reg guide is changing, and is more of a reference document and less of a regulatory guidance doctrine. I think that, you know, we'd be interested in the committee's view on it, but it's not playing such a central role as the way it was set up originally.

CHAIRMAN APOSTOLAKIS: So it's not urgent? You want to say something, Mark?

MR. CUNNINGHAM: I was going to add that the discussion that's on the agenda will probably be more along the lines of, this is how we're changing the document, as opposed to trying to walk through the

document itself. We can answer questions and things, but --

CHAIRMAN APOSTOLAKIS: But we can always come back to that document, say, next year?

MR. HOLAHAN: Yes.

CHAIRMAN APOSTOLAKIS: It doesn't have the same urgency as the rest of the document?

MR. HOLAHAN: I think our objective is to take the urgency out of NUREG-1602.

CHAIRMAN APOSTOLAKIS: Good, good. It's not an easy read.

MR. HOLAHAN: Yes. One of the other things that we're working on in parallel is making it an easier read; some clarification and simplification.

The third item that I think we've all talked about being very important and needing better treatment is dealing with uncertainties, predominantly in the regulatory guide and the general SRP. And there are some additional sections on the uncertainty topic that we've drafted that you haven't seen yet. We wanted to let you know that we're working on it and we'll give you some additional views on that.

So I guess, just to sum up as introductory remarks, what the staff wants from the ACRS. Well, I think it's important that in the next two days we have

sort of a clear understanding of major issues and concerns. We would like to have a letter from the ACRS in mid-December to support making the documents publicly available for comment, but we don't want to wait for that point.

I think we really need to have an understanding of the issues and the feeling of the committee members so that we can be dealing with those topics before we get to mid-December.

And I think in parallel with sort of refining the documents, one of the things you do in going out for public comment is not just present the documents sort of on their own, but the staff will be phrasing some questions to solicit input.

Some of the ACRS views we may be able to reflect in terms of the text of the document itself; maybe even figures in the documents themselves. And some of those issues we may reflect in terms of questions for comment, and then I think we'll deal with those in the comment resolution process.

CHAIRMAN APOSTOLAKIS: You know that tomorrow we are planning to stay a little late? We may do part of that today as well. By the way, what time -- I mean, the schedule says 7 p.m. for tomorrow. Can all the members stay until 7; 7 o'clock tomorrow? Okay. We may also stay

a little beyond 5 o'clock today. What?

MEMBER SEALE: Aye, aye, sir.

CHAIRMAN APOSTOLAKIS: Because I think there is a lot to discuss and I'd rather discuss high level issues, and I think that's what you are saying too.

MR. HOLAHAN: Yes.

CHAIRMAN APOSTOLAKIS: Rather than get into details. Yes?

MR. KING: I think the other thing we'd like to get before the close of business tomorrow is a feel for, what do you want to cover at the December full committee meeting; what do you want from us?

CHAIRMAN APOSTOLAKIS: Yes. Definitely.

MR. KING: So that we can prepare for that.

CHAIRMAN APOSTOLAKIS: That's why I'd like to do some of the discussion today, and then tomorrow, you know, we'd have almost three hours. But I'm pretty sure the schedule will slip. I mean, we're starting on philosophy now.

MR. KING: I think tomorrow we have on the agenda also, the talk about the set of questions that we envision to go with the Federal Register Notice to solicit comment. I think it will be useful to get the committee's feedback on those to see if we're hitting the right points at the right level and so forth.

CHAIRMAN APOSTOLAKIS: That's item 14, right?

MR. KING: Right.

CHAIRMAN APOSTOLAKIS: Yes, we've got to do some of it today, though. Because there are other things that will happen tomorrow as well.

MR. KING: Okay.

MR. JONES: I guess what I wanted to do as far as put up this slide that you requested, George, to go through I guess basically, what's our general philosophy and how we think we are currently attacking the problem.

And this I think, most of you recognize, and it's somewhat abbreviated in its form from the specific words that are in the guide, and you'll see that on some of the stuff we go through; that there'll be differences. and try to compile it on a slide and not put every single word.

But essentially, this is where we ended up based on the last set of discussions with the subcommittee and some internal discussions with CRGR and others. At one time we had, I think, a broader list of principles. We've now broken it down to the six principles, and then there's a series of, what I would call staff expectations, which is basically the next slide in my package.

But this is what we see is the basic framework for decision-making with the risk-informed decision-making

process. It's what we've now put in, all the application-specific reg guides fit within this envelop, and this will become central to all of them. So I guess just to initiate the discussion, this is the list and, you know --

MR. HOLAHAN: I think you can also go back one step. If you want to talk about general approach, sort of fundamental thinking.

MR. JONES: Yes, yes.

MR. HOLAHAN: To go back one step, I would go to the first statement of the Commission policy statement on PRA which says -- I don't think I have a copy of it, but Bob has a notebook with everything in it -- it basically says, the Commission is encouraging the increased use of PRA, you know, in a manner that is supportive of defense-in-depth, and complementary, you know, to -- I think it says deterministic engineering, but maybe we'll convert that to traditional engineering approaches.

And so, if you want to put your finger on a fundamental approach, it seems to me that it is mixing risk insights and traditional engineering in such a way that it preserves defense-in-depth. And you could argue about, you know, what is the fundamental principle and what are the supporting issues?

I think Bob Christie's suggestion was

basically that the safety goals and the health objectives were fundamental. I would say in the approach that we're using here, that defense-in-depth is fundamental, and that defense-in-depth is provided through risk analysis and traditional engineering. So I think it's looking at it in a different way.

CHAIRMAN APOSTOLAKIS: Yes, I don't think you can just state the philosophy. I mean, you obviously have to go beyond that, but maybe we can start talking about each one of these bullets and then see where that leads us.

The first bullet, now that can be a killer, or it can be very innocent. The current regulations are met. Now, am I supposed to assume that the regulations are met, or am I supposed to show that they are met?

MR. HOLAHAN: Well, I'll take it first and then Bob will say the same thing.

(Laughter.)

I think there are two answers and it depends what piece you're talking about. If you look at the way the words are in the documents, this is referring to the proposed changes, okay.

And what we're saying is, for the proposed change, you know, reducing the test frequency or adding a diesel generator -- whatever the change is -- the staff

would expect, not only to see the licensee meet the current regulations or justify an exemption, but that that would be explicitly justified. That there would be an explicit analysis explaining how the regulation is met or justify it otherwise. For the proposed change.

MEMBER MILLER: How are you going to define the scope of that thing?

MR. HOLAHAN: Well, that's the first -- the scope of the proposed change is the first step in what is now a 4-step process. And that's, first the licensee should define what they're asking for. You know, we're talking about license amendments so the licensee would define what it is that they want.

But to finish the thought, all the other parts of the regulations, everything else that's in the licensing basis to the plant, I think the staff expects the licensees to be operating a plant consistent with those requirements. And you expect the engineering analysis, the PRA analysis assumptions to be consistent with the licensing basis.

But we don't expect that either the licensee or the staff to do a, you know, a thorough re-review or reinspection of the plant to show that all those other things that aren't being changed, you know, are in conformance with the regulations. That's what the whole

rest of the inspection and the regulatory program are for. So I don't think this change process should be encumbered by that kind of issue.

CHAIRMAN APOSTOLAKIS: Yes, but it's not clear the way it's stated. For example, reg guide 1061 says, first the licensee must confirm that the plant is designed and operated in accordance with its CLB.

MR. HOLAHAN: Where are you reading?

CHAIRMAN APOSTOLAKIS: Page 2-3; two-dash-three. The second paragraph of section 2.3. Element 20 goes, for primary activities, first the licensee must confirm that the plant is designed and operated in accordance with its CLB.

Now, if you can interpret that a little bit to say that in the context of a case study, or the issue being studied or investigated, I think that will go a long way towards explaining this. Although, is this something that you normally require?

Let's say -- I don't know; I'm just asking naively here -- let's say somebody came a year-and-a-half ago and requested the change in the CLB using traditional methods. Would he have to first show that he complied with the current regulations?

MR. HOLAHAN: In all other areas? No.

CHAIRMAN APOSTOLAKIS: No, but in that

particular area?

MR. HOLAHAN: Well, I think the question is not whether they currently comply, but whether the proposed change would, you know, put the plant in compliance. And I think that's a normal question.

CHAIRMAN APOSTOLAKIS: Wait a minute, I'm a little bit -- I mean, a proposed change changes the CLB.

MR. HOLAHAN: Yes.

CHAIRMAN APOSTOLAKIS: So after the change it would not be in compliance with the old CLB, right?

MR. HOLAHAN: No, in compliance with the regulations.

MR. KING: Yes, regulations is the key word here.

MR. HOLAHAN: Regulations. Not CLB.

MR. KING: There's a lot of flexibility within the regulations.

MR. HOLAHAN: Yes, by definition, anything that's approved is CLB.

CHAIRMAN APOSTOLAKIS: So would they have to show that, if they didn't use PRA at all, that the current regulations are met?

MR. HOLAHAN: Yes. Yes, for a proposed change, yes.

CHAIRMAN APOSTOLAKIS: So every time they talk

to you they have to prove that this particular item that I'm about to change, at this point is in compliance?

MR. HOLAHAN: Well, I'm not sure that you'll find a guidance document that specifically called that out as a step in the process. But issuing a license amendment, the staff -- and we expect the licensee, you know, provide information supporting it -- it says, this is done because it meets the regulations.

CHAIRMAN APOSTOLAKIS: I mean, it would seem to me though, that this could be an assumption. In other words, we assume that you comply, and if we find that you don't then of course we'll take appropriate action. But you don't have to show it was.

MR. JONES: I think, George, let me -- this happens to be one of the areas in the document that's up for revision. To clearly focus it that the proposed change meets applicable regulations. So it is going to be focused to the proposed change and we'll look for the conforming words in other parts of the document.

So I think this is the point that got raised, in fact, when we went to CRGR, also, which is where that came from.

MR. KING: Yes, it would have to be a pretty major change, I think, to be outside the scope of the regulations. You'd have to remove a train and equipment,

or violate the single failure criteria, or something like that.

CHAIRMAN APOSTOLAKIS: But that's why I'm wondering why you have to say this at all. I mean, isn't that an underlying assumption?

MR. KING: No, I don't think it's unreasonable to say, you know, have them go back and look at the real fundamentals that are embodied in the regulation and make sure they're not outside those. And if they are they have to submit either an exemption request or a proposed change to the rule.

MEMBER MILLER: Why isn't it said in other regulatory guidance, then?

MR. KING: Well, I think it may have been assumed in the past, that either the licensee or the staff will look for that as part of their reviewing a change.

MEMBER MILLER: So if I go to every other chapter in the SRP it will not say this, it just assumes it? Is that right?

MR. KING: Well, the SRP now basically, is --

MEMBER MILLER: Well, every other regulatory guide?

MR. HOLAHAN: Well, I think you -- the nature of the other regulatory guides don't raise this issue because in other cases there is -- the other regulatory

guides don't cover the broad scope that we're dealing with here. There's a specific regulation and there's a staff position in effect which says, if you do it this way you meet that regulation.

So the issue is inherently covered by those reg guides. It's a description of a way of meeting the regulations, so naturally if you do it that way you meet the regulations. But the intent of showing that you meet the regulation is inherent in those reg guides.

MEMBER SEALE: But isn't it traditional now, I'll say, rather than -- and I'm not looking for a place where it's written down necessarily -- but isn't it traditional that the design basis is a liability if you will, or an obligation, that the licensee always has, and compliance with that obligation is always an open question?

That is, if there's any reason to believe that they're not complying with it, you don't need a request or anything else to raise that issue. And I don't know -- again, I don't know whether it's ever written down anywhere --

MR. HOLAHAN: Yes, and it is written down.

MEMBER SEALE: Okay. But that is --

MR. HOLAHAN: Yes.

MEMBER SEALE: -- that's sort of cornerstone

number one; set in concrete, if you will.

MR. HOLAHAN: Yes. In the part of the regulations that refers to asking questions of licensees. In 50.54(f) there is no standard for compliance questions. The staff is free -- and I would say encouraged -- to ask the questions about compliance, you know, when you don't have to meet any cost benefit tests or anything like that.

CHAIRMAN APOSTOLAKIS: So I guess the members are not unhappy with this? I would take that as an assumption, but if that's standard practice --

MEMBER KRESS: I'm happy with the statement that they're going to change the focus --

MEMBER SEALE: Yes.

MEMBER KRESS: -- to the change, putting it outside.

CHAIRMAN APOSTOLAKIS: Yes. Well, that takes away a lot of my concerns.

MEMBER SEALE: And we'll be interested in looking at your revised language to see whether or not you've convinced us that that's -- you're doing that.

MR. HOLAHAN: I'll be interested in seeing it, too.

MR. JONES: It's in my mark-up here, which I'll track the next rev 8 or 9 or 10, or whatever it is of this.

CHAIRMAN APOSTOLAKIS: Now, the second bullet, adequate defense-in-depth is maintained -- and I know in one of our letters we also said that the concept of defense-in-depth should be maintained. I guess the thing, the word of course, the trouble is, "adequate". I don't know what adequate is. Then I went to your 1061 and there is in fact, a list of six bullets on pages 2-5 and 2-6 that explain what, I suppose, adequate is.

And they made sense to me, but also they are too much influenced in my opinion, by traditional approaches. I really liked the second bullet, by the way, that over-rely on some programmatic activities to compensate for weaknesses in plant design should be avoided. I like that; that's good.

But it seems to me that, speaking of philosophy, what you're really trying to do here is, you're trying to diffuse the risk. You don't want to rely on a single barrier. In the PRA space I think that means you don't want to find yourselves in a situation where -- to take an extreme -- 99 percent of the contribution, say the core damage frequency, comes from one minimal cut set. Isn't that the equivalent?

In fact, there is a discussion like that, not quite right, but very good discussion, on page 7 and page 8 of the SRP, where they're trying to -- it's the role of

PRA to review defense-in-depth. The bottom of page 7. Where there is an attempt to interpret this idea of defense-in-depth in the PRA space.

Now, what they do there is what Bob didn't like. They talk about two event cut sets, three event cut sets and so on. But at least it's an attempt to do that.

So I was wondering whether one could restate these at the higher level, and achieve the same goal? Namely to say that the contributions to core damage frequency -- let's take that as an example -- an individual contribution should not exceed *X* percent, for example. Or some other way of spreading.

Maybe you can list unavailabilities, for example, or accident sequence of frequencies, that have been found in the vast majority of PRAs, as the industry standard and say, this is our mod as the goal, and if you are way above that, then we'll look into it in more detail.

I think that gives the required flexibility. Let's not forget that the word flexibility is key here.

MEMBER POWERS:: The trouble I have with that, George, is that looks at defense-in-depth as something that's embodied in the PRA rather than looking at defense-in-depth as something that you're interested in, because you know that the PRA is incomplete.

CHAIRMAN APOSTOLAKIS: Ah, that's -- yes. I'm sorry, that's a separate issue. You have defense-in-depth or you have incompleteness. In other words -- let's back up a little bit.

First you have to start with a clear statement of what is covered in the PRA and what is not, okay. Now, the stuff that's left out, I agree with Dana, that you have to deal with in some way. And in fact again, the SRP gives some very interesting ideas as to how to do that. And clearly there, the traditional way of doing business has to dominate, because PRA is not there and defense-in-depth, the way you define it in 2-5 and 2-6 makes perfect sense.

And then we come to the other part which is covered by the PRA, which -- and I think the way 2-5 and 2-6, those two pages list the requirements for defense-in-depth, they apply indiscriminately to everything, independently of whether PRA is used or not.

So what I'm saying is that when PRA applies and somebody has used PRA to argue for something, you can also give some guidance in terms of PRA numbers or PRA results, that will achieve the same goals here, and that will give much more flexibility in my opinion, to the licensee, to demonstrate that they have actually met these requirements.

And again, in my opinion, when I say requirements, nothing is black and white except perhaps the safety goals and the subsidiary goals, and that's a major problem that I have with the diagrams that we will discuss later and so on.

So I would be careful with the words, and as I said earlier, for example you might say -- let's say that you decide to go with one system unavailability. You can say industry average is in this range, rather than saying, you know, it has to be 5×10^{-4}, because then you end up with discussions, what do you do if it's 6×10^{-4}, 4 and so on.

Now, that's not something that can be done, you know, in five minutes, but I really think that you can take all the bullets except the one that talks about programmatic activities -- which I think address a little bit, the issue that Dana raised. You really have to rely more on programmatic activities if you have not included this particular issue in the PRA.

But to talk again about system redundancy, independence and diversity, and require that these be maintained, it seems to me that it's unnecessary if I have a PRA and the PRA shows that I have say, seven or eight contributors to this particular event. That means that indeed, I have redundancy and diversity, and that the

numbers are reasonable. But if it's .1 then of course you'd have a problem. But I'm talking about --

MEMBER KRESS: George, I have a little problem understanding why you think it's particularly bad if one sequence dominates the CDF risk?

CHAIRMAN APOSTOLAKIS: Because equivalently, that means that you probably don't have enough redundancy and independence and the defenses against potential common cause failures have not been maintained. I mean, that's the probabilistic statement of these things.

MEMBER KRESS: Well, in my view it may mean you have a lot of that because you've reduced all the rest of them so that that one dominates.

CHAIRMAN APOSTOLAKIS: It depends which one it is. I mean, if it's seismic then you have to really think about it, but if you limit yourself say, for the time being to internal events, I think a good design is a balanced design, because several contributors, not just one.

And I think that's the whole idea of defense-in-depth. That you don't want to rely on -- In a system that is diverse and redundant, you will have these situations. Several contributors, not just one. In a system that is not diverse and redundant, you would tend to see one cut set dominating.

MR. KING: I think the big change that's been made from the version of the reg guide you saw previously versus this one is, when we talked about defense-in-depth originally we didn't bring in the concept of using probabilistic risk assessment output to try and see whether you had defense-in-depth.

In this version we tried to bring that concept in. Now, we didn't go as far as putting numerical guidelines in or anything like that, but I think clearly the intent was to utilize your PRA to help you make a judgment or the defense-in-depth.

CHAIRMAN APOSTOLAKIS: Or you can give even qualitative guidelines if you should feel that we are not ready for quantitative guidelines. For example, you can say, you know, I will go look at the number of major contributors, we will look at how they compare with industry averages, you know, these kinds of things, without really specifying numbers.

But I think that achieves two things. It's at a bit higher level than this, and one of the principles that I think we had stated in our letter was that, whatever criteria one imposes, it would be desirable to have them at as high a level as possible if you think of the quantitative goals health objective as being the very top level and then you go down to the components and

events.

And why do you want to do that? Because that way you give more flexibility to the licensees. So I think at least an attempt to show that will give more -- to do that here -- will really show that we're more serious about this new approach, because I think perceptions here are as important as what goes into the document as we heard Bob say earlier today.

And I think the discussion in the SRP makes that step. Now again, we can talk about the advisability of using the number of events in a minimal cut set versus the probability of the minimal cut set, but in my mind that's a secondary issue. We can certainly discuss it when the time comes. But I'm talking now about philosophy.

But it seems to me, and that thought is triggered by what Dana said, maybe early on you should address the issue in this guide, you should address the issue of what PRA does cover and what PRA does not cover, in the context of the issue being investigated or being discussed with the licensee. And then state very clearly that for the stuff that's left out, the traditional approaches still apply, perhaps.

And for the stuff that's in the PRA, then we have this new approach and now you can choose if you want

it, to show that defense-in-depth is preserved by doing these, you know, following these six bullets, more power to you. But if you want to do something else which you know is more or less equivalent, that should be fine too. That's what I'm saying.

MR. HOLAHAN: Okay. I think that's consistent with the intent of the document, so maybe we can clarify them to do a better job.

MR. KING: I think in concept we have no problem --

CHAIRMAN APOSTOLAKIS: And I don't disagree with you. I think that's the intent of the document.

MR. KING: In earlier versions we had some words in, things like look for outliers and so forth, when we were talking about defense-in-depth. Some of that got stripped out as we were trying to put as much flexibility in as we could. But we can re --

CHAIRMAN APOSTOLAKIS: And just as a matter of record again, these ideas have been used in various forms by others. Like this idea of the Sizewell B PRA. Well, the British required that no contributor to a major event should contribute more than ten percent of the frequency of that event. That's an attempt to do that.

Now, you may disagree and say look, ten percent is overly restrictive, but you don't have to go

with ten percent. But I mean, these are not very novel ideas; other people have talked about them. And in other countries they use the results of PRAs that show where the availabilities of the safety functions are, more or less.

So if you deviate from that too much, you'd better show why you deviate, or why this particular change will have a consequence and you'd better justify it. So that's at a higher level and I really would -- I think it would send the right message.

MR. HOLAHAN: I think the reason we structured the principles and the staff expectations the way they are is because we wanted, you know, adequate defense-in-depth to be the high level principle, and these other issues about how you show that -- you know, this is what is your principle, and the question of, how do you show it, whether you use the PRA analysis or you have some numerical approach or some, you know, sequence logic approach, or whether you just use traditional engineering redundancy.

These are examples of how you approach this issue, and we actually had a much longer list of principles and we went through and we sort of culled out those things which were not really fundamental principles, which were really ways of addressing those principles and put them at a different level.

And I think what you're talking about is broadening that second list. Not necessarily changing this list --

CHAIRMAN APOSTOLAKIS: No. Exactly.

MR. HOLAHAN: -- but broadening the ways of showing that there is adequate defense-in-depth.

CHAIRMAN APOSTOLAKIS: In fact, you do state before the bullets, other equivalent decision criteria acceptable. An acceptable set of guidelines for making that assessment, namely that defense-in-depth is reserved, are summarized below. Other equivalent criteria are acceptable.

So perhaps at the end of these bullets you can say, an example of other criteria might be the following. And again, I don't think at this stage you really have to agonize over what number to use and so on.

If you just say -- give some qualitative guidance that you would not like to see for example, the plant rely on one barrier, right? Which means equivalently that you have one minimal cut set there that dominates everything else.

MR. KING: This is clearly an area we want to solicit comment on as well.

CHAIRMAN APOSTOLAKIS: Well, I thought I gave you enough.

(Laughter.)

MR. HOLAHAN: And I'm not sure that I think what we'd like is to get our principles right so that they last a long time. But the examples of how to address those principles could very well change. I mean, someone could come up with, you know, an interesting approach two years from now and it could be endorsed, you know, in a subsequent revision to the reg guide.

CHAIRMAN APOSTOLAKIS: So the fundamental principle really is that you don't rely on one thing, on one value? Isn't that really the fundamental principle? And then in the deterministic space, that evolved into defense-in-depth.

MR. KING: You don't want to rely on one barrier; you don't want to rely on strictly prevention or strictly mitigation. Those kinds --

CHAIRMAN APOSTOLAKIS: Yes. You want to diffuse the risk; that's really what the idea is. Anything on defense-in-depth?

Now, the safety margins -- oh, you think that's necessary? Well again --

MEMBER MILLER: Are we going to debate on principles or --

CHAIRMAN APOSTOLAKIS: Yes, principles, principles.

MEMBER MILLER: Not the way they're defined?

CHAIRMAN APOSTOLAKIS: No.

MEMBER MILLER: Okay. Because we got in the way they're defined on the other bullet.

CHAIRMAN APOSTOLAKIS: Well, in the second bullet really, the principle was that we don't want to rely on one barrier or one thing to save you. Now, the safety margins, what is the principle that it's driving?

I mean, let me ask -- why I'm raising the question. If one shows that all the QHOs, the subsidiary criteria and everything are met, with wide margins -- you know, you tell me 10^{-4} per year for a CDF, it might test to 10^{-5} -- that's not guaranteed that I have adequate safety margins? Again, for the stuff that PRA covers; let's understand that.

MEMBER FONTANA: Yes, but if you look at 2.4.1.1, it seems like they're covering some things that are really not covered very well in a PRA. Like I read here, code and standards and alternatives are met, adequate controls prevent sabotage, materials diversions are maintained, ALARA principles of etc., etc., etc.

Then a fourth one is one that is more conventional. Safety analysis acceptance criteria in the FSAR are met. It does seem okay to me.

CHAIRMAN APOSTOLAKIS: So if we had some

statement or a paragraph somewhere early-on in the document making this distinction between what's in the PRA and what's out --

MEMBER FONTANA: I think so.

CHAIRMAN APOSTOLAKIS: -- all these things would make much more sense. Because I agree, I mean, you have to do these if you -- but if the PRA itself shows that frequencies are very low, it seems to me you do have adequate safety margins.

MEMBER KRESS: I think we need to ask Gary or somebody what they mean by safety margins, because immediately the word connotes to me, design basis considerations and how close you come to meeting them.

MR. HOLAHAN: I think we, because this is done at the principle level, we wanted it to be something that was approachable either in a traditional engineering manner -- you know, three times the stresses -- or in a probabilistic manner saying you know, the likelihood of failure is some small number.

So in this context I think safety margin means confidence that something will do what it's supposed to do.

MEMBER MILLER: And that would mean in the end you might be able to reduce the safety margins based on your PRA.

MR. HOLAHAN: Well, based on a combination of the PRA insights and engineering analysis. You know, in a lot of these issues there's some balance that says, even if the risks are low, if there's some pipes in the plant that you don't want breaking every week, because that's not a good public policy.

MEMBER SEALE: Well, I think we're hearing that the flexibility is in the definition of the word "adequate". But --

CHAIRMAN APOSTOLAKIS: But again, if I can show that my core damage frequency is well below the subsidiary goal, and what I propose to change, say the testing device, the PRA handles fairly well. Why do I have to worry about adequate safety margin? Haven't I already covered that by showing that my frequency is low enough?

MEMBER KRESS: I think you've covered that partly by saying that a post change will not increase CDF to a value that gets you very close to the subsidiary. That's what they mean by --

CHAIRMAN APOSTOLAKIS: So what you're saying now is that that bullet is subsumed by the fourth bullet?

MEMBER KRESS: No --

MR. JONES: Let me try one comment using a specific example -- I think. And I see some of the

experts, more knowledgeable experts that's in there, in the engineering area. So I'll try it from there since I don't know it very well, but I have read all these documents too many times.

In the IST area, for example, you can show in all likelihood, there are certain pipe segments that, if they break their consequences are not very important, and you won't have any problem meeting QHOs. That allows us to extend the test interval. But we're not extending the test interval to failure.

We still want margins between when the pipe fails, or would be projected to fail based on some normal engineering analysis technique, and when we would allow the testing to be done. And we'll make that based on calculations maybe of erosion/corrosion potential; we may make it based on operating experience and other engineering evaluations.

But we still want margins to failure in determining what that testing interval is, even though that is where we would have our adequate safety margins, even though failure of that pipe would not cause us to have the QHOs be exceeded.

CHAIRMAN APOSTOLAKIS: What's the reason for that?

MR. HOLAHAN: I think there's both a technical

and a policy reason. And the policy reason goes back to the policy statement that -- which I read to say, show that the risks are low by good risk analysis, but also do good engineering. And I think if the risk analysis said, you know, pipes can break all the time and it doesn't matter, I think that's still bad engineering, okay.

So we're trying to implement a policy that says, do good engineering and use good risk judgments. I think there's a technical aspect of it, too, some of which you can figure out in advance and decide that this is well enough that the PRA has treated this safety margin well enough.

But if I think in general about the safety margins in the plant, you know, they play an underling role in the PRA that I wouldn't know how to do a risk analysis without. I mean, all the operating experience that we've got is based on plants which are built to certain codes and standards and have safety margins, and if all of a sudden you start changing those, then it's very hard to say, how can I use the operating experience in my risk analysis?

In addition, it seems to me that PRA is as easy as it is only because, you know, most things in the plant don't break all the time, and things don't, you know, break -- multiple things happen at the same time.

If there were a lot less safety margin in pipes and in the electrical capacity of wire and electrical breakers and every piece of equipment, it seems to me that the plants could be unmanageably complicated to analyze.

And so I, you know, I think the safety margins maintain the plant in a reasonably analyzable condition, and they make, you know, they make the past look something -- or, make the future look something like the past.

CHAIRMAN APOSTOLAKIS: Well yes, but the counter argument might be that, first of all, the utilities themselves for other reasons, would not like to see too many frequent failures or little pipes here and there --

MR. HOLAHAN: Yes.

CHAIRMAN APOSTOLAKIS: -- it's not just a safety concern, but we are primarily concerned with safety here, right?

MR. HOLAHAN: Right.

CHAIRMAN APOSTOLAKIS: So it's not that they would let things deteriorate just because they meet the safety codes. I mean, their primary raison d'etre is to produce power, not to meet the safety code.

A second argument is that I still think -- I mean, it's not a question of whether safety margins are good for you. The question is, if the probability numbers

under appropriate scrutiny are low enough, why would I have to worry about safety margins? I do have the safety margin.

MR. HOLAHAN: No, I would say is, you did worry about safety margins.

CHAIRMAN APOSTOLAKIS: Yes, but that doesn't allow me -- again, on this sentence, other equivalent decision criteria acceptable, is interpreted again to mean that you can show that you have adequate margins in a different way.

See, I think this sends a little bit the wrong message that we are still doing things in the traditional way.

MR. JONES: Or the first bullet: alternatives approved for use by the NRC. I mean, as Gary mentioned, plants approve certain codes and standards. You're coming in for a change. That change may be, I no longer want to commit to meeting this code or standard; here is the alternative I propose.

Or maybe they do it through another code-related process for a code case or whatever -- and that alternative would be approved and that may be risk-based. You know, and in fact we're looking at risk-based IST code changes at this point.

MEMBER MILLER: I have a question on this one.

I'm a little con -- we're talking about safety margins or design margins or have you grouped design margin and safety margin into one thing?

MR. HOLAHAN: Well, I think the word safety --

MEMBER MILLER: They're the same thing.

MR. HOLAHAN: I think they're the same thing in this case. The word safety here is sort of a traditional engineering phrase. Means, you know, I don't want the pipe to break. It doesn't necessarily mean health objectives.

MEMBER SEALE: It's much more than the QHOs.

MR. HOLAHAN: Yes. Or much less depending upon your point of view. The safety margin --

MEMBER SEALE: Well, we kill people with those --

MR. HOLAHAN: -- is very broad.

MEMBER SEALE: -- kinds of breaks where there was never a question of a QHO being violated.

MR. HOLAHAN: Yes.

MR. KING: I mean, this doesn't mean the safety margins have to remain as they've been in the plant historically. I mean, safety margins are there whether you like it or not, and they're there because of the way we've done analysis in the past -- assumptions, methods, use of codes and standards, whatever -- that result in,

you know, they were put into account for uncertainties, they were put for engineering judgment reasons, whatever. But this doesn't say you've got to keep those the way they are. This just says, take a look at them. Are you now -- go back them off.

MEMBER SHACK: In fact, they decrease all the time. I mean the pipes get cracked, they embrittle, they get smaller. The question is, you know, are they still adequate?

MR. KING: And make a judgment based on probabilistic reasons, uncertainty reasons, engineering judgment reasons, do you still feel --

MEMBER SEALE: Better experience.

MR. KING: Experience. Do you still feel you have enough margin to account for uncertainties or whatever else is worrying you? It doesn't mean you can't change them.

CHAIRMAN APOSTOLAKIS: But you said the magic word now. I can understand that question. If you have uncertainties that are quantified and unquantified, the question makes sense. Do you have enough safety margins? And I can extend that; do you have enough programmatic controls and so on, to account for this? And that makes perfect sense to me.

And the thing that worries me a little bit

about the second and third bullets, is that they could be used to really keep doing things the way we're doing them now. In the name of adequate defense-in-depth or adequate safety margins, I don't change anything. And given the skepticism that exists out there now, unfortunately in our business now, we're not just dealing with real technical issues; we're also dealing with perceptions.

And that's really my concern. I mean, in the hands of a rational and reasonable guy I think there would be no problem. But they also could be a license to deny everything. And I don't know how to correct that. I made some recommendations for the second bullet; the third one, I don't know.

MR. HOLAHAN: I think it's also important, from the staff's point of view, that perceptions are important from more than just the industry. I think public perceptions are important too, and to say that our key principles don't include adequate safety margins because people don't like to hear that, is I think, not a message that we want to send.

CHAIRMAN APOSTOLAKIS: But again, I'm not saying that they would not be adequate. All I'm saying that there may be an alternate way of expressing it. The probability space.

MEMBER SEALE: But from the point of view of

perception, the defense-in-depth and the safety margin are so ingrained into the culture now that you have to -- it seems to me you have to maintain their status.

The point here is, again, what do you mean by adequate? And that's the negotiable term, and perhaps you need to say something about alternative ways of determining what is adequate and the fact that advancing technology is a basis on which to change what you mean by adequate.

MR. HOLAHAN: Maybe we need to send a stronger signal of receptiveness to good alternatives. One way of doing that might be to advertise. That if people have got, you know, specific pieces that could be put in the reg guide as, you know, an additional list of, you know, ways of addressing these principles, the staff would be receptive to those.

CHAIRMAN APOSTOLAKIS: I think you will have a very strong message if you do what I think you agreed to do in the previous bullet, adequate defense-in-depth. Namely, add a paragraph or two to try to state the same idea now in the probability space, if possible. I think for defense-in-depth, in my mind at least, it is possible. For the safety margins I still don't know.

But let me, first of all --

MR. HOLAHAN: Even if we don't figure it out

right now, we could indicate a receptiveness to an alternative approach if someone suggests it.

CHAIRMAN APOSTOLAKIS: But you can go beyond that and give some qualitative guidance, I think; it's not difficult.

MR. CUNNINGHAM: I guess my only point was, what you'll see for the rest of the day when we get into application-specific guides, is they're trying to interpret this in a particular area, and in some cases you can interpret it in a much more probabilistic way because you've got the mechanics to be able to do it. In others you really can't.

CHAIRMAN APOSTOLAKIS: And I think a statement to that effect here would be very helpful; what you just said. Now, let me ask this question. Do you think that a plant that has a PRA that has been reviewed and, you know, it's really state-of-the-art, and shows a core damage frequency of 10^{-5} per year, would you still be suspicious that adequate safety margins have not been maintained? See, that's the question in my mind. Because if I --

MR. HOLAHAN: Yes.

CHAIRMAN APOSTOLAKIS: Why?

MR. HOLAHAN: Yes. If you want an answer to the question, the answer is yes.

CHAIRMAN APOSTOLAKIS: Why?

MEMBER MILLER: Very clearly yes, in my mind. Because you assume a certain safety margin when you did your PRA.

CHAIRMAN APOSTOLAKIS: Well, that's part of the job of the peer reviewers; to make sure that safety margin is there. You see, that's my point. If it is indeed 10^{-5}, bullets 2 and 3 have automatically been satisfied. I'm not asking to drop it; I'm saying it's there now.

MEMBER KRESS: I don't think bullet 2 is automatically satisfied.

CHAIRMAN APOSTOLAKIS: Oh, I don't think you can get to 10^{-5} without redundancy and diversity and -- no way. Unless you have a magic component that has this tremendously low --

MEMBER FONTANA: What is, for example -- let's take an example here. What is the driver, if you have a core damage frequency of 10^{-4} -- what is a driver for a PWR? What is the major initiating event?

MR. HOLAHAN: Say station blackout.

MR. CUNNINGHAM: Station blackout, small LOCAs.

MEMBER FONTANA: Small LOCAs is a good example. Now, small LOCAs, I presume you're designing your pipes and stuff from bells and all that kind of

stuff, to ASME codes and standards, aren't you?

MR. CUNNINGHAM: Yes.

MEMBER FONTANA: Which means there's a redundancy in there. I mean, you're not going to quit doing that. You're not going to quit designing your pipes to ASME codes, are you?

CHAIRMAN APOSTOLAKIS: I didn't say that.

MEMBER FONTANA: I thought you were almost saying you were going to back off of that.

MR. HOLAHAN: See, as a practical matter, I'm not sure how to do this without -- you can't design the plant to PRA goals. I mean, you have to use -- you have engineer the plant.

CHAIRMAN APOSTOLAKIS: But we're not designing now.

MR. HOLAHAN: But we're making changes --

CHAIRMAN APOSTOLAKIS: I'm talking about changes in existing plants.

MR. HOLAHAN: We're making changes, though.

MEMBER BARTON: You're making changes and it involves an element of design and engineering and a change order, so I don't think you can drop it.

MR. HOLAHAN: I don't think you can go out and buy a 10^{-4} pipe. But we all understand what an ASME standard means.

CHAIRMAN APOSTOLAKIS: But that's my point. That a 10^{-4} pipe means that it's been designed according to certain rules and so on and so on. So if I convince you that it is indeed a 10^{-4}, you don't have to go back and check that it was designed indeed, according to ASME such and such. That's my point. That I can express these things in a different way.

MR. HCLAHAN: Well, I think --

CHAIRMAN APOSTOLAKIS: It's not an accident that it's 10^{-4}. It means that it complies with all this stuff.

MEMBER MILLER: Well, if you take that argument to the extent, I would agree then bullets 2 and 3 could both be dropped.

CHAIRMAN APOSTOLAKIS: Or stated in a different way; that's my point. Stated in a different way. And I think for 2, we seem to agree more than 3. Because I don't see how a plant that can convince us, you know, people who have seen some good PRAs, that has a 10^{-5} core damage frequency, it doesn't have one single dominant contributor, that that plant is deficient in the defense-in-depth area or in the safety margins area. There's no way it will be a 10^{-5}.

MR. JONES: Well, let me just take one design aspect that shows up that doesn't show up in the PRA:

fuel design. As a matter of fuel design, there is -- we have traditional engineering standards and design margins on how we want that fuel operated so that we don't go through DNB for an AOO. It will never show up in the PRA.

And the fact of the matter is, I could probably reduce those and still not have an impact on the bottom line and still maybe not even have a big operational problem. But I think those are embodied in this principle, so to throw it totally -- or, you know, to say it's in just the PRA space, becomes difficult to us.

CHAIRMAN APOSTOLAKIS: I agree with you. And I'll tell you why I agree. Again, I think what's missing is a critical evaluation of what PRA does way up front. We already said there are certain things that I left out. There is also a whole class of issues that PRA treats in a kind of code way. And there is such a thing as good engineering practice. I think that's what Gary argued earlier.

For example, common cause failures. We lump things; we use multiple Greek letters; we use latin letters, and so on. And we do know -- now, the numbers there are really insensitive to the actual separation distance between redundant components. They are; that's the way we build the model.

On the other hand, we know that the higher the separation, the better off we are, right? So we -- you might say yes. For this kind of thing, good engineering practice requires this and it's good to do. Because PRA will never show the difference.

In that language I understand it. But also by talking about specifics now, we are really limiting the potential impact of 2 and 3. Now, if your PRA treats a particular issue in a crude way -- because PRA was developed for another reason -- then I would like to see certain things happen there, because that's what good engineering practice is.

But again, to have a blanket statement, adequate safety margins are maintained, it seems to me too strong.

MEMBER FONTANA: Why don't we go to slide number 8, just so we can be looking at the same thing?

MR. HOLAHAN: Eight?

MEMBER FONTANA: Yes. This is what we've been talking about. I think. George, I think your -- bullet number 2 --

CHAIRMAN APOSTOLAKIS: Page 2-6. I'm sorry, it's the same thing.

MEMBER FONTANA: Yes. Bullet number 2 covers some things that are just not in a PRA.

CHAIRMAN APOSTOLAKIS: And I have no problem with that; I can agree.

MEMBER FONTANA: Bullet number 3 is something you want to do anyway; I guess.

CHAIRMAN APOSTOLAKIS: And I don't have any problem with that, either.

MEMBER FONTANA: And bullet number 1 says you're going to design your piping and stem valves and stuff to codes and standards, and you don't want to back off of that.

CHAIRMAN APOSTOLAKIS: No. I don't know how anybody will achieve low probability numbers if they don't do that, frankly.

MEMBER FONTANA: Yes.

CHAIRMAN APOSTOLAKIS: First of all, they will have a hell of a problem convincing the staff.

MR. HOLAHAN: And on what basis would they have any data?

CHAIRMAN APOSTOLAKIS: And whether they -- sure.

MEMBER SEALE: Don't you think that's a great simplification though, for the engineer who's actually going to decide how you're going to go from point A to point B with a slightly different pipe routing, in order to meet a modification to change -- to implement a change

that you've got for some reason, and you want to tell him that he wants to do all of the things you want, but you give him the guideline that he will maintain the safety margin using these vehicles, rather than telling him to do a PRA to evaluate every change?

CHAIRMAN APOSTOLAKIS: No, because I'm not telling him to just do a PRA. I mean, these are engineers, they have been in the business. I mean, they're not just -- when I say, oh the PRA says this, so that's great.

But I think that comes down to the perennial argument of, how prescriptive should you be? I mean, what you just said Bob, really is the benefit that you have from a highly prescriptive process. At least you know what you're supposed to do. And if you do it, it's accepted.

MEMBER SEALE: Unambiguous language here, right.

CHAIRMAN APOSTOLAKIS: Right. But now, I think the whole -- one of the motivations for moving into risk-informed regulation is to get away as much as we can from that. It's not the idea really, that a lot of that stuff has been found to be unnecessarily prescriptive and burdensome. So that's what I'm trying to do here.

MR. HOLAHAN: Well, you're trying to do more

than the Commission's policy statement. Again, I think the --

CHAIRMAN APOSTOLAKIS: Here's what I'm trying to do. I'm not saying drop the idea. All I'm saying is that I can see whether I have adequate safety margins, the PRA results. So I should be allowed some flexibility to argue my case using PRA numbers, rather than having to go back and making sure that I demonstrate that codes and standards have been approved or have been met, and all the acceptance criteria and so on.

It may come down to that, it may come down to that.

MEMBER MILLER: Let me ask a hypothetical question. Let's say I want to change a pipe. It's going to have a different design margin, but the PRA result ends up being the same.

CHAIRMAN APOSTOLAKIS: Why? Why does it end up being the same? That's my question.

MEMBER MILLER: Maybe it doesn't.

CHAIRMAN APOSTOLAKIS: Well, if it doesn't, there's a reason for that, then it's fine with me.

MEMBER MILLER: Okay.

MR. KING: But I think the key there is finding out what the reasons are. I think to achieve what you said --

MEMBER MILLER: But you're still maintaining an adequate safety margin. You're going to have to go through --

CHAIRMAN APOSTOLAKIS: In my opinion, yes. If the reliability is the same you have --

MEMBER MILLER: Are you saying then as defined by the PRA result?

CHAIRMAN APOSTOLAKIS: It has to, to some extent, otherwise, what are we doing? Why are we introducing this at all? I mean, the Commission has declared the QHOs as being adequate protection. Now, that's not the only thing of course; I agree that's not the only thing. You have to give it somewhere.

MEMBER MILLER: Don't these safety margins also introduce the uncertainty factors?

CHAIRMAN APOSTOLAKIS: Yes.

MEMBER MILLER: Don't they drive those?

CHAIRMAN APOSTOLAKIS: Of course; they're reflected in the distribution, yes.

MR. CUNNINGHAM: I mean clearly, I think we're all in agreement that safety margins, the intent of these reg guides and SRPs is to change safety -- if a safety margin is an unnecessary burden, it ought to be changed. And PRA information can be used to help you make that decision. But I think --

MEMBER SEALE: And the key is in the definition of the word "adequate".

MR. KING: Yes. And I don't see how you can get around with going in, looking at the basis for why that PRA number is the way it is.

MR. JONES: And I think what you end up doing -- the practical implementation that's in my mind is, you either end up having to change an underlying code or standard and propose some alternative for acceptance, which is what this has as part of it, or you're proposing a change to the regulation itself.

So if what you want to do is not follow the ASME code as specified in 50.55(a), you would then come in with an exemption or a rule change and what's your basis and the underlying data and all that at that point.

CHAIRMAN APOSTOLAKIS: Yes, I think that's true; I agree.

MR. JONES: And so I think -- all we're trying to do in doing this is capturing those situations that are generally just a normal change situation, which they want to make sure this is satisfied. If you're going to make a change then they come in with the appropriate change that goes with it.

And we think that this is just an element of the overall licensing process, pulling risk-informed in

there, and these are the kinds of things we would do in a normal licensing review, and we're bringing risk-informed elements into that as appropriate.

CHAIRMAN APOSTOLAKIS: I'm willing to concede the point when it comes to safety margins. But I do feel strongly about defense-in-depth. I really think you can use PRA to demonstrate that you have adequate defense-in-depth.

MEMBER POWERS:: I really, really think you can --

CHAIRMAN APOSTOLAKIS: Well, okay, now we have a --

MEMBER POWERS:: I think your arguments that you make in favor of saying that I can use PRA to demonstrate I have adequate defense-in-depth, if I take that word adequate defense-in-depth and put in adequate safety margins, then I think you're on much safer ground there. But I look at the --

CHAIRMAN APOSTOLAKIS: I --

MEMBER POWERS:: -- continue to go back and say, why did people adopt defense-in-depth, historically? And historically they did it because they said, I cannot live on analysis alone. I just don't trust the analysis that much to be the sole basis for protecting the public in health and safety, and I don't care how sophisticated

or unsophisticated the analysis is; I need something more.

All you've done is replace the analyses that have been done in 1954, with analyses now that are done with computer codes. But I don't think the people looking at it would change their mind. They would say, I need something difference for defense -- something beyond just analysis, because I don't have -- I may have 1500 reactor years of operational experience that pales in comparison to the things that I'm used to where I have millions of operational years of experience, to see if analyses are correct.

CHAIRMAN APOSTOLAKIS: I don't think it's a matter only of analysis. It's really uncertainties, isn't it? I mean --

MEMBER POWERS:: Uncertainty is why they don't trust the analysis. They think that there's not only uncertainty that you can quantify; there's uncertainty that -- you don't know that you don't know kinds of uncertainties.

MEMBER SEALE: The lack of confidence in completeness.

MEMBER POWERS:: That's right.

CHAIRMAN APOSTOLAKIS: But we have agreed that if it -- defense-in-depth, the way it's stated here, for things that are not in the PRA are not --

MEMBER POWERS:: Yes, defense-in-depth applies even for the things that are treated in the PRA because they simply don't trust that you've done that well --

CHAIRMAN APOSTOLAKIS: No, but it's -- no. And I disagree with that. I think that if you don't have adequate defense-in-depth the way it's defined here in a PRA, you will see one dominant contributor.

You may have, for example, a single failure someplace that kills the whole system. And the PRA will show that; the minimal cut set will be there. What I'm saying is that the stuff that's listed here in the traditional language, can be assured that it's there using probabilistic language. That's what I'm saying.

The fact that you have several contributors that are contributing more or less the same. That tells me that there is redundancy, there is independence, there is diversity. I mean, if you think about it --

MEMBER SEALE: But it doesn't tell me there's completeness.

CHAIRMAN APOSTOLAKIS: And I have conceded that point. That whatever is left out has to be treated in a different way. That's why I think this guide and the SRP should start very early on, the first couple of pages, stating that, you know, when we say risk assessment in the rest of the guide, let's bear these facts in mind.

That certain things are not in the PRA, certain things are in the PRA, and these have to be assessed on a case-by-case basis, by the way, depending on --

MEMBER MILLER: If they were to handle those things, then you'd have defense-in-depth.

CHAIRMAN APOSTOLAKIS: Yes. Stuff that's left out, definitely, has to be handled in the traditional --

MEMBER MILLER: So in other words, if we did a PRA and the core damage frequency was 10^{-10} and we identified what we thought were all the paths of beyond core damage, based on that you might just get rid of the containment. But you still want a containment, right?

CHAIRMAN APOSTOLAKIS: That's right.

MEMBER SEALE: What Dana has said is, he doesn't know what's been left out.

MEMBER MILLER: That's the point, yes. That's the problem.

MEMBER SEALE: How can you handle it on a separate basis --

MEMBER MILLER: That's exactly right.

MEMBER SEALE: -- if you don't know it's been left out?

MEMBER MILLER: That's exactly right.

CHAIRMAN APOSTOLAKIS: I have a pretty good

idea that a lot of things are left out. Now, there may be others that I don't know about, yes, that's true.

MEMBER POWERS:: I don't know what you don't know.

CHAIRMAN APOSTOLAKIS: But my point --

MEMBER POWERS:: And I don't know what I don't know. I'm continuously surprised by operational events -- even today we get surprised about operational events in things that we know extremely well. Automobiles (indiscernible) in operations in ways we don't anticipate. When we have billions of years of operational experience with them.

CHAIRMAN APOSTOLAKIS: Okay, but I think --

MEMBER POWERS:: You don't get defense-in-depth there either.

CHAIRMAN APOSTOLAKIS: We're mixing two things. What you're saying is, that I cannot just say, I cannot give the standard stuff that's left out like organizational factors and errors of commission and so on. That holds a whole class of problems that I'm not sure about -- I haven't even thought of, so I'd better do something. I understand. I understand and I agree. All I'm saying is that if I take the six bullets -- let's look at them --

MR. JONES: Seven.

CHAIRMAN APOSTOLAKIS: Seven, yes. If I -- yes, if I take the six bullets up there, I can express them also in probabilistic language.

MR. HOLAHAN: Well, I think some of these are already addressed --

CHAIRMAN APOSTOLAKIS: I'm not addressing the issue of whether something is left out or not.

MR. HOLAHAN: I'm not sure why you say, you could expressed them in probabilistic language. I think some of these are in probabilistic language.

CHAIRMAN APOSTOLAKIS: No, but in the PRA space, that's what I mean.

MEMBER FONTANA: Well, they have to be.

CHAIRMAN APOSTOLAKIS: In the PRA space --

MR. HOLAHAN: Well, they're not numerical. They're not quantitative, but they're qualitatively compatible with a PRA.

MEMBER FONTANA: They have to be expressed in a probabilistic language. Look at item number 5. You can identify some severe acts and sequences that blow that bullet to smithereens. But the probability is faulty, so you have to.

CHAIRMAN APOSTOLAKIS: Well, let me take the extreme logic, the extreme conclusion of this, then. Why do anything else? Why not stay with this and we're happy?

In the traditional deterministic way.

MR. HOLAHAN: Well, I --

CHAIRMAN APOSTOLAKIS: Which also suffers by the way, by issues of completeness --

MR. HOLAHAN: I think I disagree with the premise. This is not an expression of the traditional engineering approach. This allows both PRA insights and traditional engineering in answering these questions.

CHAIRMAN APOSTOLAKIS: Let me pose it in a different way. Why do I have to tell the licensee, maintain defenses against potential common cause failure? If he does not maintain them I will see it in the PRA. In which case he may not satisfy the goal, or he may not satisfy some other requirements I've imposed on him, namely --

MEMBER FONTANA: Wait, are we --

CHAIRMAN APOSTOLAKIS: -- this confusion of contributors.

MEMBER FONTANA: Are we understanding this the same way? Could he not be using the PRA to demonstrate that he's following some of these?

CHAIRMAN APOSTOLAKIS: That's my argument; that it should be stated very clearly and explicitly that one can use PRA arguments the way I gave them, to argue that these things have actually been met.

MR. KING: And I think we agree with that. We --

MR. JONES: Yes. I've got a note to put in some words along those lines.

CHAIRMAN APOSTOLAKIS: Now, is it time for a break, perhaps?

MR. JONES: Fine with me.

CHAIRMAN APOSTOLAKIS: I think this is a good time. We'll be back at 11 o'clock.

(Whereupon, the foregoing matter went off the record at 10:46 a.m. and went back on the record at 11:06 a.m.)

CHAIRMAN APOSTOLAKIS: Yes. Let's start.

MR. HOLAHAN: Where are we?

MR. JONES: Bullet four.

CHAIRMAN APOSTOLAKIS: Four. Account for expected frequency and consequences of challenge.

MR. JONES: You mean go back to the principles.

CHAIRMAN APOSTOLAKIS: Oh, to the principles, I'm sorry.

MR. JONES: Yes. We've walked through I think half the principles. We are now --

CHAIRMAN APOSTOLAKIS: Yes. Yes. That I think it's fine. That's a definition of it.

MEMBER POWERS: And I assume what you really mean on this is safety goals or the subsidiary objectives?

CHAIRMAN APOSTOLAKIS: Yes.

MEMBER POWERS: Not and.

MR. JONES: We mean and?

MEMBER POWERS: You mean and?

MR. JONES: We mean and.

MEMBER POWERS: Okay. So if I violate the subsidiary objectives, that's okay as long as I don't --

MR. JONES: I mean it should be nor, I guess is the proper phraseology. But I mean it's not or. Neither nor kind of thing, yes.

CHAIRMAN APOSTOLAKIS: I really don't know why that has to be stated.

MR. JONES: We want to clearly communicate our principles.

MEMBER POWERS: Well, I mean it also requires that the safety goals be applicable to individual plants.

CHAIRMAN APOSTOLAKIS: Yes.

MR. JONES: And that's a recommended policy position we put up to the Commission in PRA implementation plant update back in September.

MR. HOLAHAN: March.

MR. JONES: No. September. That's this one.

MEMBER POWERS: Are we moving onto five?

MR. JONES: I guess --

CHAIRMAN APOSTOLAKIS: I think we should.

MEMBER POWERS: I am still perplexed by this. It still strikes me as just a basis for restricting the plants to making changes that are not cost effective for them to go through the pain of making the change.

MR. KING: You lost me.

MEMBER POWERS: Okay. If I have a plant that has -- I have a hypothetical plant that has a core damage frequency of 10 to the minus six per year, and otherwise similarly low on all other things. I look at that plant and I say gee, I am very low in this core damage frequency because of an item that I had done voluntarily in the past that's very expensive for me to do, and I would like to quit doing that. Because if I do that, it only drives my risk up to three times 10 to the minus fifth. That's a big change.

MR. HOLAHAN: That's a big change.

MEMBER POWERS: But it still leaves me well below your criterion. It's cost effective for me to go through the pain to do that. It gets very expensive for me to do, but you would restrict me from doing that.

MR. KING: No. I think what the intent of this is to say if you are going to make a change of that magnitude, let's do it in a phased approach so that --

MEMBER POWERS: That's one item.

MR. KING: To me, it's a way of using the monitoring and feedback to make sure that your analysis and your plant operations are consistent with all your assumptions, instead of jumping in and taking a large increment of risk increase all at once, you know, I don't know whether to call it conservatism in implementation or whatever, but it's an attempt to say let's take big changes in a step-wise fashion, not let's jump in all at once and do it.

MEMBER POWERS: Well I think then we ought to say that, and not say let's just take small -- we're only interested in small things.

CHAIRMAN APOSTOLAKIS: What I was going to propose is to drop the word only and say changes should result in preferably small increases in calculated planned risk. So that gives you a way out if something is relatively -- in other words, you would prefer to see small increases, but you are willing to listen.

MR. HOLAHAN: Well actually, I would prefer to see decreases.

MEMBER POWERS: It was I have to admit, one of my thoughts after our last subcommittee meeting is, gee, we spent a lot of time talking about increases in risk when in fact I thought going to the risk informed

performance based regulation was going to result in decreases in risk more often than not.

CHAIRMAN APOSTOLAKIS: If you are below the goals, you should expect that. So you would prefer to see small increases, but you are willing to risk. First of all, small is not well defined. What's small?

MEMBER POWERS: But I think Tom was saying a lot more than that, is that not only does he want small changes in risk, but he wants --

CHAIRMAN APOSTOLAKIS: Phased.

MEMBER POWERS: He wants things to go along at a pace such that he can validate the assumptions that have been made that led to the conclusions that these risks were even appropriate to undertake at all. This just doesn't say that.

MR. HOLAHAN: I think there are a number of reasons why small changes make sense. Certainly a phased approach and monitoring the results of your decisions based on small steps I think is valuable.

I think this also contributes to a balance in the design. If your plant was at 10 to the minus six and you are going to make a three times 10 to the minus five change, I have to ask whether you haven't done something very strange to the balance of risk in that design.

MEMBER POWERS: You could well do that, but it

seems to me that what you are saying is there's a different principle that you have than what this statement has.

MR. HOLAHAN: I think this statement is trying to capture a few different thoughts. Maybe they could be better expressed as individual items.

CHAIRMAN APOSTOLAKIS: The word only especially.

MEMBER SHACK: Well, I interpreted this principle to mean that a 10 to the minus six plant wouldn't be allowed to become a 10 to the minus four plant, even a step at a time.

MR. KING: No.

CHAIRMAN APOSTOLAKIS: But would it be allowed to become a five 10 to the minus five plant? That's an enormous change.

MEMBER MILLER: Five times 10 to the minus six, that would be --

CHAIRMAN APOSTOLAKIS: It's well within the goal. Now the way it's stated, it would not be allowed to do that, because that's certainly not a small increase.

MR. KING: It would allow 10 to the minus four. It would allow five times 10 to the minus five. But what this says is you would have to do that in a step-wise fashion, not all in one big leap.

MEMBER SHACK: But you could get there step-wise?

MR. KING: Step-wise.

MR. JONES: I would -- the actual phraseology in the reg guide is changes to CLB should be done in a fashion that results in only small increases in calculated plant risk. So I mean, but there are some words missing in there that we did have some of the step-wise concepts brought into that.

MEMBER POWERS: But again, I think that even in step-wise does not reflect the kind of thinking that I heard here. If I came in with -- I dropped on your desk 15 proposed changes that took me from one times 10 to the minus six to five times 10 to the minus fifth, you're still not happy, that you wanted to do something different than that. You need feedback as you go along. You would be very deliberate in looking at my 15 proposed changes. I think you ought to have a principle that says that you are going to be deliberate.

CHAIRMAN APOSTOLAKIS: But again, aren't we trying to be awfully prescriptive and anticipatory? I think we should state the principle that expresses a wish here that you would like to see this. But just as a wish, and leave it up to the specific cases to make a decision whether you want to comply with this or make an exception.

That's why I didn't like the word only.

MR. KING: I guess you could restate this to say significant increases in risk should be implemented in a step-wise fashion or something like that.

CHAIRMAN APOSTOLAKIS: Or it would be desirable.

MR. KING: Yes. Or desirable.

CHAIRMAN APOSTOLAKIS: Something like that. But I think Dana's example was a good one. What if it's obvious that they would save a lot of money and it really doesn't affect safety and so on, but it results in a significant increase of the current core damage frequency. You might be wiling to accept that. But if you say only small increases, then you would not. So using words desirable or preferable, something like that, and explain what precisely what you have in mind will do the job.

MR. HOLAHAN: Well, at a certain point I begin to have problems with that because you are not -- when we're talking about changes that are smaller than 10 to the minus five, then I am not so concerned. When we're talking about staying below something, if we're talking about core damage frequency, we're talking about staying below 10 to the minus four.

So this sort of range in between 10 to the minus five and 10 to the minus four, at which I get more

and more concerned. I mean if a 10 to the minus six plant wanted to make a 10 to the minus four change, I think I have a hard time concluding that made sense.

CHAIRMAN APOSTOLAKIS: But this way of stating it allows you to do that.

MR. HOLAHAN: No. It doesn't.

CHAIRMAN APOSTOLAKIS: Not this. I mean the one we're discussing.

MEMBER SHACK: That's his problem with it.

CHAIRMAN APOSTOLAKIS: Why? It says that it would be desirable to have small or phased changes, and you can say in that particular case, I'm sorry. In this case I can't approve it. Why is that inconsistent? All I said was it was desirable, and now I find this undesirable.

MR. HOLAHAN: The staff proposal was originally for more clarity with a 10 to the minus five definition of what was small. I think we've put the 10 to the minus five sort of as the example of what small constitutes.

MEMBER MILLER: So 10 to the minus five is small, even though I have 10 to the minus six to start with?

MR. HOLAHAN: Yes. What we're saying is to deal with it on an absolute basis. Ten to the minus five

is small, whether you are at 10 to the minus seven or 10 to the minus five.

I think we'll get into some difficulty when the changes, when individual changes get bigger than 10 to the minus five. We have a regulation that's interpreted in the Backfit Rule, that's been interpreted in the regulatory analysis guidelines to say things that are not very costly that could make risk reductions on the order of 10 to the minus five, would be substantial improvements and are worthwhile doing.

MEMBER MILLER: So we can say that in the other way then.

MR. HOLAHAN: So what we have done is we've chosen this definition at 10 to the minus five, to at least not allow an overlap between the things that you would approve and the things that you would reimpose.

CHAIRMAN APOSTOLAKIS: I still think that it's very hard to state in advance what you would approve and what you would not approve. You can state what your wishes are, what you would like to see, which sends a very strong message. Leave a way out in case somebody makes a convincing case.

MEMBER MILLER: Should we just delete "only"?

CHAIRMAN APOSTOLAKIS: I think "only" has to go. And maybe rephrase the whole thing in a way that

really sends the message. Because you can still reject something if you are uncomfortable, as you just said. But saying in advance that you will only approve small increases, where small means something like 10 to the minus five, is awfully restrictive.

MR. KING: Well, we tried to put the 10 to the minus five in as an example, as Gary said. It used to be a more hard limit before.

CHAIRMAN APOSTOLAKIS: Can you try to think about, not necessarily now, but phrasing this fifth bullet so that it more accurately reflects what you have in mind?

MEMBER FONTANA: Because now it doesn't allow any decrease.

MEMBER SEALE: Let me congratulate you on talking about absolute risk rather than percentages. I think we got all tied up in our linens earlier with percentages.

CHAIRMAN APOSTOLAKIS: How about if you state it in a negative way, that large increases in short periods of time, do you want to say that too?

MEMBER SEALE: That is bringing another issue in, George.

CHAIRMAN APOSTOLAKIS: Well, Tom did, he said -- Tom King.

MR. KING: I brought it in.

CHAIRMAN APOSTOLAKIS: That he would not like to see things happen --

MR. KING: Giant leaps are not --

MEMBER SEALE: Oh. That short period of time.

CHAIRMAN APOSTOLAKIS: Would be undesirable. I think that would allow you to do what you want to do.

MR. HOLAHAN: Or we could use the word substantial, which is already in the regulations.

CHAIRMAN APOSTOLAKIS: Or substantial. Substantial, okay. So state it in a negative way.

MR. HOLAHAN: And our one example that would consider defining that is what we have already defined as substantial, which is 10 to the minus five, delta CDF. I'm not saying that we wouldn't listen to a licensee proposing some alternative. There may very well be an area in which the PRA doesn't lend itself to a numerical result, for example.

MEMBER SEALE: But you don't have any prejudice against decreases greater than 10 to the minus five?

MR. HOLAHAN: Well, the slide may appear to have a bias against decreases, but I don't think the text in the document --

MEMBER MILLER: So you would approve it. You would approve a 10 to the minus --

MEMBER SEALE: I have to say, I would be a little skeptical.

MEMBER MILLER: I would too. They should just say changes should result in incremental and small changes, either way.

CHAIRMAN APOSTOLAKIS: Well I think they got the message.

MEMBER SEALE: They got the message.

MR. SHERRY: Do the small increases here equate to or meet the tests for substantial hazard like in 50.92, so if someone came in with a change which would result in a risk above your criteria, let's say 10 to the minus five, that may trigger, for example, the requirement for prior public hearings?

MR. HOLAHAN: My recollection is, the standard in 50.92 is that substantial increase or a significant increase, I think is the wording.

MR. SHERRY: Or substantial hazard, or something like that. Yes.

MR. HOLAHAN: No. I think it says significant increase for a significant hazard consideration. I don't think we have numerical guidelines for that. But I might have a hard time saying that I was approving something in this substantial range, and that it didn't constitute a potential significant hazard. I mean that in itself might

discourage people from going too far.

That might very well be appropriate. I mean after all, these plants are licensed based on public hearings and public input to the process. To say in one license amendment we're going to change all the decisions that were made before by a factor of 10 or 100, maybe that ought to require a public scrutiny.

MEMBER FONTANA: Why don't you just change the bullet to say changes do not result in significant increases --

CHAIRMAN APOSTOLAKIS: Something like that.

MEMBER FONTANA: It parallels bullet four.

MR. KING: Substantial increases. We want to be consistent with the regulatory analysis guidelines.

MEMBER FONTANA: I meant substantial. I got into a word creep.

MR. JONES: I think we already got the thought.

CHAIRMAN APOSTOLAKIS: Before we go to the sixth bullet, which addresses issues of performance, as a matter of principle, do you want to get too close to the CDF goal? If not, maybe we should state it.

I think that's related to our earlier discussion of what's in the PRA, what's left out. It's also part of defense in depth concept.

MEMBER MILLER: It's in that diagram we didn't like either.

CHAIRMAN APOSTOLAKIS: No, it's not.

MEMBER MILLER: It wasn't in there?

CHAIRMAN APOSTOLAKIS: The diagram uses sharp lines.

MR. HOLAHAN: The diagram has, well, relatively sharp lines. We could use a broader brush. It uses mean values.

CHAIRMAN APOSTOLAKIS: But even with mean values, I would be increasingly reluctant to approve changes that bring me closer and closer and closer to the goal, precisely because I know that some stuff is left out.

MEMBER SEALE: On the other hand, one of the reasons that we have accepted or suggested the idea of CDF as a subsidiary goal is that if you take the -- if you use a health objective and calculate a risk, you wind up in essence with the CDF giving you a lower risk than the straight application of the health objective.

We said one of the reasons that that made the CDF an acceptable subsidiary goal was that it had a margin in there which was in part to cover uncertainty. So we're going to let uncertainty do it again, and maybe we want to, but that's the old cascading of conservatism again, if

you're not careful.

CHAIRMAN APOSTOLAKIS: But we also said that the reason why we wanted the 10 to the minus four is because the core damage intent by itself is very undesirable.

I guess -- not I guess, I know. What I am proposing is that if I were in your shoes, and somebody is already at eight 10 to the minus five, I would discourage them from considering further increases. Okay? The reason is again, that the PRA does not cover everything. There is a lot of stuff that's left out. So the closer I get to the goal, the more uncomfortable I become.

Now I don't want to set the numerical criteria again. I don't want to say that I want to be less than 80 percent of the goal or whatever. But I want to send a clear message that the closer I get, the harder it will be for me to approve anything. Let's put it that way.

MR. HOLAHAN: We've done that at least in one manner. That is, if you see the way the regions, the areas are defined, the distinction between region III and region II, where region II is the one -- III is approaching the 10 to the minus four. What we're saying is, when you get into that region, you have an additional burden for us, scope of analysis and uncertainties that you didn't have to do if you were not so close.

So it's not entirely a graded approach, but it has some element to it.

CHAIRMAN APOSTOLAKIS: There is some element, I agree. But again, the real concern here is what's left out. So do you think that it would be desirable to have stated that sort of principle?

MR. HOLAHAN: As a principle or as explanatory words under the principle about --

CHAIRMAN APOSTOLAKIS: Which principle?

MR. KING: The fourth bullet.

MR. HOLAHAN: Or the fifth.

MR. KING: Or the fifth.

CHAIRMAN APOSTOLAKIS: Either as an explanatory statement or as a bullet by itself. I mean the fifth bullet addresses now the desirability of the rate at which you go towards the goal.

Then a sixth bullet would say but as you approach the goal, it's not the rate that counts any more. Convincing us will be harder. Give an explanation why in the text. But I think something like that would be --

MEMBER SEALE: You know, we've got more mallets to squash this rat with now than you can shake a stick at. We've also said that independently, we don't want to have more than 10 percent of the risk in any one sequence.

CHAIRMAN APOSTOLAKIS: We could agree to that.

MEMBER SEALE: Well, we've sort of -- we're sort of telling ourselves that's probably not a bad idea. But you know, that means you are limiting to 10 to the minus five right there, because you are not going to go above 10 to the minus four. If you are only going to have 10 percent in your worst contributor, that means 10 to the minus five is the limit.

CHAIRMAN APOSTOLAKIS: Oh no, no. You can have six of those.

MEMBER SEALE: The magnitude of the individual change is not more than 10 to the minus five by that argument.

CHAIRMAN APOSTOLAKIS: Which we have not agreed upon yet. We have not agreed upon yet.

MEMBER SEALE: We're doing the same thing repetitively.

CHAIRMAN APOSTOLAKIS: I think the fifth bullet addresses the rate. What I am saying is, at some point, where you are should matter. I think it does matter, so much as we'll see.

MR. HOLAHAN: And we think it matters even more when you start to talk about large early release as opposed to core damage frequency.

When we get to talking about what we are going

to do on the large early release, I mentioned earlier that we are trying to figure that out. I think we're moving in the direction of saying there is this middle range, comparable to regions II and III, where we are not quite sure how much of a change should be appropriate, and some sort of management decision and additional considerations need to be done in that sort of middle range of changes.

CHAIRMAN APOSTOLAKIS: So what do you think? You think we don't need to mention it or put it as an addendum to the fourth and fifth bullets or make it a separate bullet, or you want to think about it?

MR. KING: My own opinion is I think it's probably worth mentioning as a sub-item under the fourth bullet, because the fourth bullet says this is where you are.

CHAIRMAN APOSTOLAKIS: By the way, I have an ulterior motive here.

MR. HOLAHAN: I'm shocked.

(Laughter.)

CHAIRMAN APOSTOLAKIS: There is gambling here? I am of the opinion that we should do a good job listing principles, and keep everything else to the absolute minimum, as you will see in my further comments later today and tomorrow. So that's why I think it's important for us to state what we are really after here, and then

drop the diagrams and drop other things. That's a suggestion.

MR. HOLAHAN: I understand.

CHAIRMAN APOSTOLAKIS: So it's not that --

MEMBER KRESS: We have a difference of opinion on that.

CHAIRMAN APOSTOLAKIS: Sure, and I'm stating mine.

MR. HOLAHAN: It's possible to be shocked and not surprised.

CHAIRMAN APOSTOLAKIS: But I really think, and I will argue why I think that. Because I don't think in the PRA specs you can be as prescriptive as in a deterministic space. You have to keep flexibility. The way to do that is to state principles and desires, wishes, and then apply those principles to individual cases. Rather than saying --

MEMBER KRESS: You would leave the interpretation open to whoever is doing the particular regulating at the moment?

CHAIRMAN APOSTOLAKIS: But that's what the utilities want. They want flexibility. That is what flexibility is. I mean you can't have it both ways.

MEMBER KRESS: But that also gives flexibility to the regulator.

CHAIRMAN APOSTOLAKIS: You can not have the advantages of a prescriptive approach without a prescriptive approach. You can't have it both ways. I mean we want to know in advance when our application will be approved, but we don't want to know the rules. Because if they give us the rules, then we complain it's prescriptive. I mean come on.

MEMBER KRESS: But this is not prescriptive.

CHAIRMAN APOSTOLAKIS: Well, we'll come to that.

MR. HOLAHAN: Isn't what we're trying to do, I think is better than either approach. Which is to say, and not being entirely prescriptive, but set out principles and expectations that we would find acceptable, but then leave the door open to other flexible approaches. I think leaving complete flexibility and not really signalling what you would find acceptable I think is not helpful.

CHAIRMAN APOSTOLAKIS: And that's what we are doing here.

MR. HOLAHAN: No, at a lower level than this also.

MEMBER KRESS: Yes, but they're used to the charts. I wouldn't define that as being prescriptive, because it's prescriptive in a sense that it defines some

of their expectations. But it leaves open a lot of flexibility to the applicants to how he's going to deal in that space.

CHAIRMAN APOSTOLAKIS: We can talk about the charts later when the time comes, because there may be ways of salvaging it. But I really think that the heart of the matter is here, it's the principles. Because that's really what is guiding the decision.

MEMBER SEALE: Well, let's let him take a shot at putting that in as an elaboration in four. Let's talk about this performance-based thing, because that seems to be one that we've been beating on or chewing on awfully hard too.

CHAIRMAN APOSTOLAKIS: Why did you take it off?

MR. HOLAHAN: We have a sub. We have a --

MR. JONES: Some of the sub-headings which we've discussed in the other activities, we got them here. I guess slide 15 -- basically 14 is the objective which is effectively just a restatement of the principle. Slide 15 discusses what we expect licensees to do to meet this principle. It's discussed in more detail in the section 2.5 of the reg guide and on page 21 of the SRP, just for reference information. Now I have to find my right pages.

Basically, what we see when you get done doing

all the engineering analysis, and one item we haven't discussed fully yet is the area of uncertainty and some of the thinking in the uncertainty area.

We anticipate that you will find yourself faced with issues associated with maybe long tails of distributions to deal with, that maybe come from a particular component or assumption in the analysis that may be sensitive and you want to put in some kind of a monitoring implementation scheme to deal with that.

You may find, for example, when you deal with broad programmatic changes, like graded QA, you have difficultly in trying to ascertain or even pre-predict the impact of the change of graded QA across the spectrum of components. So that you may decide that all certain types of valves are okay, you can deal with it within a given system, but as you look across systems, the effect of the potential common cause impact, potential from taking graded QA out or grading the QA and now doing less QA on certain components, it may actually go across several systems.

So what we are looking for here is a careful examination of what you are doing and what you are impacting, looking for things like common cause failure, looking for areas where you have particular uncertainty issues, and think about that when you develop your

specific implementation strategy.

In the area of IST, for example, you talk about extending component testing intervals. Yet we basically have no experience base on what's going to happen as you move these components out. Do it in a phased way.

So I think in the guide we talk about a doubling of the time frame to do this in as part of the concept of the implementation.

In monitoring, it's the same in a similar fashion.

MEMBER POWERS: Before you go to monitoring, I have just got to say that the thoughts you have expressed here and the thoughts that are in the reg guide and the review plan are a lot better than the words that are used up here.

What you are asking for is does implementation of this change cause any unanticipated degradation. I think that's a much better way to express it than saying commensurate with uncertainty.

MR. JONES: Okay.

MEMBER SEALE: It's probably been easier for the applicant to figure out what you mean.

MEMBER POWERS: That's right. In fact, uncertainty doesn't even really show up in the language as

I recall in either one of them. It's asking for something very specific that seems like it's very doable. That is, is there something coming up when you implement this that you didn't anticipate, which seems to be a legitimate and perhaps even a likely event. Legitimate concern in a likely event.

MR. JONES: In the monitoring area, monitoring is actually something we've struggled with a little bit too, because we recognize that for many of these components, and as you make changes, you are talking basically very reliable components. So to say that you are going to validate the assumptions in any statistically rigorous or even unrigorous way by monitoring is likely to be impossible.

I don't want to get into a mode where we're dealing with the diesel generator issue of many years ago that we had lots of discussion on. I wasn't involved, but I saw it and said I'm glad that's not mine. Here I am today trying to deal with that. So we're somewhat sensitive to that.

On the other hand, we think it is important to monitor the components that are being impacted by the change. We think you need to look at what you are doing, what may be impacted, and make sure that if you start seeing failures, that the change itself that you are

making isn't the cause.

So if it comes from poor QA because you started replacing components, maybe it then goes and kicks off a corrective action program which then goes and addresses how you would upgrade the QA for that component for the future.

So in the general guidelines, we have tried to capture those kind of thoughts, that it ought to be measurable, you ought to be monitoring something, it ought to be reflective of the type of change you are considering. We recognize that you may have to gauge it based on testing.

Ideally, the testing would approximate the situation that you are trying to rely on the component for, but that may not be possible. So we recognize that there may be a grading as you go through that and pick that up. Then deal with it more specifically when you get in the application specific stuff with this kind of general framework for them to deal with.

CHAIRMAN APOSTOLAKIS: But aren't you setting though the performance criteria now in advance? You are saying if I affect a change that affects this particular component, you better monitor that component.

So somebody comes and says well, for this particular system, I want to change the periodic

surveillance intervals. I will use as a performance measure the availability or unavailability of the system. According to this, you will say no. You will have to monitor every single component, the test strategy of which you have changed. I don't see what the logic of that is. Because you are affecting these components, right? This says you have to monitor their performance.

So there is a conflict here, it seems to me, between the desire to have performance criteria that are fairly high level, and the desire here to monitor the results of your change. Right?

I may change, you know, several of these strategies that affect individual pieces of the system. Then I'm proposing to monitor the performance of the system, because that's what you really want to know.

MEMBER FONTANA: Well, as long as you meet bullet 2C that prevents unacceptable consequences, you know what you are talking about.

In other words, if you fail an objective criteria, you still must not have an unacceptable consequence.

CHAIRMAN APOSTOLAKIS: Well, yes. Sure. But Bob just said that if you made a change that affected a particular component, you better monitor that at least for a while. You didn't say that.

MEMBER FONTANA: You mean all the time or it depends on the significance?

MR. JONES: I think it depends on the significance. I think it depends on the change itself. I mean when we start dealing with graded QA and maybe in fact, IST, and I'm stretching myself out in some of these areas with the monitoring, but I think in those areas, you start really looking at components. In fact, your problem is more component related, because the concern is broader. You are concerned about going cross systems. So doing a system alone could cause you problems.

But you may be able to monitor it at the system level, identify then where the change was by at a component level. The reason it happened may be because of that particular change. Then you may have to expand your look across the other components then that were affected by that change.

MR. WESSMAN: Bob, I'm Dick Wessman from the mechanical engineering branch. I would like to expand a little bit on Bob's comments, particularly in the area of IST. IST is extremely component focused. It is under the current regime, and it would be that way under a risk-informed regime.

But our expectation would be that the licensee would monitor the valves performance once the licensee has

established some new or extended test frequency pursuant to applying the engineering and the PRA criteria to evaluate why it would be appropriate to extend the test frequency. But the expectations would be monitoring the performance, looking for degradation, monitoring operation, and adjusting that extended test frequency accordingly, depending on what they saw.

If they discovered that they had moved that frequency too far out, and had gone from a classical approach of a quarterly valve test and had gotten themselves to a two-year test, they better back up that frequency and come back down to a more frequent test to make sure that they are anticipating the degradation of the valve, and testing it before it degrades so much that they discover it failed.

But that's how we see monitoring applied in the area of IST.

CHAIRMAN APOSTOLAKIS: And they could not find these things if they did it at the system level? I mean they could do the component monitoring, but you would not get involved.

MR. WESSMAN: I would not envision this sort of thing, at least in IST at the system level because IST is a component focused program.

CHAIRMAN APOSTOLAKIS: Sure.

MR. WESSMAN: Now maybe in the QA area or something else, it may be a little more system in nature. But I think in IST, it just doesn't come out that way.

MR. HOLAHAN: There's a related issue which the Commission has asked us to get back to them on in the spring, March I think. Which is the relationship between the Maintenance Rule and the performance strategies we called for in risk informed regulation.

The Maintenance Rule covers, at least partially, you know maintenance related activities with respect to monitoring equipment. Some of the equipment for which we would change the requirements would be covered by the Maintenance Rule, may be continued to be covered by the Maintenance Rule in some fashion. Just implementing the Maintenance Rule for some, let's say, low safety significance equipment may in fact be an appropriate approach to monitoring.

Now at the moment, we don't have much experience with the Maintenance Rule to see how well that really works. I think that's partly why the Commission asked us to get back to them after we go through the first, at least some initial inspection activities against the Maintenance Rule.

This particular principle, I don't see as being very rigid in the sense that it doesn't have a

numerical test to it. . calls for some appropriate level of monitoring to make sure that the changes you put in place are really accomplishing what you intended and not causing unintended consequences.

In the past, we haven't done this at all, so everything we do in this area except for the Maintenance Rule, but everything we do in this area is really an improvement. I think there's no absolute standards. I think we're just going to look for reasonable measures to address the circumstances of the change.

That's very hard to define what they are in all sorts of different applications. I think some of them might be numerical reliability type tests. It could be on the component or a system basis. Others might be some conditions monitoring, just as the system should be looked at and inspected or some other approach to monitoring.

CHAIRMAN APOSTOLAKIS: And you would approve the monitoring program?

MR. HOLAHAN: We are envisioning it being an integral part of the decision making process. In part, the decision is made because there is some appropriate monitoring to get along with it.

CHAIRMAN APOSTOLAKIS: Again, shouldn't the results of that program be of interest to you rather than the program itself?

MR. KING: That's the last bullet. The results are important. What a licensee does with those results are important.

CHAIRMAN APOSTOLAKIS: If the licensee says okay, we're making this change to this valve and we will provide results to you every six months or whatever, monitoring the condition of the valve and so on, how we do that, you don't really need to know. I mean all you need to know is that these are the results we've gotten by making these measurements and monitoring this parameter.

But I am not sure that you should get involved into how they are going to do it, and what kind of program they have in place.

MR. HOLAHAN: I think there are two aspects to this. Every time we talk about performance-based programs, we get into this argument of how much does the staff need to know about the program versus the performance.

What I envision is kind of what we're doing on the Maintenance Rule, which is in the future you measure performance. But you have to have some basic understanding of what kind of program is producing that data and what scope it covers. If you have a program and it's not covering the scope of the equipment, it's never going to generate data. If you never hear anything from

it, you really didn't learn anything.

So it seems to me, there is a kind of one-time review or inspection or whatever the program is, so that the staff has an understanding of what it is that's being monitored.

In the future, you rely on performance information. Maybe it's not a report every six months. Maybe it's just a report if -- or maybe it's just appropriate corrective action if the failures or conditions change.

So I would not expect the staff to re-review or inspect the program in the future. But at the decision stage or at some first time stage, I think you have to understand how the program works. Otherwise, you can't really deal with the data that comes out of it.

CHAIRMAN APOSTOLAKIS: Is that clearly stated in the documents we have? I wouldn't have any problem with that. I mean if it's part of the application that you really want to understand what they plan to do, it makes sense to me.

MR. HOLAHAN: I think that's the intent, how clear it is. Maybe it's better judged by the readers than the writers.

MR. JONES: We think that's what it says.

CHAIRMAN APOSTOLAKIS: I didn't get that

impression, although I remember vaguely those statements in one of the documents, but not the other.

MEMBER BARTON: The reg guide covers that doesn't it.

CHAIRMAN APOSTOLAKIS: Where?

MEMBER BARTON: 2.5, page 2-10.

CHAIRMAN APOSTOLAKIS: But does it say that this will be only in the initial review?

MR. JONES: Well, once we approve the change, there's no mechanism for us to -- as long as we continue to review.

MR. HOLAHAN: I don't think that detail is addressed. The staff doesn't normally sort of advertise in advance what we're not going to look at. But I think the emphasis of the program could be clarified to say that in a performance-based program ultimately you should be looking at performance and not the program. But there's got to be some underlying understanding of what the program is doing.

MR. KING: Clearly it would be fair game for an auditor and inspection at any time to go in and see are they still implementing it, are they still doing the feedback and corrective action.

MR. WESSMAN: Dick Wessman again --

CHAIRMAN APOSTOLAKIS: Somehow I liked better

what you said than what you read. I think what you said made more sense to me, because if you read here pages 2-10 and 2-11, you get the impression that you really want to see a monitoring program there in place, and that this is part of their responsibility now. If you go say three years later and you see that program was not what you had approved originally, then you will get upset.

MR. WESSMAN: If I could, George, Dick Wessman here again. Let me comment on the test records and this sort of thing in the IST area. Currently, the licensees under the ASME code are required to keep records of the tests and the results of component performance. We have our inspectors required under the inspection procedures to periodically look at the conduct in the implementation of the IST program.

I think under a risk-informed IST program, for example, we would expect exactly the same sort of process to prevail. The emerging ASME code cases and procedures will require certain documentation and records. We would be expecting our inspectors to take a look at those records as part of the inspection process. Of course if we identify situations where the component performance isn't as they expected, they may find themselves either in an enforcement situation or having to take appropriate corrective action. I think this would be a normal part of

our regulatory and inspection oversight process.

CHAIRMAN APOSTOLAKIS: Well, I guess the thing that I find a little bit troublesome is that you keep looking at components. I thought the whole idea here was to relieve some of that burden. This is a direct extension of what it is now.

In fact, I thought there was a principle when we set up the performance criteria that we would like to set them up as high as we can. We said that in our first letter.

If we keep monitoring individual components, then where is the benefit? Why should we do that if some higher level performance criteria tells me that the thing is working according to what is anticipated.

MR. JONES: I think, George, it is going to depend on the specific change.

CHAIRMAN APOSTOLAKIS: I am sure it will, but I think it's a matter of principle though. I think we should make it clear that we don't intend to do that. Because then I can see, I mean, what the source of unhappiness is in the industry.

MR. PIETRANGELO: Before you leave this subject. Tony Pietrangelo, NEI.

This is kind of being all tested out as we speak. First of all, I think I agree with what Gary said

about even in a performance based approach, the staff has to have an understanding of the licensee's program, that it meets some certain basic attributes that are maybe spelled out in the regulation on terms of scope and what they do and that kind of stuff.

In the Maintenance Rule that's happening. The licensee has a lot of flexibility in their program to make up what they want to do. As long as they satisfy the main parts of the requirements in the regulation, they should be able to maintain that flexibility.

The reason this is so important is because this is where the cultural differences start to come in, with how we have done it in the past versus how we would like to do it in the future, because that's not how the oversight process has worked before.

There is a tendency to want to look at are you still doing what you said you were going to do. We have already seen some instances in some of hte baseline inspections for Maintenance Rule, where some of the procedural aspects were cited as a potential violation of appendix B. Your procedure is inadequate.

I think there is an OIG report out that cites this kind of enforcement aspect in a performance based rule. They may be meeting the performance criteria, everything is fine from a safety standpoint, yet there was

some programmatic aspect that either the licensee inadvertently missed or maybe even willfully missed, that's still subject to some other part of the regulation.

That's I think a part that the industry worries about. That's the kind of layering effect. Not only do we have performance criteria that we can trip over and get cited on, but even some procedural aspect, regardless of the safety significance, we're still going to get cited on.

That has been spelled out again in this OIG report. It's an issue we're interested in. But I do not disagree with what was said. There has to be an understanding, but do you have to regulate to it rather than just understand it.

CHAIRMAN APOSTOLAKIS: So you disagree with me? It's not clear to me whether you agree or disagree.

MR. PIETRANGELO: No. Back to the point that Gary was making. Yes, I think there does have to be an understanding of the program. Do you have to regulate to the dotted I's and crossed E's of what's in the program? I think not. That we want to be judged on the results of those. Understanding is different than regulating and holding --

CHAIRMAN APOSTOLAKIS: I guess that's what I was --

MR. PIETRANGELO: Compliance to each aspect of that. That's just our view at this point. It's going to evolve I think, as the Maintenance Rule implementation goes forth.

MR. HOLAHAN: I think we agree in principle. I think it is something of a culture change. I think it won't be put in place so easily.

But ultimately, to have the staff continue to review programs as opposed to focusing on performance, and especially higher level performance, I think is a waste of staff expertise and resources.

It's one thing to say you need to understand whether the program is functioning and whether it's producing the kind of data it ought to. But I learn a lot more about whether the Fermi plant is safe by looking at Bob Christie's reliability of RCIC than I do looking at the QA program.

CHAIRMAN APOSTOLAKIS: So I was going to bring up an example. I can understand what you said earlier, that somebody is proposing a change. As part of it, they have a monitoring program. I want to understand that monitoring program at the beginning. But then at some point, I have to switch over to Christie's figures and say okay, fine, they are doing a good job now. I don't have to go back to the program again.

MR. HOLAHAN: Right.

CHAIRMAN APOSTOLAKIS: What if I find that they are not doing things exactly the same way as they promised five years ago, that's fine with me, because the performance is what I want.

So how do we convey that, that there is this transition period which I think is basically what Tony said too. So somehow I think that should be stated somewhere.

MR. HOLAHAN: I think in the text we can state what hte emphasis of the -- really, the expectations. I think it works both ways. I mean this doesn't work unless not only the staff is focusing on performance, but hte licensee has got to focus on performance, put more energy into the performance monitoring as opposed to the programmatic aspects also.

CHAIRMAN APOSTOLAKIS: So I think it's a matter of clarification, really.

Now since we talk about the principles, let me raise one or two other ideas that may or may not be principled.

In our letter or report to the Commissioners dated November 18, the subject was plant specific application of safety goals. We tried to be as pragmatic as we could. Essentially what we're saying is that at

this time and for the foreseeable future, the primary criterion for doing risk-informed regulation and so on, should be the CDF. You may do a qualitative evaluation or a quantitative evaluation of the possible level II and level III PRA issues that the proposed change raises. Then we give some options and so on.

Should that thought be somewhere here?

MR. HOLAHAN: That sounds like a good staff expectation. In other words, I would take it one level down from the principles. Your principle is still whatever the fourth one was about conforming with the safety goal. Then what does the staff expect to see from licensees in conforming with the safety goals. Here's the current state one way to do that.

CHAIRMAN APOSTOLAKIS: Okay. Well, that's one way of doing it. Which will change then the way you present CDF and LERF as a package. You would separate the two. You would demand the CDF figure or no figure, but for LERF, you would be more flexible. Depending on what the issue is, depending on what the argument from the licensee is, when we say qualitative, they may choose to go the traditional deterministic approach.

MR. KING: I'm not sure why you would treat LERF any differently than CDF.

MR HOLAHAN: I'm not sure that your letter

says that either.

CHAIRMAN APOSTOLAKIS: It doesn't?

MR. HOLAHAN: Doesn't the letter call for an evaluation of Level II and III, qualitative or quantitative. But it doesn't say don't do it at all.

CHAIRMAN APOSTOLAKIS: No, no, no, no, no. I didn't say don't do it at all. Qualitative though doesn't mean you look at LERF. You could do it with something else.

LERF in my mind is quantitative.

MR. HOLAHAN: I see. Okay.

CHAIRMAN APOSTOLAKIS: So that's one. So you don't think it's a principle, okay.

MR. HOLAHAN: Well, I would rather have the principles be things that don't change with the time and the analysis of the state.

MEMBER SEALE: But you feel that's a reasonably accurate, pragmatic statement of the state of the art and what you guys would expect, would be willing to accept?

MR. HOLAHAN: Well, I'm tempted to agree, but it's not what we put in the current draft of the reg guide.

The current draft of the reg guide is pragmatic in the sense that for the plants that don't have

a full level II, it gives them some sort of in numerical approach, and then has them do a LERF calculation, a sort of a substitute LERF calculation.

MEMBER FONTANA: Is this where I get to say it looks pretty -- I'm pretty skeptical about what I read here?

MR. HOLAHAN: If you like.

MR. JONES: And I think to some extent on page 2-2 when we talk about our expectations, we talk about all safety aspects of the change must be evaluated, which would include LERF. But we also recognize that the scope and quality of the analysis should be appropriate for the nature and the scope of the change.

So that if the change doesn't do much in the LERF area, we wouldn't expect much. Qualitative would be sufficient.

So I think we have kind of captured that thought. I think, like you said, it's somewhat pragmatic. We recognize that we have a varied sort of situation as to what analysis is out there. That's why the appendix.

MEMBER KRESS: Here again, this is an area where there appears to be a minority opinion on the Committee that this says to the effect that without some pretty strong consideration of LERF as well as CDF, they are really being incomplete, and that if you are making

regulations for now and the long-term, then in the reg guide that you don't want to go change it all the time. That you really ought to include LERF in there.

Pragmatically, you may be dealing with CDF, but you can't deal with CDF in isolation. That CDF has to think about LERF also.

MR. KING: I think we agree with you.

MEMBER KRESS: But that's not what George said. That's basically not what our letter said, I don't think.

There's a minority opinion on this committee that doesn't quite agree with it, although it didn't show up.

CHAIRMAN APOSTOLAKIS: In my mind, I would like to make a distinction between a regulatory system that says look at CDF and LERF, and the system that says look at CDF, then tell me how the proposed change affects level II and level III issues, and tell me how you handle them.

Now you want more? I'll tell you. You can do that qualitatively. You may use an event tree, perhaps, and then argue using traditional methods that this doesn't affect it and so on, or it's acceptable. Or you can be quantitative and use a LERF and the various criteria. Or if you are really willing, and maybe the change is

significant enough, you do a full-blown level III PRA. That's even better. I will admit it's better. That's really the distinction.

MEMBER KRESS: I think they have aspects of that in there. My feeling is that suppose you are coming in or you are faced with a change request that only changes CDF, it doesn't change LERF, your approach to whether or not you want to approve that change ought to have something -- ought to depend to some extent on your status with respect to LERF. It almost has to. Their approach I think captures it.

I am saying you can't deal with it in isolation. You have to look at LERF in order to make reasonable judgements on whether that's an acceptable CDF change.

MR. KING: I think there will be changes that just change LERF, won't tough CDF.

MEMBER KRESS: There might be changes that just change LERF.

MR. KING: You've got to deal with that.

MEMBER KRESS: Yes. You'll have to deal with those.

CHAIRMAN APOSTOLAKIS: But then they have to. That's what the letter says. It says identify what level II and level III issues your proposed change raises.

In your case, if that's all it does, it raises issues in level II, then clearly you have to do something about it.

Now you may choose to come in with a traditional deterministic approach and use all these margins and so on. Fine. Want to do something probabilistic, then you definitely have to use LERF, because that's where the action is for this change. But there may be other changes.

For example, coming back to what Tom was saying, what if I propose a change that clearly affects CDF only.

MEMBER KRESS: Only CDF.

CHAIRMAN APOSTOLAKIS: Only CDF, clearly, nothing else.

MEMBER KRESS: Only CDF.

CHAIRMAN APOSTOLAKIS: Only CDF. And the existing LERF of the plant is maybe on the high side.

MEMBER KRESS: But you have to know what it is.

CHAIRMAN APOSTOLAKIS: Well, I don't know and I suspect it's on the high side.

MEMBER KRESS: You have to think about what it is in looking at the CDF.

CHAIRMAN APOSTOLAKIS: But why shouldn't I

approve the changes. It affects only the CDF and it's cost effective.

MEMBER FONTANA: You can think of some situations where you could reduce the core damage frequency and increase the probability of containment bypass or something like that.

CHAIRMAN APOSTOLAKIS: But we agree that that's not the case. The proposed change doesn't do that.

MEMBER FONTANA: Oh, okay.

CHAIRMAN APOSTOLAKIS: Remember now, they are willing to let plants operate that violate both goals. They are willing to do that because they are only looking at proposed changes. Those plants have no chance of having any proposed change approved, but they are not going to do anything about it.

So it seems to me a logical extension of that is to say if your change doesn't affect LERF at all, I'm not going to look at it at all.

MEMBER KRESS: I don't think that makes good sense.

CHAIRMAN APOSTOLAKIS: Then it doesn't make sense to let them operate.

MR. KING: You have to look at it enough to conclude it doesn't affect it at all.

CHAIRMAN APOSTOLAKIS: Yes.

MEMBER KRESS: Well, you have to certainly do that, but I do not think that's enough. I think you have to look at it and say, now am I getting myself in a situation where I am getting too close to a risk criteria. You can't do that unless you say what is my status with respect to LERF. That status is going to have some input into my judgement as to whether I am going to allow this change in CDF when it's only a change in CDF. I think you capture that in there, and that's one of the things I like about it.

MR. HOLAHAN: Can I go back one statement?

CHAIRMAN APOSTOLAKIS: Sure.

MR. HOLAHAN: The staff is allowing high LERFs and CDFs without challenging them I think is not entirely accurate. We do have an IPE/IPEEE follow-up program, where we are taking the insights report and we're looking at those specific plants when specific issues that make for potential outliers. We will look at those to see whether they do pass Backfit Rule for imposing additional requirements.

The insights report is being sent to all the utilities at the executive level to really make sure that high level management in the utilities recognizes where their plants lie with respect to the state of the art. So there is some follow-up activity. It's just not a matter

of leaving things where they are. But this doesn't happen to be the program for doing that.

CHAIRMAN APOSTOLAKIS: But I remember from last time that we made it very clear, or you made it very clear that if a plant is above the goal, this activity does not address that. The only thing it says is don't come to us with a proposed change unless it's on the way down.

MR. HOLAHAN: Yes. Yes.

CHAIRMAN APOSTOLAKIS: I am saying, a logical conclusion from that is that if they are above the LERF goal, if there is such a goal, and they propose a change in the CDF that makes sense, and that change has nothing to do with LERF, we should accept it.

MEMBER KRESS: Well, we'll just agree to disagree on that.

CHAIRMAN APOSTOLAKIS: Otherwise what you're saying is, if any of the goals, if any of the goals is violated, don't dare propose anything.

MEMBER KRESS: But the reason we --

CHAIRMAN APOSTOLAKIS: Irrelevant.

MEMBER KRESS: The reason we have a LERF is because we're really talking about a quantitative health objective goal. LERF is not a fundamental goal in itself. The fundamental goal is a CDF. We can buy that. But the

reason we have a LERF is because of the fundamental goal of the quantitative health. If you don't have that in your system when you're dealing with CDFs, it's incomplete.

CHAIRMAN APOSTOLAKIS: In an absolute sense? Yes, you are incomplete. But this is supposed to be a transition period.

MEMBER KRESS: I don't think you should screw up your regulations just for a transition period. You make the regulations right and then do the transition with how you implement it.

MR. HOLAHAN: Can I understand the minority view a little better? Are you talking about quantitative assessment of large early release frequency or would it also allow a qualitative assessment to say --

MEMBER KRESS: We would allow a qualitative assessment, as long as you get some really good idea of what it is.

MR. HOLAHAN: So the only difference I hear between that and what's written in the November 18th, is this doesn't say large early release. It just says level 2 and 3.

MEMBER KRESS: Yes. But it had in mind was, the letter had in mind giving options of doing a real LERF, a possible qualitative LERF, or even also doing a

conditional containment failure probability, which would be different than LERF, and may have to be more -- may have to have different set of those for different types of plants. A different set for BWR and a different one for PWR, and may have to be more conservative.

Even that could also be qualitative, depending on the nature of the change. I think you capture a lot of that in your regions and in your double sets of criteria. You pretty well capture what I think is the minority opinion in this letter.

CHAIRMAN APOSTOLAKIS: But these options are still in the letter though, they are. Full scope level 2, where a conservative LERF criterion must be determined. Full scope level 2, conservative values for early containment failure frequency criteria. They are there.

MEMBER KRESS: I think where we are differing is whether or not you can deal with CDF in isolation -- that is a bit of ambiguity in there. That's where we differ.

CHAIRMAN APOSTOLAKIS: And it's not entirely correct either. Whether you can deal with CDF quantitatively and qualitatively with level 2 issues or whether you have to look at LERF or conditional containment failure frequency at the same time you are looking at CDF, quantitatively. I think that's the

distinction.

MEMBER KRESS: Well, I didn't want to draw that distinction because I'm not against being qualitative. It depends on the application.

MR. KING: I thought the distinction was -- your main distinction is if somebody is high on LERF, they should not be allowed to increase CDF no matter where they are on CDF?

MEMBER KRESS: That is right.

MR. KING: I think George differs with that.

MEMBER KRESS: That is the distinction.

CHAIRMAN APOSTOLAKIS: I differ not in an absolute sense. I am saying I differ because I think that's a logical extension of your willingness to live with or at least not address that issue here.

MR. HOLAHAN: I don't think that our current draft guidance documents would prevent an increase in CDF for a high LERF for which there was no change in LERF.

MEMBER KRESS: It wouldn't prevent it, but it would --

MR. HOLAHAN: Require it to be analyzed.

MEMBER KRESS: Require it to be analyzed and looked at. I think that's what I think --

MR. HOLAHAN: Is the real distinction between a LERF assessment and a containment performance

assessment?

MEMBER FONTANA: Yes.

MR. HOLAHAN: I could read this letter to say do a qualitative containment performance assessment to cover the level 2, 3 concerns.

MEMBER FONTANA: I'll take back what I said. I mis-heard what he translated --

CHAIRMAN APOSTOLAKIS: Isn't that what the second option is? Without fission product transport capability.

MR. HOLAHAN: There's a third option that isn't written here. In other words, these two options in the letter are the quantitative options. Then there's another qualitative option which is not sort of stated. But I presume that a qualitative option addressing level 2 could be containment performance and some phenomenological assessments.

MEMBER KRESS: Yes. That's implied.

MEMBER POWERS: The qualitative assessment is specified in the letter, isn't it?

MEMBER KRESS: I think that was -- I'm not sure we really spell it out very clearly.

MEMBER POWERS: It doesn't say how --

CHAIRMAN APOSTOLAKIS: We don't say what it is.

MEMBER POWERS: We didn't describe how to do it, but it allows you to do that.

MR. HOLAHAN: No, what I'm trying to understand is, but the minority opinion wouldn't like doing CDF and qualitative containment performance?

MEMBER KRESS: No, no, no. The minority opinion would accept that.

MR. HOLAHAN: It would?

MEMBER KRESS: Yes.

CHAIRMAN APOSTOLAKIS: The minority opinion would accept that?

MEMBER KRESS: The minority opinion would not like to see CDF in isolation without dealing with those other things in some way. That some way would have to be appropriate to the magnitude of the CDF change.

I mean qualitative would be all right, depending on the circumstances and how you did that qualitative assessment. Is it a conservative qualitative assessment or not, and that sort of thing. So it's not --

CHAIRMAN APOSTOLAKIS: That's not minority. That's what the letter says.

MR. HOLAHAN: I think there's a minority interpretation of what these words mean.

MEMBER KRESS: Maybe there's a minority interpretation.

CHAIRMAN APOSTOLAKIS: Well, let's read it. An evolutionary and pragmatic approach for using safety goals on a plant-specific basis would be to use the CDF as the primary criterion for evaluating proposed changes, along with a qualitative or quantitative evaluation of the possible level 2 and level 3 PRA issues.

Isn't that what Tom just described?

MR. KING: That doesn't address Tom's issue of if somebody is high on LERF, he wouldn't want a CDF --

CHAIRMAN APOSTOLAKIS: But that's the decision criterion, and the letter does not address decisions.

MEMBER SEALE: That's your decision.

CHAIRMAN APOSTOLAKIS: That's a decision. That's different. The letter is silent.

MR. HOLAHAN: You could interpret that by the word primary, meaning if CDF is so important it should have a strong role regardless of the LERF.

CHAIRMAN APOSTOLAKIS: And then you do a qualitative analysis if you choose to do so. That analysis has to be convincing.

If a bounding analysis is all that's needed, that's fine. We didn't get into details of that sort. But I think the distinction between this approach and the other approach is that the other approach would say the CDF and LERF or the containment failure frequency

criterion. In other words, you always do quantitatively the level 2 part as well.

MR. HOLAHAN: I think the reg guide would allow qualitative, but the quantitative is sort of pushed forward in your view by having hte numbers and hte figures in the document.

So I think it's a matter of emphasis. There's less emphasis here on quantitative than there is in the reg guide. But I think both actually would allow the same things.

CHAIRMAN APOSTOLAKIS: Let's see. Where are we in the schedule here? Mark just finished his presentation. Is that what it is?

MR. JONES: We haven't started I don't think -- no.

CHAIRMAN APOSTOLAKIS: I think that item four --

MR. JONES: No. I would say that there is --

CHAIRMAN APOSTOLAKIS: We covered most of it, right?

MR. JONES: I think it's worthwhile, Mark, I think we ought to probably walk through the changes in LERF.

CHAIRMAN APOSTOLAKIS: I think we should start with --

MR. JONES: I think we need to start roughly around pages 11 on or deal with some of the changes --

CHAIRMAN APOSTOLAKIS: How about 10? Let's start with 10.

MR. JONES: All right, 10.

CHAIRMAN APOSTOLAKIS: Do you want to do that after lunch or now?

MEMBER FONTANA: It's time to eat.

CHAIRMAN APOSTOLAKIS: It's time to eat? We need extra strength for this.

MR. JONES: We assume then that --

CHAIRMAN APOSTOLAKIS: Now I understand that my earlier proposal of having a longer discussion today can not happen. The reason is that at 5:30, we have scheduled a video conference with Southern California Edison, so we'll see how their risk monitor works.

MR. MARKLEY: So basically we are closing the meeting at that point in time.

MEMBER KRESS: How long will that take?

CHAIRMAN APOSTOLAKIS: Forty five minutes to an hour. That's pretty inflexible. I don't think we can move that, can we? If we could move that to 6:00, I think that will help everybody, because it's still 3:00 in California. Only if it's easy for the utility. If they say it creates problems, then we don't move it. That

gives us a little more time.

So shall we reconvene at 1:10?

(Whereupon, the foregoing matter went off the record at 12:23 p.m. to reconvene 1:10 p.m.)

A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

(1:16 p.m.)

MR. JONES: I was going to say we could just quickly go to 18 and kind of wrap this -- the rest of the time is going to be on the two figures.

(Slide)

MR. JONES: This one --

CHAIRMAN APOSTOLAKIS: They're here. They're here. They're here.

MR. JONES: I will go back to Phase I.

CHAIRMAN APOSTOLAKIS: Well, let's look at this since it's up there. Let me tell you why I think it shouldn't be there or what I think the problem --

MEMBER MILLER: Shouldn't be any place in the whole document?

CHAIRMAN APOSTOLAKIS: If it was up to me, I would drop it completely, yes. I like the idea of the Roman numerals there in the sense that you're trying to give some guidance regarding why type of analysis you want people to do. What I don't like is the 10^{-6}, 10^{-5} under "ΔCDF" because I don't think they can be as clearly cut criteria as they are here to be there.

I think you can convey everything you want to say here in the text without the figure, with the appropriate caveats. Another way to show this figure but

go to WordPerfect or Word and, instead of a straight line, use a band, a shade, you know, a shaded band, two horizontal lines, to indicate very clearly that this is roughly where you draw the line, but you don't want to --

MR. HOLAHAN: Thick line.

MEMBER KRESS: Or another way to do it is to draw the line and say in the words --

CHAIRMAN APOSTOLAKIS: No.

MEMBER KRESS: -- that you meant that to be a hazy line.

CHAIRMAN APOSTOLAKIS: Why not show it, too? I mean, it does a beautiful job.

MEMBER BARTON: A band,

CHAIRMAN APOSTOLAKIS: Yes, a band.

MEMBER POWERS: George, let me ask you a question: Suppose you put a band in there. There would be a top of the band --

MEMBER KRESS: And a bottom of the band.

MEMBER POWERS: -- someplace.

MEMBER KRESS: Yes. And there also --

CHAIRMAN APOSTOLAKIS: Can you do it in a shaded way so it goes slowly --

(Laughter.)

MEMBER SEALE: How do you convince a guy that at his 1 times E-5 deserves a bottom of the fuzzy line

while somebody else's 1 times 10^{-5} plant deserves the top of the fuzzy line?

CHAIRMAN APOSTOLAKIS: That's why I would not use the figure at all. But if those guys insist on using the figure and there is also support within the Committee, I am offering a compromise.

MEMBER FONTANA: If you guys really, really, really knew what you were doing, you would have a distribution on that CDF.

CHAIRMAN APOSTOLAKIS: That's right.

MEMBER FONTANA: And you wouldn't have to --

CHAIRMAN APOSTOLAKIS: It seems to me that we are trying to be prescriptive in the usual way in the probablistic domain. And I don't think you can do that because you can make a very good case for increasing the CDF by more than 10^{-5}. And I'm sure people will accept it if they see all the arguments and they --

MEMBER KRESS: We keep saying we need clear, well-defined, concise acceptance criteria. That's what these are, George: clear, well-defined, concise acceptance criteria.

CHAIRMAN APOSTOLAKIS: No, no. First of all, we never said we needed that. And, second, I think we have also said that we should be very careful not to become the PSA space as prescriptive as we have been in

the deterministic space. And I think this is very prescriptive.

MEMBER KRESS: No.

CHAIRMAN APOSTOLAKIS: So I am offering two alternatives. Well, first of all, again, the discussion with the appropriate caveats and warnings can be in the text. So I'm not saying drop the idea.

My third option is to drop the figure and just put everything in the text.

MEMBER KRESS: Well, my preference --

CHAIRMAN APOSTOLAKIS: And you say a ΔCDF that is not -- what did we say? -- substantial is of this order, rather than drawing the line.

Now, if you are to keep the figure just to make the point better, what's wrong with using a band?

MEMBER KRESS: Because I don't think we've ever said we shouldn't be really prescriptive on your acceptance criteria. In fact, I think we said you ought to be very clear about what they are.

CHAIRMAN APOSTOLAKIS: But this is not the --

MEMBER KRESS: These are acceptance criteria.

CHAIRMAN APOSTOLAKIS: But they are not intended to be acceptance 10^{-5} or not. I mean ΔCDF. If it's not delta -- if it's more than 10^{-5}, it's not acceptable. That's not what these guys have been saying.

MEMBER KRESS: Yes, but they make that pretty clear in the text.

CHAIRMAN APOSTOLAKIS: So where is the clarity, then? I mean, why don't we make it in the figure as well that it's a band, it's a gray area?

MEMBER KRESS: It's hard to draw a gray area.

CHAIRMAN APOSTOLAKIS: No. It's very easy. I did it.

MEMBER KRESS: And Dana is right. No matter if you put a band, you've still got a bottom and a top line. There are still lines.

CHAIRMAN APOSTOLAKIS: Yes. But we --

MR. HOLAHAN: But we wouldn't have to tell people where those were.

CHAIRMAN APOSTOLAKIS: Yes. The message has been sent. He doesn't have to put numbers there.

MEMBER KRESS: If you draw them in, you can -- I don't know how to draw them in, but --

MR. HOLAHAN: Not to scale.

CHAIRMAN APOSTOLAKIS: It's not to scale.

MEMBER KRESS: Well, you could say this is not to scale. I mean, it's just a feeling, George.

CHAIRMAN APOSTOLAKIS: No, no. I think this is very specific, and it really sends the wrong message. I think if you do that and without specifying the upper

and lower bounds of the band, I think you have achieved what you want to achieve without becoming vulnerable to criticism.

MEMBER KRESS: Well, I wouldn't argue strongly about that, although I think it's just carrying things a little too far. But I would argue strongly that something like this is needed, and I wouldn't want to see it done away with and just replaced by words.

CHAIRMAN APOSTOLAKIS: We are creating criteria all the time. We had the subsidiary goal. Now we have a new one. The ΔCDF should be 10^{-5}. And we have this fuzzy area now that this is per change. Okay? This is per change. So I can have five changes in a week.

Now, of course, Tom will be unhappy because you will not have time to digest the significance of each one. But, in principle, I could. So now I can have discussions forever. Why do you do this? Why a week? Then Tom says I'm unhappy. So we give him a month. He says I'm still unhappy. Give you three months. And now we debate it. Why three months and not four months. We don't need all of that.

MEMBER SHACK: But, George, he's got big, wide regions where there is no debate.

CHAIRMAN APOSTOLAKIS: But 10^{-5} is awfully restrictive. We are creating new criteria.

MEMBER KRESS: No. You're arguing about the numbers now. I think --

CHAIRMAN APOSTOLAKIS: Well, I am. If it is to be a clear line, I am. Of course, I am. If it is a band, I don't care.

MEMBER POWERS: Well, George, you can't look at it as it is a band. It's between .98 times 10^{-5} and 1.05 to 10^{-5}.

(Laughter.)

MR. PARRY: This is Kenny Parry, NRR.

I think, George, I don't like the idea of bands for these lines. I think the purpose of putting in the solid line on the outside of that box is just as a goal. So all the fuzziness that's involved with making decisions is in the guidelines for how you decide that something is acceptable or not.

So that you don't need to think of these things as absolute in that sense, but the fuzziness is related to the decision-making and not to the goals.

I think what you're suggesting almost is like -- I mean, we know that the speed limits, for example, are not rigid either because the cops let you get away with some. But are you also suggesting that we should have speed limits that go like 25/35?

(Laughter.)

MR. PARRY: That I think is what you're saying. You're going to be comparing two fuzzy distributions, as opposed to a fuzzy distribution with a line.

CHAIRMAN APOSTOLAKIS: If I were a member of an advisory committee of the Department of Transportation, you might see that.

(Laughter.)

CHAIRMAN APOSTOLAKIS: But I am not. My point is that this is fundamentally a decision problem. You cannot put constraints that in my opinion are unnecessary and try to anticipate all possible future decisions.

MEMBER FONTANA: George, I don't think they are.

CHAIRMAN APOSTOLAKIS: They are very unnecessary.

MEMBER FONTANA: I think they've drawn a box, basically. And it says you can do whatever --

CHAIRMAN APOSTOLAKIS: And they boxed themselves in. Yes, I know.

MEMBER KRESS: Would you like to put blinds around the one percent on the QHOs?

CHAIRMAN APOSTOLAKIS: No. That's policy. I'm sorry. There is a big difference. We are introducing new stuff here.

MEMBER KRESS: Would you like to put --

CHAIRMAN APOSTOLAKIS: Now, remember, by the way, speaking of goals that Gareth mentioned, there was a time when we were saying that 10^{-4} is a goal, we can be above it. And today we're saying changes do not result in individual plant risk exceeding the safety goal and the subsidiary objectives.

So if I read that and I look at this, I will also say, "Well, gee, they don't want me to exceed the 10^{-5}, then the ΔCDF either."

MR. PARRY: No, but, again, that's an objective, I think. And the way you decide whether that applies is part of the decision.

CHAIRMAN APOSTOLAKIS: And that's what I'm saying, that we have the goals, we have the policy statements. We have to live with those constraints. Why don't we say that as long as I'm to the left of 10^{-4}, I will use a decision analysis type of analysis to make the best decision I can? Why do I have to specify everything?

MEMBER SEALE: But Gary and these other guys may buy a lottery ticket one of these days and get so filthy rich that they're not here anymore. And now we've got a set of imprecise NUREGs and so on with an undisciplined set of regulators, and we don't know what we wind up with.

CHAIRMAN APOSTOLAKIS: So if you put that band there, that --

MEMBER SEALE: Well, it seems to me the operative difference here is that the word up there is "Guidelines," and not "Goals."

MEMBER MILLER: "Guidelines"?

MEMBER SEALE: Yes.

MEMBER MILLER: That means there's room for decisions.

MEMBER SEALE: That's right.

MR. KING: Yes. We tried to loosen this up from the first version you saw. Even though the figure looks the same, the text is intended to say, you know, we now have principles that say small changes. Well, what's small? We want to give some idea of what the staff had in mind when they used the word "small," how that --

CHAIRMAN APOSTOLAKIS: Well, you can say small is a few 10^{-5}.

MR. KING: You should say that or you could put a figure up like this with some qualifying words that say this is a ballpark idea of what we had in mind, recognizing there is some flexibility to look at the specific request, blah blah blah.

CHAIRMAN APOSTOLAKIS: I think it is way much more precise than it's supposed to be.

MR. HOLAHAN: One level of precision we've already agreed to remove is the .0s on the numbers.

(Laughter.)

MR. HOLAHAN: They're orders of magnitude. They're not both ways.

CHAIRMAN APOSTOLAKIS: I think it's fundamentally a decision problem. As long as I'm below the goals, I should go with the change that makes the most sense to the utility.

Now you wanted it not to be dramatic. You've stated that. So the utility will take that into account. I think that's fair play. But to go beyond that and actually say it's in increments of 10^{-5} just doesn't make sense to me.

And, as I say, it will create interminable debates. Why did you draw the line there and not somewhere else? And why do you think that I should do a Roman II analysis if I'm about 10^{-6} and not one type of analysis, even if I am above it.

MR. KING: Would you be willing to live with this kind of figure still staying in the reg guide but some specific questions in the public comment period directed toward: How useful are these ΔCDF guidelines? How useful is the figure? Are there other ways to do it? At this stage, can you live with that?

CHAIRMAN APOSTOLAKIS: I know the answers to these questions.

MEMBER FONTANA: George, does the NEI figure -- do you like that any better, --

CHAIRMAN APOSTOLAKIS: No.

MEMBER FONTANA: -- where there's a slope where you can --

CHAIRMAN APOSTOLAKIS: No.

MEMBER FONTANA: No. There's one --

CHAIRMAN APOSTOLAKIS: I don't like it better, no. No. It's the same problem.

MEMBER SEALE: No. It's worse. It's a --

CHAIRMAN APOSTOLAKIS: The slope is not the problem.

MEMBER KRESS: Well, George, the thing I like about this -- and maybe you can say it in words just as well -- is that, number one, it communicates the expectation that in this process we're going to be interested in the actual value of CDF, we're going to be interested in the change in CDF you're talking about as well as this thing for LERF.

And we're going to be willing to be flexible in our requirements for how do you deal with these things by the designations in the boxes, what you have to bring me. And it's really a good communication tool to tell me

what to expect.

CHAIRMAN APOSTOLAKIS: My point is I could live with that text. Everything you just said I agree with. And I think they have text. They explain the Roman numerals. And that's very good, very nice. You can say we have stated already a principle that says changes resulting. We'll change that. Changes should be only small, result in small increases. But emphasize in text a few 10^{-5}, close parentheses. Thank you very much. You sent your message.

This goes way beyond that message.

MEMBER KRESS: How are you going to communicate the graded PRA?

CHAIRMAN APOSTOLAKIS: The graded PRA. Oh, it's already in the text. They do that already. They do a very nice job of it. They discuss this. Would you remind me where it is, of the page?

MEMBER MILLER: Page 2-8 in the reg guide.

MEMBER KRESS: They discuss it in terms of region.

CHAIRMAN APOSTOLAKIS: Yes. And you can make sure --

MEMBER KRESS: Not knowing what those regions are, you really don't know what you're talking about.

CHAIRMAN APOSTOLAKIS: You can make that a

little bit more specific. It's not a big problem. It's not a big problem. And the other thing is it's not clear to me that all of these descriptions of the regions really are acceptable. I mean, I can see changes.

MEMBER KRESS: I think that's --

MEMBER MILLER: That's another issue, though.

CHAIRMAN APOSTOLAKIS: Yes, but it's a big issue because we can debate it for six months. You see, I like the way the draft guide and the SRP and some of the other reg guides state it. They simply say -- now, of course, I can't find it quickly, but that the analysis should be a property to the problem at hand. I mean, are we stupid and we don't understand that?

MEMBER KRESS: Well, that was --

MEMBER SHACK: Debate me now or debate me later.

CHAIRMAN APOSTOLAKIS: Why? It's very clear. If I come to you and you ask me, "Well, should I do a fire assessment here?" and I say "No because" blah blah blah, what's the problem?

MEMBER KRESS: They have to come to you and ask. Here they already know.

CHAIRMAN APOSTOLAKIS: But I may do it when it's unnecessary.

MEMBER KRESS: It's not if --

CHAIRMAN APOSTOLAKIS: That's not easy. That may turn off people. Remember, we have a long paragraph in our letter that says that people are still digesting these methods.

What's wrong with putting a shade bound there?

MEMBER POWERS: George, I have sketched out a figure with a shaded band. And I'll be darned if I can understand the difference.

MEMBER KRESS: They're the same to me.

MEMBER FONTANA: You'd still have to draw these lines in gray, rather than black, I'm sure.

MEMBER SHACK: You could do a map like those medieval maps. It could be a probably not acceptable and --

MEMBER KRESS: There would be monsters beyond here. They could make it out of rubber also.

CHAIRMAN APOSTOLAKIS: Do you really believe that something will be treated as a goal and will not become a criterion within three hours?

MEMBER POWERS: But, George, the same thing happens if you put it in a shade. Somebody just looks simply at the top of the shading and says, "It ain't going to go by there."

CHAIRMAN APOSTOLAKIS: But he doesn't know where it is. He's not going to tell them where --

MEMBER POWERS: It's pretty easy to tell from the shading where it is.

CHAIRMAN APOSTOLAKIS: Not to scale.

MEMBER KRESS: You just scale it off.

CHAIRMAN APOSTOLAKIS: Not to scale.

MEMBER POWERS: We use a random scale here. I mean --

CHAIRMAN APOSTOLAKIS: Not to scale. Just indicate that --

MEMBER POWERS: George, if there's a vertical access, he's going to take his little ruler and figure it out.

CHAIRMAN APOSTOLAKIS: He doesn't know what it --

MEMBER FONTANA: What's the problem with -- do you think it's going to be a hard and fast --

CHAIRMAN APOSTOLAKIS: I don't think you can prescribe --

MEMBER BARTON: Somebody wants to represent a hard/fast line.

CHAIRMAN APOSTOLAKIS: Yes.

MEMBER BARTON: And you can't go beyond it.

CHAIRMAN APOSTOLAKIS: Mario, I can come up with a situation where an increase of 6 10^{-5} may make perfect sense to C. And the guys who's about to do that

looks at this and says, "Now, should I do it or not?"

It's a fundamentally uncertain problem. It's a decision problem where you compare alternatives. I don't see why I should have criteria where I don't need them. I can leave with a 10^{-4}.

MEMBER FONTANA: If you could do these PRA assessments with great perfection and no uncertainties, then all you really wanted to know is that it stays below 10^{-4}.

CHAIRMAN APOSTOLAKIS: No. You're bringing other issues now. Yes. The 10^{-4}. Yes. That's all I need to know.

MEMBER FONTANA: Is that correct? So you just have one line here.

CHAIRMAN APOSTOLAKIS: And the principles they stated. I'm willing to accept those. In other words, I do my calculations. And I know that they don't like to see dramatic changes. I take that into account.

But I may decide to take my chances because I think I have a strong case. I think if I have my hands tied like this, I may not even try.

MR. PARRY: George, is your problem -- I mean, do you think that the way --

CHAIRMAN APOSTOLAKIS: The problem is I'm alone in this.

(Laughter.)

MR. PARRY: I don't think the intent is for somebody to calculate a number and to compare it with that graph and say yes or no. The intent if you read what's in the reg guide -- maybe it's not in this version; it will be in the next -- is that there will also be an analysis of the uncertainties that helps you decide whether or which region you're in and whether you should make that change or not. And that's where the uncertainty is folded in, into the decision, rather than to the line.

And if we have the uncertainty folded into both the line and the decision process, that's going to be extremely hard to explain to anybody.

MEMBER KRESS: Yes. That really fuzzes it up.

MR. PARRY: That really fuzzes it up, yes.

CHAIRMAN APOSTOLAKIS: I think from day one we have been arguing in the nuclear business that there is a distinction between a goal and a criterion. And we all agree that there is a distinction. And then when the time comes to use them, there is this criteria.

I'm sorry. That's what happened at DOE 2 with the new production reactor, major debates. But this is a goal. Yes, I know. And then if you went a little above the goal, why? Why don't you go down? It's treated as a criterion.

MR. PARRY: Let's learn from that and make sure it doesn't happen this time.

CHAIRMAN APOSTOLAKIS: I don't think that will be the case. I think people when they see figures like that, they instinctively treat them as criteria.

MR. MARKLEY: George, if I put myself in the shoes of a reviewer who has got to deal with a change in the submittal, what is going to lead me to a more consistent regulatory decision? How do you come up with regulatory treatment from one submittal to the next?

CHAIRMAN APOSTOLAKIS: I have a set of principles. There will be a discussion of the principles. When they talk about changes should be in small increases, they will give me examples. But they will tell me for example. They will not give me a straight line. They will not say it's 10^{-5}.

MR. MARKLEY: But if I'm that reviewer, I can find lots of ways to say adequate defense-in-depth is this and safety margin is this and small is this. And those are not as intuitively obvious in some ways to individual people from one to the next.

CHAIRMAN APOSTOLAKIS: And another point that I tried to make last time and I will repeat now is that it will take a change in the attitude of the reviewers. It will not be business as usual.

MR. HOLAHAN: Yes.

CHAIRMAN APOSTOLAKIS: They will have to appreciate also the fact that when you are to the left of the line, 10^{-4}, you can't expect to have detailed guidance as to what's acceptable, that you have to use a different kind of thinking.

MR. HOLAHAN: In the ACRS letter, it calls for use of CDF as the primary criterion. What did it mean?

CHAIRMAN APOSTOLAKIS: The 10^{-4}.

MR. HOLAHAN: As a criterion?

CHAIRMAN APOSTOLAKIS: And the changes to --

MR. HOLAHAN: As a sharp line?

CHAIRMAN APOSTOLAKIS: Yes. And using the CDF to evaluate changes. But it doesn't mean you have to have a value for ΔCDF.

MR. HOLAHAN: So your concern is not on the thickness of the vertical line --

CHAIRMAN APOSTOLAKIS: No, no, no.

MR. HOLAHAN: -- but the thickness of the horizontal line?

CHAIRMAN APOSTOLAKIS: Yes, yes, right. That's the only one.

MR. HOLAHAN: Well, before we talk you out of this, I think you should see the large early release figure because we'll probably want to talk you into a very

broad line in that one.

CHAIRMAN APOSTOLAKIS: Okay.

(Slide)

MR. HOLAHAN: You'll see since we published the reg guide, we've added two large question marks on Regions II and III. And we're trying to think of those as regions for which, well, maybe you should grant the change and maybe you shouldn't and other factors in management decision need to be involved in those regions. And so you might begin to think of that whole region as a fuzzy line.

CHAIRMAN APOSTOLAKIS: That has to do with the detail of the analysis; right?

MR. HOLAHAN: In part and other compensatory measures. And you might even use judgments like, well, a large early release for a high population density site versus a desert site might change your judgment.

CHAIRMAN APOSTOLAKIS: And isn't that really real life? That's my argument.

MR. HOLAHAN: Why I wanted to put this one up is before we showed you the foolishness of it on the other curve, something like that is what we're leaning towards on the large early release frequency.

CHAIRMAN APOSTOLAKIS: But you would still keep the solid line of the 10^{-6} delta. I mean, how can it be so fuzzy immediately below the line and it becomes

clear-cut?

MR. HOLAHAN: It's not.

CHAIRMAN APOSTOLAKIS: It's not.

MR. HOLAHAN: It's not.

CHAIRMAN APOSTOLAKIS: It's not. It's not.

MEMBER FONTANA: I didn't know 10^{-5} would be acceptable today.

DR. SHERRY: What is the definition you're using?

MR. HOLAHAN: We didn't know either until we kicked it around a while and tried to settle on some values. And we're reasonably comfortable with the 10^{-5}, and we're trying to figure out what sort of deltas are appropriate.

One of the problems is we're trying to be consistent with the regulatory analysis guidelines, as we said with the ΔCDF. What is the substantial change? And if you use the regulatory analysis guidelines, sometimes changes on the order of 10^{-6} would discourage a backfit. And other times at 10^{-6} would be forwarded for a management decision on the backfit depending upon in that case conditional containment failure probability.

But since we've moved away from containment measure, it sort of fuzzes up the issue of: What do you do in the range between 10^{-6} and 10^{-7}? What we're thinking

is, well, maybe some of those might be okay, but others might not be okay. We're trying to figure out what other considerations should be in such a decision.

And this one is getting more fuzzy while the CDF one is with lines drawn less fuzzy.

CHAIRMAN APOSTOLAKIS: Is it because you have the same amount of time thinking about this idea? Maybe it was more obvious here, but there is great fuzziness. See, that's exactly my point. Every time we revisit this, we may have to redraw the lines or change the numbers in the parentheses.

My argument is there is no need for that. Let's not create work for ourselves. I think the text is great with examples, principles. Everything that Tom Kress said earlier I agree with if I see it in text. It's a case where 1,000 words are clearly better than a picture.

MEMBER KRESS: To back off a little bit, -- I missed the last meeting -- did you guys define what you meant by LERF?

MR. KING: It's defined in the regulatory analysis guidelines. We were going to use the same definition.

MEMBER KRESS: What is the --

MR. HOLAHAN: It's core damage with

containment failure a short time after vessel breach or bypass.

MEMBER KRESS: So it's the same thing as containment failure.

MR. CUNNINGHAM: Early containment failure. In effect, it's the definition from 1150 of early containment failure bypass.

MEMBER KRESS: And you would expect that to be equally applicable to BWRs and PWRs?

MR. HOLAHAN: I think the reg analysis guidelines cover both. I think it's --

MEMBER KRESS: I mean, the same valve here would be just as well for a BWR as a PWR?

MR. HOLAHAN: Yes, but I think in the regulatory analysis guidelines, it talks about slightly different time frames for the BWRs and the PWRs, doesn't it?

MEMBER FONTANA: I think this is probably a case where actually doing a Level 2 and some of the Level 3 PRA would get you out of a lot of grief. The LERF is a surrogate.

Particularly when I was looking at the appendix here and how do you estimate a LERF when you don't have a Level 2 or 3, it seems like you get into a real thick -- if you can advise or recommend or -- what's

the proper word? -- promote the use of Level 2 PRAs inasmuch as possible, I think it will probably save a lot of grief.

MR. CUNNINGHAM: Yes. The attachment or the appendix to the reg guide or whatever was just offering one way to deal with it if you didn't have a Level 2 since we're not in a position we can tell them they have to do a Level 2, really.

MEMBER FONTANA: It would be okay as a first cut screen or something, but --

MR. CUNNINGHAM: Yes.

MEMBER POWERS: Mario, I guess I am just perplexed why you would say doing a Level 2 PRA is going to save you a lot of grief.

MEMBER FONTANA: Well, because it's --

MEMBER POWERS: And I hearken back to the insights document, which does a major slam dunk on some of the Level 2 PRA analyses that were done based on what they characterized as optimistic assumptions.

It seems to me that in Level 2 PRA you get into this world, a contentious world, where there are limited numbers of standards and a limited technology for doing things. And I'm willing to bet that to the extent that they offer a way out on doing it in the reg guide, that people are going to jump all over that as being a far

less contentious area than trying to do their own analyses.

I mean, the entirety of the insights document is just filled with these things as soon as you get to the Level 2 land of where it's obvious that the reviewers would just really like to reject the conclusions that the analysts have come up with.

MEMBER FONTANA: The part that I don't understand is a lot of Level 2 is based on physics and chemistry and things that have limit on it. You know, it's part of the real world. And, sure, there are uncertainties in it. But I suggest that the difference in uncertainties isn't -- in other words, there are uncertainties in Level 1, too, big uncertainties.

And a bad Level 2 -- you're saying because people have done bad Level 2's, they're no good. I think there's got to be some kind of assessment of what's good enough. The thing is it doesn't have to be perfect to provide a lot of guidance.

MEMBER KRESS: Well, I didn't realize what your definition of LERF was, but I suspect it unfairly penalizes BWRs and that that 1 times 10^{-5} might be very applicable to PWRs -- in fact, I think it is -- but that it's maybe not quite right for BWRs. But that can be fixed. I mean, in principle I think you have the right

idea.

MEMBER FONTANA: Well, certainly if --

MEMBER KRESS: And it's so much easier in my mind to determine a containment failure by lots of deterministic qualitative type analyses, as opposed to fission product transport, that I think it's an appropriate thing to deal with. I just think you may want to think about whether one criterion is right for BWRs and the other one is right for PWRs to cause the scrubbing that you get in BWRs.

MEMBER POWERS: If you look at the IPEs with defocused glasses so that you only look at the --

MEMBER KRESS: Rose-colored?

MEMBER POWERS: -- you only look at the whole box around all the results, as opposed to the individual results. It is true that the CDF on a BWR is slightly lower than for a PWR. And it is true that the early containment failures are a little bit higher, but it's small compared to the size of the box. The difference is small compared to the size of the box.

MEMBER KRESS: Yes, but in the case of the BWR, most of the releases go through the pool. And you're only worried about bypasses. I'm not sure this captures that correctly.

MEMBER POWERS: I think that if you look at

the analyses the licensee has done that, of course, bypass is not very important for the IIs and IIIs, Mark IIs and IIIs, --

MEMBER KRESS: Except for the Is.

MEMBER POWERS: -- for it -- I'm sorry -- not important for the Is and IIs.

MEMBER KRESS: But for the IIIs.

MEMBER POWERS: But it is for the IIIs. But there are scenarios that get you into bypass because there are scenarios that have containment failure prior to vessel breach.

MEMBER KRESS: Yes. My point is that general containment failure criterion doesn't describe the risk status of BWRs as well as does PWRs because it doesn't properly incorporate the source term. And, I mean, the release to the atmosphere doesn't properly capture that and that that ought to be accounted for some way, either in your criteria or using a real LERF that deals with fission products.

I prefer personally to deal with containment failure because it's so much easier to deal with and capture that difference in my criteria.

MEMBER FONTANA: Tom, I don't think it's -- really, when you get right down to it, it's not that easy to deal with. Ask Bill about detecting structural

failures and --

MEMBER KRESS: It's easier to deal in fission products.

MEMBER FONTANA: That's because you know too much about fission product transport, you and Dana both. If you knew a little less, you would agree with me.

MEMBER POWERS: I think Mario makes a very good point. I'm sure that when you get the structural types in here, they will tell you that structures fail at defects and that it's virtually unpredictable what those defects are and that the analyses that have been done, for instance, in NUREG-1150 and things like that are looking at the bulk structure, where things never fail. They always fail early at defect, discontinuities.

MEMBER KRESS: I didn't mean to imply there weren't uncertainties. I think it would be difficult to find anybody who doesn't agree with the statement that it's easier to deal with containment failure than it is both containment failure and fission products. This is what you have to do.

And so all I'm saying is it's easier to deal with, although there are uncertainties there. And I think most licensees would refer to them. I just think you're unfairly penalizing most BWRs with a single LERF.

MEMBER FONTANA: Look, the hazard is due to

fission product release. If it weren't for fission products, there wouldn't be any hazard to speak of. So, then, why not look at that? Then that solves your problem of BWR versus PWR.

MEMBER KRESS: I say you have to look at it when you decide how you're going to have a different criterion for containment failure for BWRs and PWRs. You have to have that in mind. And you have to have some insights. You have to have some previous calculations. You have to know something about bypass and what the suppression pool does for you.

You can't do it in a vacuum. In the long run, you have to have that information in some form.

MR. CUNNINGHAM: If I might, Tom, if you go into the discussion in the appendix on the BWRs, one of the things it tries to do in that simple event tree logic is try to reflect unscrubbed versus scrubbed releases.

So it gives a credit, if you will, for some split fraction, if you will, that the release is scrubbed. And if it is scrubbed, it tends to put you in the category that would not be called large release by this definition.

MEMBER KRESS: I'm suffering from the fact that I didn't bring this guideline.

MR. CUNNINGHAM: Okay. Well, we're suffering because we have forgotten what's in the back here, if you

will.

DR. SHERRY: I like the simplified guidelines better than I do your definition of LERF because I think the simplified guidelines point to a LERF which is different than what you defined.

MR. CUNNINGHAM: Somewhat different. The 1 times 10^{-5} isn't dictated purely by --

DR. SHERRY: I'm not talking about the numbers. I'm talking about the definition, early containment failure with core damage versus a LERF which is defined based on magnitude of fission product release and timing of release, which is I think what is required because if you're using LERF as a surrogate for the safety goal QHOs, I don't believe that you'll get a good correlation between the safety goal QHOs and your definition of LERF. Okay?

MEMBER KRESS: I think you could if you used two different LERFs for BWRs and PWRs, but I agree with you on basically that principle. That's one of the things I was complaining about.

CHAIRMAN APOSTOLAKIS: Are you done with this? Let me come back to the issue of the figures. The SRP itself, Pages 12, 13, 14, and 15, are what I have in mind. I think you are doing a great job there discussing the scope of analysis. You are using great lines, such as,

"Where applicable, the modeling and quantification of the effects of the change should also be reviewed to ensure that the models are appropriate. When" --

MEMBER BARTON: Where are you, George?

CHAIRMAN APOSTOLAKIS: I'm randomly reading from Page 13.

MEMBER BARTON: Thirteen?

CHAIRMAN APOSTOLAKIS: Yes. "When full scope PRAs are not available, licensees should demonstrate that the needed findings are supportable based on traditional engineering analysis. They should provide rationale why analyses are not necessary." I mean, this is great. Combine this with the principles we have discussed this morning, and I support that 100 percent. This is great.

Level of detail on Page 14. It's exactly what real life is. If the SSCs are included within the boundaries or if they're included in black boxes or this or this or that, then do this. I don't need a figure for that because I can't capture all of this in a figure. That's my problem. I can't capture --

MEMBER KRESS: But the figure doesn't detract anything.

CHAIRMAN APOSTOLAKIS: It does. It absolutely does. I know of cases -- that was a long time ago -- where in a similar situation the utility was 1.3 10^{-5} and

the application was rejected.

MEMBER KRESS: Probably for a lot of other --

CHAIRMAN APOSTOLAKIS: People were screaming that was a goal. I don't know what kind of a goal that was. But I think this kind of discussion is great. It really sends the message and also the philosophy of what we want to implement.

DR. SHERRY: But didn't the industry originally propose figures?

CHAIRMAN APOSTOLAKIS: They are as wrong as the NRC stuff.

DR. SHERRY: But I think they send the initial signal that this is what they were willing to live with.

CHAIRMAN APOSTOLAKIS: Well, I thought our --

DR. SHERRY: The values are different, but at least the concept was the same.

CHAIRMAN APOSTOLAKIS: Well, I mean, we mentioned earlier that we need a change in culture. That doesn't mean the NRC staff culture. It means everybody's culture. And I think this is a direct extrapolation in a straight line of past practice. You have to be very prescriptive, very precise, "This is where it is," because you will have an inspector who goes by the book, checks things.

And my argument has always been that this is a

new way of thinking, a new way of doing business. And we have to demonstrate that we understand that. We cannot avoid having boundaries. And the goals serve that role. But let's not overdo it. That's my point.

And I think this discussion in the SRP in my opinion is a good example of what I have in mind. And I didn't write it.

MEMBER KRESS: But what bothers me, George, is that these are --

CHAIRMAN APOSTOLAKIS: But I insist.

MEMBER KRESS: -- these are the goals. One of them is the quantitative health goal. Ard the other one is the CDF goal that we're raising up.

CHAIRMAN APOSTOLAKIS: My problem is the horizontal lines.

MEMBER KRESS: I know. I know. But the --

MEMBER MILLER: I think if they do just a little bit of rewording with the principles already stated and modified, I think this is very, very good guidance. And it's guidance.

CHAIRMAN APOSTOLAKIS: Even the figure?

MEMBER KRESS: I think they may want to massage some of the words. I've been looking through the wording there, and it looks like it's a guideline.

CHAIRMAN APOSTOLAKIS: It doesn't look even

willing to concede having a band up there.

MEMBER KRESS: I think the --

CHAIRMAN APOSTOLAKIS: That is a mystery to me.

MEMBER KRESS: Well, I think the band is there, whether it's shown on the drawing or not, is what I think.

CHAIRMAN APOSTOLAKIS: If you judge from past experience, maybe in your mind and my mind and Gary's mind, but I don't think that if you go out in the industry, it will be treated as such. Lots of people want to --

MEMBER POWERS: Well, George, there's no question in my mind that the limit defined by this will quickly become exactly a limit. And then people making proposals will say, "Well, I don't want to get close to that limit." So I'd best make sure my submission actually has some margin in there because people that evaluate it will tend to push my numbers up a little bit.

And so the management will dictate, "Let's stay below 10^{-5}. Let's not get above 8 times 10^{-6}."

And the guy that does the analysis says, "Well, I don't want to get too close to the boss' 8 times 10^{-6}. So I'll do my analysis at 5 times 10^{-6} so I don't get too close there because when I go to the review committee,

they're liable to kick me up just a little bit." I mean, that's the way these things happen in reality.

MEMBER KRESS: Whatever happened to the concept of pricing your car several thousand dollars too high because you know they're going to knock you down?

CHAIRMAN APOSTOLAKIS: But, you see, the whole premise of this is that the limit is at 10^{-5}. If it was very clear to them that this could also go higher, then perhaps this kind of argument would not take place. And I think it can depending on the situation, depending on the money saved, depending on what the proposed change is.

And we're not willing to accept that. It's very issue-specific.

MEMBER POWERS: Well, it seems to me what you have to argue is whether that principle on small changes in risk can be reworded in a way that you understand what they're trying to achieve because all this does is impose small changes in risk here.

And I don't believe that's exactly the principle that was trying to be articulated. There was. I think what they want to do is to have some mechanism, not only to monitor the effectiveness of the change they made, but some way, some period, to monitor its interactions with other things that may be unanticipated.

CHAIRMAN APOSTOLAKIS: Yes. And Tom King told

us how they're going to rephrase it to make sure that's there.

MEMBER SEALE: Maybe all you have to do is put a footnote in that said that we knew what we were doing when we wrote that as 1 times 10^{-5}, instead of 1.0 times --

MEMBER POWERS: You see, the trouble is --

MEMBER SEALE: There's a procedure that's implicit in that. And that's what we're arguing about.

MEMBER FONTANA: Well, they've to give the potential applicants some idea of what's going to be successful. If you didn't say anything, the first case through is set a precedent. And then you'd be right back where you started.

CHAIRMAN APOSTOLAKIS: How are we going to change our culture if we keep doing things the same way?

MEMBER FONTANA: Well, they're letting them do anything they want within the box. In the old days you were stuck to a certain point. And if you want to move off that point --

CHAIRMAN APOSTOLAKIS: Well, that's really very -- I wonder whether anybody from the industry has something to say about this. Do you think that the figure --

MR. FULFORD: Jim Fulford, LIS.

Why don't you take off all the interior lines

and the tick marks? Just use them as indications of areas.

CHAIRMAN APOSTOLAKIS: Oh, just keep the Roman numerals but take out the lines? I like that.

Tony?

MR. PIETRANGELO: This is what we're going to do. And then you can --

CHAIRMAN APOSTOLAKIS: Identify yourself.

MR. PIETRANGELO: Tony Pietrangelo, NEI.

We're going to manage risk such to provide long-term assurance that the safety goals are going to continue to be met.

CHAIRMAN APOSTOLAKIS: Yes. But you guys have a figure similar to this.

MR. PIETRANGELO: That use of that figure helps us do the stated intent.

CHAIRMAN APOSTOLAKIS: What?

MR. PIETRANGELO: We're trying to provide long-term assurance that we meet the safety goals. We are going to use the criteria or we call them screening criteria, called decision guidelines, whatever you want to call them to help us provide assurance. That's our framework that we'll use to provide long-term assurance that we will continue to meet the safety goals.

That's what you really -- you want to tie it

back to your policy statements. And that's how all of this started. At some point you've got to get to that level.

CHAIRMAN APOSTOLAKIS: If you have a clear statement of the principles that we discussed this morning, you have a discussion of these principles along the lines of Pages 12 to 14 of the SRP, who do you need the figure? Why do you want to run the risk of having somebody use this as a --

(Laughter.)

MR. PIETRANGELO: I think it's inherent in all of this. You've got to provide -- the NRC wants to provide some expectations about what was acceptable, unacceptable, and where further evaluation is required. We tried to do that, too.

CHAIRMAN APOSTOLAKIS: It's in the text. I know you tried.

MR. PIETRANGELO: Right. And we don't suggest --

CHAIRMAN APOSTOLAKIS: I'm giving you a second chance.

MR. PIETRANGELO: We don't suggest and I don't think the staff is trying to suggest that you can just take the figure out of the context of what's written down in the guidance. You have to apply it within that

context. You can't just go to the figure and make the decision.

MEMBER FONTANA: George, now do you understand?

(Laughter.)

MEMBER KRESS: Does it make it clearer for you, George?

CHAIRMAN APOSTOLAKIS: Well, I guess it's a minority opinion, which --

MEMBER POWERS: George, it's not a minority opinion with respect to the smaller changes in risk that's being enforced here.

CHAIRMAN APOSTOLAKIS: It's a minority opinion with respect to what? I'm missing something.

MEMBER MILLER: How to communicate it.

CHAIRMAN APOSTOLAKIS: How to communicate it. That's my disagreement.

MEMBER SHACK: Just remember, George, any man more right than his neighbors constitutes a majority of one.

CHAIRMAN APOSTOLAKIS: The fundamental problem is that we don't seem to be willing to change the culture. We are talking about it, but we are not willing to do it.

MEMBER KRESS: I think the whole thing changes the culture.

CHAIRMAN APOSTOLAKIS: No.

MEMBER MILLER: Are you saying by putting a figure in there --

CHAIRMAN APOSTOLAKIS: Yes.

MEMBER MILLER: -- and maybe using a --

CHAIRMAN APOSTOLAKIS: It's too prescriptive. It's too prescriptive. Mike said, "If I'm in the specter, I need to have things to check out." Well, that's what I want to change. That's what I want to change.

MR. MARKLEY: We don't want checklists. We want something that's going to give you some kind of guidance so that you can do regulation in a consistent manner.

CHAIRMAN APOSTOLAKIS: So what's guidance? That's really the issue here.

MR. MARKLEY: That's really it. What is going to lead them down a pathway of consistency.

CHAIRMAN APOSTOLAKIS: My argument is that below the boundary of the goal can state some principles. You can state some desired ways of doing things. And that's as far as you can go. Everything else depends on a cost-benefit, risk-benefit, or everything slash benefit.

MEMBER FONTANA: George, would it help some -- like in my hometown, a police chief says that if the cops arrest somebody for speeding less than 10 miles an hour

over the speed limit, they have to explain why they arrested the guy. And if they don't arrest him at more than 10 miles an hour over the speed limit, they have to explain why they didn't arrest the guy. Now, there you've got kind of a ban. Does that help you any?

CHAIRMAN APOSTOLAKIS: I would have to know more about it. I mean, already I have --

MEMBER FONTANA: In other words, they have to explain what their --

CHAIRMAN APOSTOLAKIS: Ah, we're getting there. We're getting there.

MR. HOLAHAN: I'm testing you. I'm not necessarily making an offer.

(Laughter.)

CHAIRMAN APOSTOLAKIS: We are getting --

(Laughter.)

MR. HOLAHAN: Okay.

CHAIRMAN APOSTOLAKIS: Your offer is not one I cannot refuse.

(Laughter.)

MR. HOLAHAN: Okay. Okay.

MEMBER KRESS: But somewhere in the text you would give an idea what "very small" and "small" meant.

CHAIRMAN APOSTOLAKIS: Well, this is becoming now more consistent with the text, and I'm happy. It was

very inconsistent with the text.

MEMBER KRESS: But somewhere in the text you would have to give some guidance as to what you thought those numbers were.

MR. HOLAHAN: Well, it says approximately.

CHAIRMAN APOSTOLAKIS: A few 10^{-5}.

MR. HOLAHAN: Well, no, it doesn't say a few. It says approximately.

CHAIRMAN APOSTOLAKIS: Well, I said a few.

MR. HOLAHAN: I know you did.

CHAIRMAN APOSTOLAKIS: That's a suggestion.

MR. HOLAHAN: All right. All right.

MEMBER SEALE: But he is not willing to remove the 1 and just read it/write it as E^{-5}.

CHAIRMAN APOSTOLAKIS: He put a tilde there.

MEMBER SEALE: I understand that. But he is not willing to remove the 1. Do you see what I'm saying? He still wants the 1 E^{-5}, not just E.

MEMBER KRESS: That's standard number.

CHAIRMAN APOSTOLAKIS: I think you mean on the order of it.

MEMBER SEALE: Yes, right. That's right.

CHAIRMAN APOSTOLAKIS: Maybe you can put in words, "on the order of 10^{-5}."

MEMBER POWERS: And, Gary, I still think that

delta at the top and delta to the right are different deltas. That going -- transcending beyond a delta CDF of 10^{-5} is not the same as going beyond a CDF of 10^{-4}.

CHAIRMAN APOSTOLAKIS: I rest my case. You see, we talk about it for an hour. You come up with a very good insight. That's my point. We haven't really thought about these things very well, and we draw lines. I think what Dana just said makes perfect sense to me.

MEMBER KRESS: Make that top line dashed, then.

CHAIRMAN APOSTOLAKIS: Delta star.

MEMBER POWERS: Well, it seems to me that the first thing I would do is extend the vertical line at 1 times 10^{-4} on up.

MEMBER KRESS: Up to infinity?

MEMBER POWERS: Yes. I think that somehow constitutes a boundary, despite the fact, so it's probably a little fuzzy itself.

MR. HOLAHAN: But 10^{-4}, from a decision point of view there is no difference, so --

CHAIRMAN APOSTOLAKIS: But there should be a difference.

MEMBER POWERS: Gary, there is no difference. There's no difference if what you say, "My goal is to have small changes in risk." There is a difference if you say,

"My goal is to not make a big jump that I can't see it develop and get some feedback on." Those are different concepts there. And I got the feeling from your discussion of the small change in risk that it was the latter that was really your idea, that whether it's 1 times 10^{-5}, or half of that, you would still want to know, as it got implemented, some feedback on what effect it was having.

MEMBER FONTANA: What if you said that something like the change in CDF should be sufficiently small that you can discern the trends? In other words, if it was too big and it jumps you over, then it's not -- you know, it's too big.

MEMBER POWERS: And, of course, if it's too small, there is no trend.

(Laughter.)

MEMBER FONTANA: But that's really what you're after. You don't want to jump -- you don't want to --

CHAIRMAN APOSTOLAKIS: I think that was Tom King's point this morning.

MR. HOLAHAN: But I think it's only one aspect of why you want it small. That's, you know, related to being able to check the performance. I think there are other reasons why you should do small steps. It could be simply a policy matter. I think the Commission has told

us, "Make small" -- you know, small changes would be all right.

MEMBER FONTANA: But there's uncertainties involved there because of that.

MR. SHERRY: I'm still curious about how these small changes in delta CDF relate to the 50.92 criteria. I mean, what change in CDF would trigger -- would be considered a significant hazard and require prior public hearings? Is it --

MR. HOLAHAN: I don't know. We haven't related them.

MR. SHERRY: But it seems that you would need to, since that's in your regulations and deals directly with the increase in probability of -- and consequences of an accident when dealing with amendments. I mean, there seems to be a direct -- some sort of correlation between the two, you know, that --

MR. HOLAHAN: It certainly sounds like a similar topic.

CHAIRMAN APOSTOLAKIS: I think we should close this discussion. It seems to me that the fact that we're discovering new things about it all the time is a message for us, that we are trying to capture too many things that are fuzzy and uncertain, and so on, in a picture. And that's not possible. And I don't agree that the deltas

are the same, by the way.

I think it's much -- I think the delta on the right is more solid than the delta on the top, because you are violating the goal, really violating -- so maybe we should close it here and we should all think about it again, because I don't see -- I mean, it's going to change again if we keep talking about it.

MR. HOLAHAN: Okay.

CHAIRMAN APOSTOLAKIS: Are we done with 1061 now? Do you want to cover your last summary?

MR. JONES: I think it was page 19, I think just to -- I'll just throw that out. I think all this is is just to simply let you know where we're going as we continue to revise the document. And, I mean, we spent -- Gary showed you some of the -- page 18 I guess -- some of the -- the fact that the LERF guidelines are still being discussed and are likely to be changed. We're not exactly sure what will happen.

The one concept we're kicking around is that management decision region. We are going to update the guidance on uncertainties, incorporate them directly into the draft guide and the SRP. We are going to change the role of 1602 and bring forward issues like peer review, categorization, into the document, into the guides themselves and take them out of 1602, and therefore

deemphasize the NUREG as far as the specifics of the guidance to licensees.

We are continuing, as we said earlier, to move forward on 1602, and that's the next presentation. And then there are several CRGR comments, some of which we alluded to this morning as we went through here, like the proposed change meets the regulations, as opposed to all of the current regulations and that kind of item, which will be -- which we will be changing.

And our hope at this time is to try to internally get another draft of these documents ready some time early next week for at least an internal review and try to force everything back into consistency again, which is not an easy task with seven documents that we're playing with here. And then to try to get them to the committee as quick as possible before the full committee meeting in December.

We recognize this is a little bit difficult. We'll walk you through what the changes are at that time, but the way the schedule is and the work and environments leading us down this path.

CHAIRMAN APOSTOLAKIS: Could you, when you do all of this, go to pages 12 -- 11, 12, 13, 14, 15, 16 of the SRP and see whether you could live with those if you put them in the reg. guide.

MR. JONES: With some changes.

CHAIRMAN APOSTOLAKIS: Perhaps? I think they really state what your thinking is.

MR. JONES: Well, some of that is already captured, although in much briefer terms --

CHAIRMAN APOSTOLAKIS: That's correct.

MR. JONES: -- in the --

CHAIRMAN APOSTOLAKIS: I don't want to imply that they are --

MR. JONES: -- guide.

CHAIRMAN APOSTOLAKIS: -- mutually exclusive.

MR. JONES: No, they're not. And I'm saying we have tried to -- we'll look and see if there's anything that needs to be brought forward.

CHAIRMAN APOSTOLAKIS: Yes.

MR. JONES: I mean, at this point, one of the things we're thinking about is possibly reformatting and throwing that into the appendix anyway --

CHAIRMAN APOSTOLAKIS: Yes.

MR. JONES: -- to make it clear, the wide variation in PRAs or risk assessments that can be proposed as part of a change. It's one of the things we're looking at doing in response to comments here.

CHAIRMAN APOSTOLAKIS: So we're going to talk about --

MR. JONES: We'll think about it.

CHAIRMAN APOSTOLAKIS: -- the SRP now?

MR. JONES: Well, that was both. I mean, the attempt has been to make these things consistent. There is obviously more detail in the SRPs for the review guidance, but the essence we think were captured in what we have, but we'd welcome any comments or issues.

CHAIRMAN APOSTOLAKIS: I have a problem with page 8 of the SRP, which also seemed to bother Bob Christie this morning.

MR. JONES: Okay.

CHAIRMAN APOSTOLAKIS: The two bullets -- again, this is in the section "Role of PRA in Review of Defense-in-Depth."

MR. JONES: Yes.

CHAIRMAN APOSTOLAKIS: On page 8, it says, "For anticipated operational occurrence initiating events, the PRA-credited portion of the plant should withstand two active failures without core damage, and three active failures without a large early release." And then for infrequent but severe design basis accidents, blah, blah, blah, "The PRA-credited portion of the plant should withstand one active failure without core damage and two active failures without large early release."

And I was wondering what the reasoning behind

this was, because it seems that we are going back to something that people tried 15 years or so ago, where instead of working with the probabilities of the minimal cut sets, they just counted how many events were in the minimal cut set.

And also, I mean as Bob said this morning, now we have a two-failure criteria, and a three-failure criteria, and we used to have a single-failure criterion. So this is the achievement of PRA?

MR. JONES: Let me -- we had this comment come to us on Tuesday when we met with CRGR, and we agreed with them at the time we're going to take it out.

CHAIRMAN APOSTOLAKIS: Okay.

MR. JONES: And do it with words.

CHAIRMAN APOSTOLAKIS: Okay.

MR. JONES: At least not so much as the barriers, but what these were intended to do was to focus the review --

CHAIRMAN APOSTOLAKIS: Okay.

MR. JONES: -- to where things have changed and it looked like defense-in-depth may have been cut back.

CHAIRMAN APOSTOLAKIS: Okay.

MR. JONES: We're just going to do it with words, in more general terms.

CHAIRMAN APOSTOLAKIS: So you're on the record that you will do it with words.

MR. JONES: We will be doing the -- if that's going to change on defense-in-depth, the words, look at where we may be placing undue reliance on operators, etcetera.

MEMBER FONTANA: I hadn't thought about using the figure. But now that you mention it --

(Laughter.)

CHAIRMAN APOSTOLAKIS: Oh. And then some parts of it are really too detailed, but I don't think that today's -- I mean, on page 19, for example, the top bullet says, "A desire is that it should reflect the data uncertainties associated with each parameter. A Monte Carlo or Latin Hypercube model or equivalent is acceptable to estimate the overall uncertainties." I mean, you don't need that. You could drop all that.

I mean, "should reflect the data uncertainties associated with each parameter." Period. How they propagate them, and so on, is a mechanistic problem we don't need. But, again, this is --

By the way, the SRP seems to be more concerned about potential incompleteness of the PRA model than the reg. guide. I mean, even here it says, "It should attempt to address uncertainty that is caused by potential

incompleteness of the overall PRA model." I don't remember seeing things like that in the reg. guide.

MR. HOLAHAN: I think those thoughts like that are going to be worked into the reg. guide.

CHAIRMAN APOSTOLAKIS: Okay.

MR. HOLAHAN: There is a new section on uncertainties that is being worked, and it has parameter, model, and other uncertainties.

CHAIRMAN APOSTOLAKIS: So unless you guys want to say something about Reg. Guide 1061, or SRP Chapter 19, we can move on to NUREG-1602? Is that the plan?

MS. JONES: We covered almost everything that we were going to talk about in 1602 in some of the previous conversations.

CHAIRMAN APOSTOLAKIS: Okay. But are we going to revisit it as a separate document at some point? Not these two days. In the future? Or you don't intend to have the committee review it?

MR. CUNNINGHAM: It is being extensively reworked to reflect, among other things, the comments we got from the committee, some of the committee members last time, that -- the lack of clarity or scrutability and that type of thing.

CHAIRMAN APOSTOLAKIS: But you don't plan to come here again?

MEMBER SEALE: Well, but they do plan to give us a copy of the revised draft. And if we have questions we can --

MR. CUNNINGHAM: Yes. Yes.

CHAIRMAN APOSTOLAKIS: It is a major document, and it's a big document. But the potential of major impact -- I mean, if we are to review it carefully, that takes time. So --

MR. HOLAHAN: I think we're trying to minimize its role in --

CHAIRMAN APOSTOLAKIS: Okay.

MR. HOLAHAN: -- guidelines for risk-informed regulation.

CHAIRMAN APOSTOLAKIS: And why is that?

MR. HOLAHAN: Because we'd rather have the guidelines and the decision process in the reg. guide and the SRP as opposed to a NUREG. And so what we're doing is going through and picking and choosing the pieces that would have actually been referenced and drawing those up into the documents.

CHAIRMAN APOSTOLAKIS: Okay.

MR. HOLAHAN: And then leaving it as a reference.

CHAIRMAN APOSTOLAKIS: Okay.

MR. HOLAHAN: As a library book.

CHAIRMAN APOSTOLAKIS: So are we ready, then, to move on to item 7 on the agenda?

MR. HOLAHAN: Yes.

CHAIRMAN APOSTOLAKIS: So we're only 19 minutes behind schedule.

MEMBER FONTANA: We're never -- we're not going to get, at this point, to how you estimate LERF. We'll talk about that another time.

CHAIRMAN APOSTOLAKIS: It's an appendix to the reg. guide, so you can raise the question now. This is the time to raise the question.

MEMBER FONTANA: Well, the only question is that I think it's okay for screened, but it seems to fall far short of what one would like to see. As far as it goes, I think it's --

MR. SHERRY: I'd like to make two quick comments on the reg. guide before we leave. On page 211, related to the monitoring program, there is a sentence that says, "The program should also include monitoring of similar component performances at other plants, to establish a sufficient database of temporally-related degradation." I wonder what that means and how this can be accomplished vis-a-vis a change at a specific plant.

MR. HOLAHAN: Well, it's not a requirement for those other plants to provide any more data than is

publicly available. If I remember the way the maintenance rule is structured, it already calls for licensees to use industry-wide data in their availability, in the balancing of availability and functional failures. It's this thing I'll -- this part, whatever it is, (a)(3) of the rule on a sort of 18-month basis.

So I think it's a reference to using other available data as opposed to requiring licensees who aren't involved in this to start generating new data.

MR. SHERRY: Yes. I had thought there were two concerns. One was that a change at a specific plant may be unique, or may not be at any other plants which have a similar type of --

MR. HOLAHAN: Could be.

MR. SHERRY: -- activity.

MR. HOLAHAN: Yes.

MR. SHERRY: And as you stated --

MR. HOLAHAN: That would just make monitoring more difficult.

MR. SHERRY: The second comment was with regard to in Appendix 3 you have a criteria -- I think it's involved in the event trees -- and containment isolated or -- we're not bypassed, and there's no definition for what constitutes a loss of containment isolation, and specifically in referring to size of the

liner penetration, which is required in order to define a sequence involving a loss of isolation, because there are many lines which penetrate containment which, you know, are very small size.

And because of their small size, the leak rates and the fission product release are, I don't think, sufficient that you would have sufficient off-site doses to threaten early fatalities. And hence, I don't think that would define a high or low risk category. So I think you need some thought given to what constitutes a loss of isolation in terms of leakage rate or size or something.

MR. HOLAHAN: Yes. Okay. Good things to think about.

CHAIRMAN APOSTOLAKIS: So tech. specs.

MR. HOLAHAN: Okay.

MS. GILLES: Good afternoon. I'm Nanette Gilles from NRR's Technical Specifications Branch. And I have with me Roy Woods from the Office of Research, who was my co-leader on the risk-informed technical specifications team, and Millard Wohl from NRR's PRA Branch, who is NRR's resident PRA expert for tech. spec. issues.

I'll just give you a little background. We have been using risk insights in technical specifications for a number of years, so this is not a new area where we

are applying risk insights. And we are now attempting to write guidance that follows what we have been doing in the past years and putting it in a little more consistent manner.

As is mentioned, the application-specific reg. guides and standard review plans do follow the general guidance documents very closely. So this presentation is prepared based on those documents, so changes that were discussed today obviously won't be reflected.

This is just a listing of the same key principles that have already been discussed, and those are referenced in the technical specification documents.

MEMBER POWERS: I notice that on number 4 you only call out exceeding the safety goals and not the subsidiary requirements.

MS. GILLES: Well, the wording is just the same as it was in the general document. So whatever is changed there will also be reflected in the technical specification document. It is the same guidelines.

MR. RUBIN: This is Mark Rubin for staff. They're all meant to look at the subsidiary objectives in addition to the safety goal in each case, and they will be made consistent in the next revisions.

MS. GILLES: I'll just mention that the pilot application in the technical specification area is the

Combustion Engineering owners group, and they have submitted a number of risk-informed technical specification changes that we are reviewing in the pilot activity.

You are familiar, I believe, with the four-element approach that is being used in all of the guidance documents, and the first element of that is to define the proposed change. In the technical specification area, we are looking specifically, and providing guidance specifically, for changes in allowed outage times and surveillance test intervals because these are historically the areas where the industry has applied risk insights in making changes to their current licensing basis.

One thing that we do require in the technical specification area is that the licensee demonstrate a need for what they're requesting. We will not approve a request simply because the probabilistic risk assessment could justify an extension.

CHAIRMAN APOSTOLAKIS: If I could make a suggestion, I realize and appreciate the fact that your regulatory guide has to rely on 1061, and a lot of stuff is the same. But since we've discussed all of these things extensively here, maybe we can go directly to where you address issues that are specific to your reg. guide.

For example --

MS. GILLES: Certainly.

CHAIRMAN APOSTOLAKIS: -- in 5, slide 5, there may be some differences. If it's okay with you.

MS. GILLES: Sure. That's fine.

CHAIRMAN APOSTOLAKIS: Yes.

MS. GILLES: Yes.

CHAIRMAN APOSTOLAKIS: Because otherwise, we'll see those principles eight or nine times and --

MS. GILLES: That's right. And you're right, this is probably the area where --

CHAIRMAN APOSTOLAKIS: And we may find more comments for Gary and company.

MS. GILLES: This is probably the area where the technical specification documents differ the greatest.

CHAIRMAN APOSTOLAKIS: Can I suggest that we do that with all of the reg. guides that we will review today and tomorrow? I mean, let's keep the stuff that's common with the basic 1061 approach.

MS. GILLES: Okay.

CHAIRMAN APOSTOLAKIS: Please.

MS. GILLES: Okay. In the area of probabilistic analysis for technical specifications, the staff has been applying what we refer to as a three-tiered approach to evaluation of those changes. And I will tell you what the three tiers are, and then I will define for

you the type of acceptance guidelines we are using for each tier.

The first tier is basically an upper bound change on the quantitative risk measures that are being used to evaluate the technical specification changes.

The second tier is avoidance of risk significant plant configurations. In other words, if they are requesting an extended allowed outage time for one piece of equipment, and we want them to have in place some kind of process -- either programs that would preclude other equipment being out of service simultaneously -- where the combination of those two being out would be a risk-significant combination.

And then the third tier is an overall plant configuration control process that would allow the licensee at any time to evaluate the configuration he is in in a real-time basis.

MEMBER FONTANA: Does that mean that he doesn't have to do configuration management for things that are not risk significant? Is that what that means?

MS. GILLES: Are you referring to tier 3?

MEMBER FONTANA: Yes.

MS. GILLES: Maybe the --

MEMBER FONTANA: It says, "Risk-informed plant configuration control." Does that mean that there are a

lot of things that he doesn't have to have configuration management for, if he can show they're not significant risks?

MR. WOHL: I think I can help with that one. An example -- there is a plant that has about 2,000 different maintenance space setup, which has combinations of equipment that cause high risk. It was found that of these 2,000 maintenance states about 100 contributed about 99 percent of the risk. And so there's a lot of concentration on those 100, developing risk achievement worths for those, taking dynamic measures of those risk achievement worths and averages of them.

If it's suspected that there is a piece of equipment that can impact risk that is not, for some reason, rated as high risk by a PRA analysis, then that's considered in a qualitative fashion usually, but not necessarily folded into the PRA analysis.

MEMBER FONTANA: Okay. Thanks.

MS. GILLES: With regard to the acceptance guidance on tier 1, we would follow the general regulatory guide criterion, as you discussed previously. In addition to that, we have added additional guidance for technical specification allowed outage time changes.

And the reason for that is that, in general, licensees are changing one allowed outage time for one

system at a time, and rarely would you see that -- that type of change anywhere come near the type of guidelines that are being provided in a general reg. guide -- changing one system at a time.

And because the use of allowed outage time is an infrequent occurrence, it is almost like a temporary change. And so the additional criterion that we have added is a small incremental conditional core damage probability, and we say "small" is in the range of $5E^{-7}$, and a similar small criterion for incremental conditional large early release probability.

MEMBER POWERS: When you're thinking about this, do you cast these into annualized terms?

MR. WOHL: What Nan is referring to is a single AOT risk, rather than an annualized. In this case, it is really the area under a risk peak, and we feel this has to be controlled for AOT extensions. The French have a similar criterion. EPRI has a similar criterion. IAEA has a similar criterion.

It's the fact that if you are allowing, for instance, an AOT to go from three days to 14 days, you want to make sure that the single AOT risk does not get out of hand, so that it's controlled in some manner other than an annualized manner.

MEMBER POWERS: I guess what I -- I think I

understand what you're doing. What I'm looking at is just the units on these numbers that you've put up here.

MR. WOHL: Well, $5E^{-7}$ is a pure probability. It's an incremental conditional core damage probability -- the condition being that a piece of equipment is out of service. What is the incremental probability of core damage due to that?

CHAIRMAN APOSTOLAKIS: For that --

MR. WOHL: For that single AOT. That's all. And we feel that's important, because a lot of people are coming in with requests for very -- relatively large extensions of AOTs, for instance. And we feel it's important to control that.

MEMBER POWERS: What you don't want to do is get benefit from time -- the fact that it's over a short time still, relative to a year.

MR. WOHL: That's right.

MEMBER POWERS: I mean, there is a point where that's not good enough.

MR. WOHL: So, for instance, a case that I happen to recall had tech. specs. change requests for three systems. The change in the baseline CDF was very small, about 5 percent, and it was low to start with. So we didn't have a concern about that.

But we required that they present the

incremental conditional core damage probability. It was just slightly larger than $5E^{-7}$, which is not a speed limit. So that gave us a warm, fuzzy feeling that even during this AOT period we weren't doing anything egregious, anything which could send a very large risk spike up, or PRA under a spike --

MR. RUBIN: This was a very active area of discussion with NEI on the EPRI applications guide, where the issue of how large an instantaneous risk might be appropriate, even for very short periods of time. And obviously, risk peak should be controlled even if you assume that it's for a short period of time, because you can't guarantee that you can restore items as you originally planned during a maintenance cycle.

MEMBER POWERS: That leads us into the discussion of the shutdown risk, where we had the same problem. That time is short, and so when you annualize the numbers --

CHAIRMAN APOSTOLAKIS: That's right.

MEMBER POWERS: -- you come up with very modest-looking core damage frequencies. But the fact is it's all concentrated into a 45-day period. You know, it changes your perception on things, and it's something that it seems to me you have to wrestle with in our previous discussion as well. Are those annualized numbers, and is

that the appropriate thing?

CHAIRMAN APOSTOLAKIS: We have not discussed this at all with Gary and his friends, and I wonder whether we should. I remember there was a document -- maybe it was 1602 -- there was a line there that we hadn't really done this yet, namely address the issue of temporary increases.

But it seems to me you don't have guidance there from the Commission. Do you? Because the goals don't apply to that.

MR. KING: No. The first version of the reg. guide had a placeholder that said we needed --

CHAIRMAN APOSTOLAKIS: Yes, I remember seeing that someplace. Yes.

So it seems to me that is an important subject that deserves a discussion like the one we had this morning with you guys.

MR. WOHL: Dr. Apostolakis? I might add that the $5E^{-7}$ number comes from a reg. guide type -- I'm sorry, from a safety goal type argument. It was derived by saying that if we have a safety goal nominal plant, with an annualized CDF of 10^{-4} per reactor year, and see an order of magnitude risk increase due to a piece of equipment going down, that generally, for single pieces of equipment, gives a rather large upper bound for such

things.

Usually, there is, even for important pieces of equipment, factors of 2^5 or 6, something like that. But if you allow that order of magnitude to exist for five hours, which was a mean repair time, which was considered in the original tech. spec. structures, you get the area under that risk peak to be about 5 times 10^{-7}. So the --

CHAIRMAN APOSTOLAKIS: Yes. And I'm not saying that you pulled this out of the blue. All I'm saying is that we should have some time at some point to discuss these arguments and see whether we're all in agreement. And I don't know when this time will be.

MR. WOODS: Well, please recall, you know, what we are discussing in these application-specific presentations are the things that are different, or importantly different from the general --

CHAIRMAN APOSTOLAKIS: I understand that.

MR. WOODS: And so this is the first time we've seen --

CHAIRMAN APOSTOLAKIS: This is surely different, yes.

MR. WOODS: That's why it's the first time you've seen it.

CHAIRMAN APOSTOLAKIS: Yes.

No, no, no. But it's a bigger issue, though.

It's a --

MR. WOODS: It's a lot most important here -- more important than --

MEMBER POWERS: But it's very important in the shutdown --

CHAIRMAN APOSTOLAKIS: It's a larger issue than just --

MEMBER POWERS: Of course.

CHAIRMAN APOSTOLAKIS: It's a larger issue. And when we say CDF and all of this stuff there, we mean an average annualized frequency, and all of the discussions so far have been in terms of that. So I think --

MR. WOHL: The single AOT is really a different situation. Physically, you are giving up some defense-in-depth for some period of time. The question you're asking --

CHAIRMAN APOSTOLAKIS: Exactly.

MR. WOHL: -- is, how long can you really afford to do that? You sort of have to get semi-quantitative about that, we have always felt, because otherwise it's just open for anybody's --

CHAIRMAN APOSTOLAKIS: No. I agree with you. It's just that I would like to have an opportunity to read about that argument and have a presentation and discuss

it. So when do you think we should do that? I don't think we can do it before January at least. Do we have any other meeting with you? No.

MR. KING: No. No.

CHAIRMAN APOSTOLAKIS: Except for the full committee presentation, which is normally a summary of the subcommittee presentations. So --

MR. KING: We moved that placeholder from the general reg. guide, felt it was more appropriate to address it where you actually come across application-specific changes that are temporary.

CHAIRMAN APOSTOLAKIS: But as Dana said, this is also important to shutdown risk. Right? So this is a much larger issue.

Anyway, we'll note that, and at some point in the future we'll have to revisit it. So this is now a probability. It's not really a --

MR. WOHL: It's pure probability.

CHAIRMAN APOSTOLAKIS: -- frequency of anything. It's a probability.

MR. WOHL: For one single AOT and that's all. So it's the area under a risk spike. It's the difference between the conditional core damage frequency and the baseline. Or some people use a number just slightly below the baseline, which makes very little difference, and the

width of that spike. So you're talking about the area under a risk spike that is tolerable.

CHAIRMAN APOSTOLAKIS: It's actually a strange quantity. It's not really a probability either, because the rest of the plant, the rest of the PRA, is done in the normal way, which averages a lot of things over time.

MR. WOHL: Well, it's an incremental conditional --

CHAIRMAN APOSTOLAKIS: Incremental thing. It's --

MR. WOHL: -- probability.

CHAIRMAN APOSTOLAKIS: Exactly.

MR. WOHL: It's how much are you adding. If I live next door to this plant, and I see suddenly a very large AOT for an important system, and I know a little bit about math and I say, "Well, you know, how much riskier is this during this period the equipment is out?" It's that increment.

CHAIRMAN APOSTOLAKIS: I think what it is is you do the risk assessment for the base case. You do it for the disturbed case. Take the difference and multiply by the time duration. That's the result.

MR. WOHL: That's right.

CHAIRMAN APOSTOLAKIS: It's not necessarily the instantaneous probability, because you have not really

made sure that you have the instantaneous stages of all of the components.

MR. WOHL: That's what --

CHAIRMAN APOSTOLAKIS: You are still doing everything else on the --

MR. WOODS: Incremental.

MR. WOHL: Just the incremental --

CHAIRMAN APOSTOLAKIS: Yes. "Incremental" is a much more accurate word, yes.

MEMBER POWERS: And I think if you did that same analysis under a shutdown circumstance, because it's not just one system that is out then, you end up with very big numbers.

CHAIRMAN APOSTOLAKIS: You might, yes.

MR. WOODS: And, of course, you get into the tradeoff. I mean, if you don't allow this AOT, then you would have to shut down. And so you get into the transition risk and the shutdown risk and the comparison --

MEMBER POWERS: Yes. You can make a very analytic decision on whether it's better to allow an outage or it's better to shut down. I mean, it becomes numbers, then, that are fairly easy to grind out.

CHAIRMAN APOSTOLAKIS: Dr. Miller?

MEMBER MILLER: Yes. I was going to say when

we talk about the risk monitors, which we will see this afternoon later, I think these ideas will come out more clearly. I think they're using them -- take a delta CDF and multiply it times the time and you get -- these are the numbers they are looking at.

MR. WOHL: As a matter of fact, in that safety monitor, which I have seen about three weeks ago, they do have an internal programmatic alarm point when the CDF goes an order of magnitude above baseline, and then they have a yearly total core damage probability for the actual case, including all preventive maintenance. And they fix numbers to those, and they have levels of discussion involving upper management when they trip one of those levels or about to. So there's much more than just the monitor screen that goes into the use of that safety monitor.

CHAIRMAN APOSTOLAKIS: Okay.

MS. GILLES: And these are the acceptance criteria that are stated in the guidance documents for the tier 2 and tier 3 pieces, and basically tier 2 is that -- the acceptance guidance is that the licensee can demonstrate appropriate restrictions on dominant, risk-significant configurations associated with the change. In other words, if there is other equipment that becomes even more important when this particular piece of equipment is

out of service, we would expect that they would put some kind of restrictions either in the plant procedures or the tech. specs. themselves on that combination of equipment.

In addition to that, in the third tier we would expect that they would implement a risk-informed plant configuration control program with procedures to utilize and maintain a program. That would allow them to, both when they are planning to enter an allowed outage time for pre-planned maintenance or when they find themselves in a situation -- an equipment outage situation because of unplanned circumstances, they have the ability to evaluate that plant configuration and come up with some corrective actions if they find themselves in a risky situation.

MR. MARKLEY: I've got a quick question before you move on from the AOT stuff real quick, and this is not really on the PRA per se. But enforcement discretion has really become kind of a non-existent thing. I was wondering how that would change in a risk-informed environment, or what's being done to accommodate that.

MS. GILLES: To accommodate the enforcement discretion?

MR. MARKLEY: Well, I mean, you're talking about changing allowable outage times. I mean, that's what -- theoretically, if it's not built into the tech.

specs. now, it would come in for an enforcement discretion of some sort. How is that being --

MS. GILLES: As a matter of fact, that question has come up a lot with the pilot licensees on these issues. One consideration that licensees are taking into account when they are requesting tech. spec. changes is our changed position on enforcement discretion. They know that enforcement discretion isn't being granted as readily as it used to be, so there is even more incentive for them to get two allowed outage times that they feel they can realistically live with based on the types of things they plan to do on line. So that is definitely an incentive for them to pursue risk-informed extensions of allowed outage times.

MR. MARKLEY: Is the enforcement policy being modified to have risk-informed provisions?

MS. GILLES: Risk-informed provisions for evaluating --

MR. MARKLEY: Yes.

MS. GILLES: -- enforcement discretion? I believe that we are using risk insights in evaluating enforcement discretion cases today.

MR. HOLAHAN: Yes. This is Gary Holahan again. I think there is an effort to put risk information into the enforcement program. But I don't think it's

changing the policy with respect to granting an enforcement discretion. I think it is more related to enforcement levels and decisions about civil penalties or not.

MR. JONES: But I would comment further, Gary, that as part of the actual -- I forget how many questions there are for when you grant enforcement discretion. There's, I think, 11 of them. Part of that is the impact on risk, so that is addressed as part of the enforcement discretion issue. Obviously, it's very difficult to review them over the phone, which is what you're doing generally on enforcement discretion. So it tends to be more --

CHAIRMAN APOSTOLAKIS: What is the mission enforcement discretion? What does that mean?

MR. JONES: Basically, what it means is it's a period of time where licensees want to change their tech. specs. and not follow their tech. specs. And we're granting them discretion to operate outside the tech. spec. within some specific compensatory actions and other things, for some limited period of time. And we will not enforce them being in violation of the tech. spec. at that point, but we may still go back and take enforcement action for how they got there.

CHAIRMAN APOSTOLAKIS: Okay.

MS. GILLES: One of the other areas I wanted to point out, you mentioned to discuss areas where we may be doing something a little differently in the tech. spec. arena. And under the issue of PRA quality, I believe you have heard a presentation from the CE owners group on their cross-comparison process, where they employed this process to compare the PRAs amongst all of the owners group participants to come to some conclusions about the quality of their analysis for the tech. spec. application.

And the staff feels that this process is an appropriate process for the type of changes they are requesting, and this issue is under discussion as to whether this is enough of a check on quality for technical specification issues as compared to the peer review process, which will be described in the general regulatory guide.

MR. WOHL: So you have the advantage there that these plants are a very similar design. So cross-comparison has a lot more meaning than just comparing arbitrary designs with one another.

CHAIRMAN APOSTOLAKIS: I guess I missed something. What does a cross-comparison have to do with quality? Each plant is doing its own PRA?

MS. GILLES: Each plant is doing their own --

CHAIRMAN APOSTOLAKIS: Okay.

MS. GILLES: -- PRA and then comparing --

CHAIRMAN APOSTOLAKIS: Independently, presumably, they are doing it.

MS. GILLES: They do it for the PRAs.

CHAIRMAN APOSTOLAKIS: Yes.

MR. MARKLEY: Is this the same as the owners group was doing?

MS. GILLES: This is --

MR. MARKLEY: This is the owners group --

MS. GILLES: Yes.

MR. MARKLEY: -- comparison --

MS. GILLES: Yes.

MR. MARKLEY: -- that they heard about.

MS. GILLES: Yes.

MR. WOHL: And we have -- Westinghouse owners group is organizing some efforts along similar lines as is the B&W owners group. I have not heard anything from General Electric.

MEMBER FONTANA: Now, "versus" means instead of and --

CHAIRMAN APOSTOLAKIS: Not necessarily --

MS. GILLES: Not necessarily better than, but in place of, yes. In place of the process.

CHAIRMAN APOSTOLAKIS: Now, there isn't only one peer review, is there? I mean, there is a discussion

in there somewhere I remember. But, for example, here you could have a minimal peer review because of the cross-comparisons -- hire one of two guys to review it and give you their opinion after three days, or something like that, instead of going through a more rigorous peer review process.

MR. WOHL: Generally, the tools that are used in the cross-comparison have been reviewed independently before that time. The peer review is an additional increment that they feel has a lot of importance because of the similarity of design and knowledge of the plant type.

CHAIRMAN APOSTOLAKIS: And this is definitely something that the figure could not capture, right?

MR. HOLAHAN: This is something that could be used in combination with the figure for making decisions.

(Laughter.)

CHAIRMAN APOSTOLAKIS: I don't think so. Go ahead.

MR. WOHL: We don't have any figures in this presentation, I think.

(Laughter.)

CHAIRMAN APOSTOLAKIS: That's why you will finish in 20 minutes.

(Laughter.)

MS. GILLES: I think one other important area to point out in technical specifications under the element of implementation and monitoring strategies is that it is our belief that monitoring of the types of technical specification changes that we are seeing being used in risk-informed regulation can be accomplished through the maintenance rule, because the types of changes we are seeing are changes in allowed outage times and surveillance test intervals.

The types of parameters you would want to monitor to see whether you are having any negative effect because of those changes would be the same types of parameters that are being monitored under the maintenance rule, mainly equipment availability and reliability. And we feel that the -- if a licensee has a good maintenance rule program, and it has set realistic goals, that this program can provide the monitoring and feedback mechanisms that are necessary for determining if the technical specification change was an appropriate change to be made or not.

And nothing really different in the fourth element, which is simply the documentation -- the evaluation and the submittal of the request. This is a standard license amendment request, so it would follow the standard submittal guidance and amendment guidance that is

contained in the regulations.

In addition, we are requesting that they do provide us information on how they would implement the three-tiered implementation approach that we have discussed in the reg. guide.

CHAIRMAN APOSTOLAKIS: So what is the status of this now? I know we've had a presentation from the CE owners group. Have they submitted the request to you?

MR. WOHL: Yes.

MS. GILLES: As a matter of fact, we are very close to completing our review of two of the three technical specification changes they have submitted, and we will be forwarding that review to the Commission shortly here after we complete the publication of the reg. guide and standard review plan.

CHAIRMAN APOSTOLAKIS: Are we going to have a chance to look at that and learn from it, or your review? Well, first of all, your review doesn't follow this reg. guide, does it? Or it's very close.

MS. GILLES: Yes, very -- yes, it does, very close -- the three-tiered approach

MR. WOODS: As she said when she started, tech. specs. is one area where this approach has been used for quite some time. This is not new.

MR. WOHL: I'd say that in the first two

systems that we're looking at, which are safety injection tanks and LPSI, the so-called Level 1 incremental conditional core damage probability numbers are extremely low, so that the importance of the tier 2 and tier 3 is somewhat less than in the cases where we're considering a diesel or HPSI or some system of higher risk importance.

CHAIRMAN APOSTOLAKIS: Okay. So it seems that we have plenty of time here, and maybe what we can do is try to learn from your experience, if you can talk about it. Can you talk about it?

MR. WOHL: I think there are quite a few things that can be said about -- my experience goes back to when I was in the Tech. Spec. Branch. There are what I will call hidden variables that are hard to quantify things that I have run into. For instance, the mathematics dictates that if you're doing surveillance testing, if you do staggered testing, it's a better idea.

But at a particular plant, because of the expertise of some of the people doing the testing, and the fact that they were uniquely qualified to do it on several systems, that was all they did. So they told management they would either have to be transferred to other jobs or quit. I mean, this sounds like something outside of the purview of our regulatory authority, and it really is.

But it does affect things like human error

rates in some indirect ways. And so that the idea that you might set up a staggered test requirement for these people and condemn them to doing the same thing for the rest of their lives might not be the best decision. In that case, it wasn't made that way, partly for that reason, that even though the analysis might indicate it's a better idea, it might not be.

Other things, such as -- subtle in that area, the idea of workaround, where you may have certain degraded equipment at some plants where it's hard to get spare parts for them, or not a high enough priority is put on repair. And the maintenance people are forced to work around that fact, and it may affect the other work that they're doing, because they have to keep a particular piece of equipment running which is difficult to keep in full repair.

You know, when I was a young student I used to work in the machine shop at a betatron laboratory, and one of the first things I had to do every morning was start a certain compressor, which didn't like to start at all. But I found out there was a particular spot where if I kicked it it would start every time, and that was what I had to do because I couldn't afford a new compressor.

I mean, things like this, workaround items are some of the subtleties that make it really hard to make

accurate estimates of human error rates.

CHAIRMAN APOSTOLAKIS: What I would like to do is to go down the list of principles and see how you handled each one. For example, the current regulations are met unless the change is related to an exemption or rule change. What did you do about that?

MS. GILLES: Well, that's not a very difficult one to handle in the tech. spec. area. There is a tech. spec. rule that addresses the content of technical specifications, and the types of changes we have seen to date, as I mentioned, are changes where they are simply extending an allowed outage time or a surveillance test interval, which wouldn't in any way violate anything that is written in the rule.

So, in general, we have not had -- seen any types of changes where they have come close to doing anything that would, you know --

CHAIRMAN APOSTOLAKIS: Well, that addresses the question of change. I thought this morning we heard that you want the licensee to confirm that they are complying with a current -- what --

MR. JONES: No. We said we changed that. That is --

CHAIRMAN APOSTOLAKIS: Oh, okay. You changed it.

MR. JONES: It is addressed to the change.

CHAIRMAN APOSTOLAKIS: Okay. So that's --

MR. JONES: But let me just follow up a little further on that one, though, and give you one that was an actual practical and somewhat difficult exercise in trying to deal with what I would call a conflict between the traditional engineering, the regulations, and the PRA insights.

And this was on South Texas. South Texas came in to extend their diesel outage time. When we usually are in outage times, what we typically do is demonstrate that all of the typical Chapter 15 acceptance criteria are met, assuming that no other equipment fails. So that if you have one diesel out of service you could still meet LOCA criteria because one train would still be available, one diesel would be available, that would be fine.

If you had two diesels out, the typical tech. specs. say basically, you know, immediately shut down, fix the problem, or you have an hour, something along those lines. South Texas is a little bit unique. South Texas has three diesels, but they're not three fully capable diesels. Some power -- you know, sometimes they have two out of three. They only have two pumps in the system as opposed to three, so you can get some odd combination. They wanted to extend the outage time for having two pumps

out -- two of the diesels out of service.

We looked at it through the traditional engineering deterministic standpoints. What we found was there was indeed circumstances wherein, even assuming all of the other equipment functioned, you would not meet the traditional engineering analysis requirements. Or arguably -- you could arguably say the regulations. I think you're in an interpretation space when you're into tech. specs. and LCOs. You have some leeway as to what the regulations apply, because the tech. specs. rule then takes over.

But you could find, in fact, that when two diesels were out of service there were a certain class of LOCAs in a certain location, basically in the cold leg piping, for which you could not meet the acceptance criteria in 50.46. It could not be done.

There were also some other equipment that had that problem. I don't remember all of the details.

In light of the short period of time, the incremental risk, compensatory actions taken, which wouldn't allow them to do -- wouldn't allow them to go out and do maintenance in the switchyard, for example, those kinds of things, we granted the change. But here was a conflict, if you wish, between the traditional engineering, the effective change in the regulations and

whether they met regulations, and the risk analysis that had to be kind of pulled together in some kind of integrated fashion, and to give them the relief they wanted.

So, I mean, there is an example of how we did use the risk for a very remote scenario and very specific, and so the risk in that very small window, which was only I think a day, if I remember the change, was not significant. So we granted the change.

CHAIRMAN APOSTOLAKIS: Adequate defense-in-depth is maintained. Did you have to do anything about that, or, again, save your --

MS. GILLES: Well, what we look at there is what -- one of the things that we're concerned with is the reasons they are requesting the change and what kind of operational changes are they anticipating based on the change. For example, one of the pilot changes was to extend the allowed outage time for the low pressure safety injection system. And the reason was to move some of the major preventive maintenance that they were doing at shutdown to being done on line.

CHAIRMAN APOSTOLAKIS: I remember that.

MS. GILLES: And so the types of things we would like to look at in those situations is the anticipated changes in your operational practices, do you

-- can they increase the likelihood of any of the accidents you had or introduce any new accidents? Are they making any changes that could be affecting defense-in-depth because you are going to change your operational practices based on this tech. spec. change?

CHAIRMAN APOSTOLAKIS: You would compare that against a decrease, the probability of accidents during outage? Or you couldn't do that?

MS. GILLES: Well, in the overall change, we do look at what the calculated -- what they gave us as the calculated increase in risk at power, and then they did provide us with some estimates of the gained risk at shutdown.

CHAIRMAN APOSTOLAKIS: But I remember the argument was that if you shift some of the activities from the outage time to this extended AOT, then the outage activities become easier to carry out, and so on. Is that the argument? How do you quantify that?

MS. GILLES: You can't.

CHAIRMAN APOSTOLAKIS: But it has to be part of your --

MS. GILLES: It has to be a qualitative --

CHAIRMAN APOSTOLAKIS: -- integrated decisionmaking.

MS. GILLES: It's a qualitative judgment.

MR. WOHL: The San Onofre people -- you see their safety monitor, they're extending that to a shutdown space now also by -- they only have to add a couple of sequences. They have been doing outage-type risk studies from the inception of Units 2 and 3, and some of the numbers they come up with are very comparable at shutdown to power operation. CEOG is getting -- they did a very weak analysis of the shutdown, so we don't put much faith in it. But it showed non-negligible --

CHAIRMAN APOSTOLAKIS: So we cannot quantify the decrease in risk due to doing less during outage. But we can quantify the increase because we are doing more of power? Yes?

MR. WOHL: Yes.

MR. JONES: And then, because the PRA is much better, is much more developed. I think that's -- there are not many shutdown PRAs out there to estimate the risk on. So you end up with qualitative arguments about having greater equipment availability during shutdown, which is clearly a benefit to you.

CHAIRMAN APOSTOLAKIS: In terms of equipment availability, I agree. But I think the fact that now people don't have to rush to do too many things, that's difficult to quantify. Isn't it?

MR. JONES: Yes. That is --

CHAIRMAN APOSTOLAKIS: Even if you had a good shutdown PRA, you would still have difficulty quantifying it.

MR. JONES: That's correct. And I think when you see some of these allowed outage times, we're looking at power even. They're looking to extend them so they don't have to go running around in a panic to try to get these things done in short periods of time. And there are benefits to that, which are impossible or near impossible to quantify.

CHAIRMAN APOSTOLAKIS: Are we addressing these qualitative tradeoffs at all in 10.61?

MR. JONES: Yes.

CHAIRMAN APOSTOLAKIS: We are?

MR. JONES: There are comments in there about qualitative effects in ALARA, and some other comments in there that could be considered in making your request for the changes. And I think it also shows up somewhere -- is it in the tech. spec. guide, too?

MS. GILLES: Yes.

MR. JONES: Yes. Thought so. So we have identified that.

But going back to defense-in-depth, let me just make another comment on that. Tier 3, which is basically when you have these extended outage times, and

therefore are controlling other risks and not getting yourself an odd -- other potentially more risk-significant configurations, I think that is effectively a defense-in-depth, PRA-based, to assure adequate barriers by limiting or restricting what other equipment administratively that you will not take out of service while in this mode.

And while that's somewhat covered by the maintenance rule, we are being more specific and making sure that's being addressed when we do these, so we maintain adequate defense-in-depth while in these extended outages.

MR. SHERRY: The reg. guide seems to imply in Section 4.3.2 that if you're moving maintenance activities on line that the applicant should provide an analysis for the reduction in shutdown risk and transition risk. And I was wondering why that would be needed if he can demonstrate that the increase in risk due to moving the maintenance on line is small and that the reduction in burden is sufficient to, you know, justify the change.

MS. GILLES: I guess it would be our preference to have the analysis for shutdown and transition risk. However, as in the case of the pilots at the time the analyses were done, which was now, you know, a couple of years ago, they did not have the models and we did accept their qualitative arguments.

MR. SHERRY: But I'm not even sure why you'd need that if -- because those types of analyses would simply demonstrate some reduction in risk. And if the licensee or the applicant doesn't feel he needs that to justify the change, you know, why are you going to require it?

MS. GILLES: Why wouldn't he provide that information if he had it? I mean, if I were a licensee, I would provide all of the information I had to justify a change.

MR. SHERRY: But if he doesn't have it, if he doesn't have a shutdown risk assessment, if he doesn't have the transition --

MS. GILLES: But, I mean, even if he has the qualitative argument that such is the case. I believe most licensees would make those.

MR. SHERRY: But in the reg. guide it says, "Models for shutdown mode should also be used." It doesn't seem to say anything in this particular section about qualitative --

MS. GILLES: Yes. It may not be -- I know we have those words in here. It may not be in this section, and perhaps we need to add those in this section. But I know we do have the words in other sections that qualitative arguments may be made.

MR. SHERRY: But what you're saying is it's not going to be a requirement for meeting the intent of the reg. guide that they need to submit an analysis --

MS. GILLES: A shutdown risk.

MR. SHERRY: -- for shutdown risk or a transition --

MS. GILLES: I don't believe we ever intended that that was a requirement.

CHAIRMAN APOSTOLAKIS: It seems to me we have a major hole there, and I don't know that we can fill it. It seems that qualitative arguments will be much more -- I mean, we spent the whole morning discussing the figure and whether it's 10^{-5} or whatever. And it seems to me the qualitative part of the analysis will be very important in a lot of these applications, and I'm not sure we spent enough time thinking about it.

I mean, in this case, we seem to have done a reasonable thing. But can one do more, give more guidance, or is it hopeless? You rely on the --

MR. JONES: Well, we --

CHAIRMAN APOSTOLAKIS: -- is more the reviewer?

MR. JONES: I think it's difficult to give more guidance in the general. I think in the specifics we're able to identify it much more focused. I think we

have tried to identify the need for addressing all aspects of the change. I think we have certainly signaled our intent that we would accept qualitative arguments, where appropriate.

I think we also signaled our intent that if it's a very complex change you're proposing, and it spreads across various systems and components you haven't modeled, a qualitative argument may be very difficult to be -- for us to bite off. So I think we have tried to recognize the spectrum of applications that are there and uses that we may have to face, and the inadequacy of scope, the simplicity of the change itself.

If the change is relatively simple, it doesn't seem to us to warrant a necessity of calculating in great depth the impact on the risk, if it can be argued.

CHAIRMAN APOSTOLAKIS: In light of all this, though, does it make sense to really spend a lot of time defining delta CDF? I mean, think about it. What we're saying here is that we can do a qualitative analysis, and then we have this gut feeling that that's a small change in risk. And then we're going to spend hours upon hours arguing about the quantitative part, simply because we can argue about it, and argue whether it's 10^{-5}, or 2 times 10^{-5}, or .9 of 10^{-5}.

Again, it is like the guy looking for his keys

under the lamppost just because there is light there. Just because we can quantify here, we argue forever what is a small delta CDF, when then, on the other side, we have the qualitative arguments, we have no idea what the delta CDF was.

MR. JONES: Let me say that --

CHAIRMAN APOSTOLAKIS: I mean, that's not a criticism. It's a --

MR. JONES: And I'd like to point out that Millard did make the point that in the applications we're looking at the delta CDF is above the guidelines that are in this document. And at this point in time, we have full expectation of accepting it and moving on, even though it's above the line or target or goal or guideline, or whatever specific phraseology we may have put in any of these documents along those lines. We recognize that there is that difference, and we are indeed using them as guidelines. And so we are accepting greater than the guidelines.

CHAIRMAN APOSTOLAKIS: But do you think if we decided to schedule a three-hour meeting on the qualitative tradeoffs we would be better off, or we would never get anywhere?

MR. HOLAHAN: I think if you did it in the context of specific applications, you would get somewhere.

If you tried to do it in the abstract, I think we wouldn't make a lot of progress.

CHAIRMAN APOSTOLAKIS: You may even get a figure at the end, right?

Anything else? Oh, yes, we have a few other -- adequate safety margins maintained. That was straightforward in your case.

MS. GILLES: Yes. It follows very much the discussion in the general reg. guide. We do consider things such as any applicable codes and standards, ALARA considerations, and --

CHAIRMAN APOSTOLAKIS: You were satisfied that the goals were not violated?

MS. GILLES: Right.

CHAIRMAN APOSTOLAKIS: That there were small increases. You made sure they were small.

MR. WOHL: In the case, for instance, of the ALARA application, the CE owners group, the safety injection tank requests us to extend the AOT from one hour to 24 hours. The one hour is not enough time to do anything. And they have been in situations where they had to rush so much trying to get something accomplished that they exposed personnel more than they would have liked, so that going to a 24-hour AOT makes a lot of sense.

CHAIRMAN APOSTOLAKIS: Now, what kind of a

monitoring strategy did they propose?

MS. GILLES: As I mentioned, in general, it is the maintenance rule monitoring that would be used to also address the types of issues that arise from these types of tech. spec. changes.

MR. HOLAHAN: And the tech. spec. surveillance tests.

MS. GILLES: Yes.

MR. WOHL: There is, I should mention, one sort of generic thing that we get in submittals from licensees about wanting to increase the amount of maintenance done on line. They say that they can use their own well-trained personnel. Therefore, the error rates are going to be a lot less; recovery rates are a lot better.

During outages, a lot of plants have to use a lot of contract personnel that are unfamiliar with the equipment. They might know the equipment at another plant and not so well at this plant, exceptions being Cowonney, which has had the same farmers working on the same equipment for 20 or 25 years. They know it very well, even though they contract personnel.

But this is kind of a generic -- again, a lot of these human considerations I think dominate the qualitative arguments, and they're very hard to quantify.

But they're, nonetheless, very real.

MEMBER SEALE: At least they're very persuading.

MR. JONES: And I think you heard them go both ways. Today Millard made the comment about using one crew to do the same thing all of the time, and arguably, the qualitative looking at that says that introduces some potential vulnerabilities you may not want to deal with. So go -- it has cut both ways in these reviews.

CHAIRMAN APOSTOLAKIS: And when do you expect a decision this? Is it something that's going to happen in the near future?

MS. GILLES: Yes, I believe so. A safety evaluation I believe will be written in the near future for the first two of the three changes.

CHAIRMAN APOSTOLAKIS: A couple of months? That near future?

MS. GILLES: Yes.

CHAIRMAN APOSTOLAKIS: Any questions? Any --

MR. JONES: And we do have to send that to the Commission first, Nan?

MS. GILLES: Yes.

MR. JONES: The Commission has asked to see that before it is issued.

CHAIRMAN APOSTOLAKIS: Who makes the decision,

by the way, you or the Commission, to allow -- I don't know.

MR. JONES: Well, I think since the Commission has asked to see it, I think that we make the decision but they are -- they want to look at it.

CHAIRMAN APOSTOLAKIS: It's a conditional decision.

MR. JONES: Yes.

(Laughter.)

MR. HOLAHAN: The normal license amendment reviews, some time in the future with guidance documents, would be done at the branch chief level and issued by a project manager.

CHAIRMAN APOSTOLAKIS: Any other questions or comments on this?

MR. SHERRY: Yes, one quick comment. In Section 4.2.2, item 1 says, "TS, AOT, and STI modifications should be supported by the overall safety benefit." Should I scratch "safety" there, so it conforms with general principle 6?

MS. GILLES: Say that one more time. I --

MR. SHERRY: That particular item seems to imply that only risk reductions or safety improvements are acceptable.

MS. GILLES: What we are looking for there is,

in addition to discussing the risk increase simply brought about by the quantitative analysis, we have asked them also to discuss the types of compensatory measures they would expect to take in those situations where they'd be entering an extended AOT, such as I think someone mentioned not -- in the case of a diesel general, not performing switchyard maintenance. We would expect them to discuss, in the cases where it was applicable, the benefits they might be gaining by moving maintenance from shutdown arena to a --

MR. SHERRY: But that's not necessarily a safety benefit, right? There may be an economic benefit?

MS. GILLES: No. I believe we're looking at the safety benefit. We believe, in the case of the low pressure safety injection, there is a safety benefit by moving the maintenance from shutdown when you need that system for shutdown cooling, you know, for the majority of the shutdown cycle to at power, where you typically do not need that system. And we believe that's a safety benefit.

MR. SHERRY: But does the modification to the AOT or STI require that it be supported by the overall safety benefit, or just the overall benefits, both economic, safety, whatever?

MS. GILLES: We are not looking for a simple economic benefit for approving the changes. I believe it

was a conscious decision to put the word "safety" there.

MR. SHERRY: So even if this is --

MR. JONES: If I could, I think based on the principles, we will allow small increases in risk. And I think a fair reading of these words is that we are requiring risk reduction, and that's not required. So I think we probably want to look at these words a little bit.

I think what we're really talking about here is we want to understand the total implication of the change. So if the change is to move it from shutdown into at power, there is a positive and a negative attribute to that. We want to understand the positive attributes also. But the positive does not have to outweigh the negatives in order to get the change.

MR. SHERRY: And the positive can be qualitative arguments like --

MR. JONES: Positive can be qualitative argument. I think in this area it's a lot -- there's a lot more room because the changes are so small. But I -- I mean, but that's basically what we want. So, yes, it doesn't require an overall safety benefit.

CHAIRMAN APOSTOLAKIS: Gary?

MR. HOLAHAN: I just wanted to make one comment, and that is that I think your asking about how

the principles worked out in these cases is a good idea. And I think also this is probably typical of a lot of the cases, and that is that they seem almost trivial. That we spent a lot of time thinking about, I mean, what are our really principles, and what are we trying to preserve? And then when you go to an actual application, you find out that most of those principles aren't really very threatened or challenged for most of the changes that we're talking about.

But to me that doesn't mean that it was a trivial exercise. I think it's very important for the staff and the industry and the public and everybody to understand that, you know, there were checks in this process to make sure that the important principles we have haven't been violated. And the fact that it was easy to say, "That one is okay. That one is okay," to me doesn't -- is not contrary to the value of that exercise.

It was still an important piece of the exercise and to understanding that these changes, you know, really made sense. And even though some of the answers were easy, I think they were important in saying this is okay.

CHAIRMAN APOSTOLAKIS: Any other comments from the members? From the audience?

Okay. Thank you very much.

As it turns out, we have some time now and we can't really do anything today that was scheduled for tomorrow. So what I propose is that we take a break, and then we come back with the staff, if we want to discuss any general concepts or problems or issues, so we will not have as much to discuss tomorrow. You know, we have 4:15 to 7:00 for general discussion. Maybe we can start that today. And I propose that we come back at 3:35 or so.

(Whereupon, the proceedings in the foregoing matter went off the record at 3:24 p.m. and went back on the record at 3:41 p.m.)

CHAIRMAN APOSTOLAKIS: We're back in session. So what do you want to discuss?

MR. HOLAHAN: Well, I would like to discuss what are the issues and what are the options so that we can help come to some -- at least an understanding of where we agree and where we don't agree and how to deal with those.

And if we can start doing that, I think it will be helpful -- and your writing a letter, if you choose to, or us deciding how to make revisions or not.

CHAIRMAN APOSTOLAKIS: Okay. Well, one way to do this is to go around the table and see whether any issues -- or, do I have any volunteers?

Tom?

MEMBER KRESS: My major issue is whether or not the definition of LERF actually captures the quantitative health objectives. And that's the major one.

CHAIRMAN APOSTOLAKIS: Captures -- I'm sorry, captures what?

MEMBER KRESS: Captures the quantitative health objectives. And that's the major one I have with it.

MR. KING: Your concern is that it's not restrictive enough or too restrictive? It's de facto new goal or --

MR. HOLAHAN: Or different.

MEMBER KRESS: Different. I don't think it captures quantitative health objectives.

MR. KING: You mean it's not restrictive enough?

MR. HOLAHAN: Too restrictive sometime, not restrictive enough others.

MEMBER KRESS: Yeah, I think it -- there is not a one to one correlation between that definition and the actual risk. And it's possible to use that definition, but I think you'd have to be careful to differentiate the value that you use the criteria for BWR's versus PWR's.

MR. HOLAHAN: Or we could do it as scrubbed

versus non-scrubbed releases.

MEMBER KRESS: Yes. And that's where I see the difference being.

MR. HOLAHAN: I see what's happening is -- what we did is, to avoid the years of discussion as to what is a large early release by, you know, trying to figure out something that looks like a dose calculation and make it simpler by saying core damage and containment failure -- but by having done that, it's -- you're saying it's not a close enough surrogate to --

MEMBER KRESS: You don't capture it quite --

MR. HOLAHAN: You don't capture quite enough.

MEMBER KRESS: And I like the thought of doing that, but I don't think it captures QHO. And --

MR. HOLAHAN: However, --

MEMBER KRESS: Well, I did like the general approach; and regardless of what George says, I liked your figures. And you know, I think you could put the fuzziness in the language. You already discussed change in the distance and meeting current regulation and focusing more on the change, so that would --

But that's really all I -- the major problem I had.

CHAIRMAN APOSTOLAKIS: Okay. Any other volunteers?

MEMBER FONTANA: We didn't get to the appendix, an approach for estimating the frequencies of --

CHAIRMAN APOSTOLAKIS: Okay, you want to do that now?

MEMBER FONTANA: Well, I don't know if it's really worth getting into. I don't know how far you're going to carry this, because you've already said that you're reevaluating or redoing that.

MR. JONES: He isn't here. My understanding of this appendix is effectively -- I'm not aware of any changes being made to this appendix. I think the way it petitions it into low and high categories on consequences, we would only be working with the highs in comparison to LERF.

So I think the issue of scrubbed versus un-scrubbed, I think implicit in this is we're only particularly worried in the boilers for un-scrubbed releases. I'd have to rego through the trees again to make sure that's -- there's a lot of double negatives, so I'm not sure I understand sort of this up/down's, but --

MEMBER FONTANA: The trees look pretty good. I just have some problems with, for example -- well, take Appendix page three, question -- question four, restore ECC, restore before vessel breach. Take the second paragraph -- credit for in-vessel will only begin for

cases where recovering AC powers lead to restoration of ECC within 30 minutes of the onset of core damage.

For example, no credit will be given for an operator manually depressurizing a reactor using a low pressure system between core damage and vessel breach. If cooling is restored within 30 minutes, the possibility of success will be .1. If cooling restored after 30 minutes, the probability of success assumed to be zero.

Well, you know, that's pretty arbitrary. On Appendix page four, on high pressure sequences, -- no, I don't want to go through item by item, but it seems to me -- you know, looking at the rough containment event tree, you know, that looks pretty good. It's just that some of the criteria seem to be awfully -- kind of hokey.

As a screen, I think it's probably okay. But to make decisions on it, it would be a lot nicer to do a more in depth analysis.

MR. KING: But in terms -- the concept of putting something in the reg. guide that allows someone who has not done a Level 2 PRA to extrapolate his analysis to get a LERF value, you don't have a problem with the concept that's more detailed --

MEMBER FONTANA: Well, I have a little bit of a problem of doing though -- trying to do a LERF on the basis of a Level 1 PRA -- trying to extend that kind. You

know, that's -- I think the concern is there's -- I think the concern is that doing a Level 2 PRA would be too much of a load on people and they won't do it.

But I'm not so sure that --

MR. HOLAHAN: Perhaps one way to --

MEMBER FONTANA: You have a big question mark.

MR. HOLAHAN: Yeah. Perhaps one way to think of the appendix is, as you suggested, as a screen. That is, if it says LERF -- delta LERF is very small, then that's okay. If it says it's, let's say, in the question mark regions, you might not want to use the simplified approach for a change that's that large.

And you might either require compensatory measures or reject the proposal, or say that, you know, a detailed Level 2 analysis is required and -- you know, for that sort of case.

So maybe we could find a way of using it as a screening tool as opposed to as direct input to a decision criteria.

MEMBER FONTANA: Now, I haven't checked, but some of these screening things here like more than 30 minutes is zero, less than one -- does that tend to be on the conservative side -- conservative kind of break downs?

MR. HOLAHAN: Do we know who --

MEMBER FONTANA: We don't have to get into it

in --

MR. GOODMAN: This is Jack Goodman from the Office of Research. The experts who came up with these are basically the Level 2 experts from Sandia and Brookhaven National Laboratories, and they're not with us at this point. They were not intended to be exact numbers. They've intended to be screening criteria.

And if you'd like some additional information and to go into greater depth into the details of that, we'd be more than happy to provide this at a later date.

MEMBER FONTANA: Well, I'm not sure we want to do that. The thing is, in these expert's point of view, are these break points -- tend to be conservative. If they drive you to the part of that diagram where you'd have to do more work, it's okay with me.

MR. GOODMAN: Why don't we try and find out and get back to this tomorrow with -- talk to the people who put it together and get some feel as to whether it drives you toward a conservative or a --

MR. GOODMAN: Those are conservative numbers. For those -- to be applied in terms of if you have a Level 1 PRA and you do not have a Level 2 to try to assess, do you need to do a Level 2 PRA or not. If you can go through his matrix and say hey, I can pass it; then fine. Otherwise, the decision may be that you have to do a more

detailed analysis.

The intent is to be a screening test.

MEMBER FONTANA: Thanks.

CHAIRMAN APOSTOLAKIS: Dana?

MEMBER POWERS: Well, I think we have to come back to this issue of what is the CDF and what time period does it cover. I think there's similar questions with LERF, but CDF is easier to handle.

Is the CDF a number for just power operations, or does it cover all modes of operation? And is it strictly an annualized thing, or is it a criterion that the -- that must be met at all times?

MR. HOLAHAN: Well, I think that what we're dealing with is mean values. They're annualized in the sense that they're considering a -- you know, for a full reactor year. And that in terms of scope, whether shut down is included or not, I would say in Region III, yes; and in Region II, no.

MEMBER POWERS: Why -- there must be a reason.

MR. HOLAHAN: Well, first let me also explain -- if the change that's being proposed would affect shut down or fire or something, then I think we would say that needs to be addressed. Okay, but if it's a change in something else and then there's a question about what scope the PRA could be used in addressing it, what we've

said is in order to use the part of the region where you have a -- I don't want to say relatively large, but somewhat substantial increase relatively close to the goal, we're looking for a full scope PRA because leaving things out could very well move you out of that region.

CHAIRMAN APOSTOLAKIS: Full scope means including shutdown?

MR. HOLAHAN: Full scope means including shut down. Okay, what we're saying is -- and this is judgementally that if you are below what we would say half an order of magnitude away from the goal, 3×10^{-5}, and even though you left things out, there is, you know, less likelihood that the things you didn't analyze would push you over the goal, so we would allow its use in the beta region.

MEMBER POWERS: I guess I'm sitting here gaping like a fish actually because I say gee, has anybody done a full scope Level 1 analysis that would allow you to make that judgement?

I mean, I have no basis for contesting your judgement; but I'm not sure you have a basis for drawing your judgement either.

MR. CUNNINGHAM: There are a couple of -- you know, the low power and shut down PRA's that the staff sponsored are two examples. There's some of the others.

Does it -- you know, as Gary said, we kind of characterize it as half an order or magnitude because that's with about the precision that we want to even try to characterize this.

You know, you see in those PRA's -- at least in a number of them, anyway, the answer is the core damage frequency from shut down is roughly comparable to that from full power operation. So there is -- this isn't inconsistent with that, but it's -- but just recognize it's a real imprecise cut at this, if you will.

MEMBER KRESS: Is that true for all CDF's?

MR. CUNNINGHAM: Sorry?

MEMBER KRESS: You seem to be extrapolating that from a specific CDF for those two plants to any CDF, that it would be about the same order of magnitude. Is there some justification for that?

MR. CUNNINGHAM: It's not a strong justification other than the ones we've seen have been of that magnitude.

MEMBER KRESS: Dana, your question revolved around deciding where you were on that --

MEMBER POWERS: Well, I mean, I have two questions here. I have -- my first question is, what do I have to do to calculate -- to find out where I am on a horizontal axis.

MEMBER KRESS: To see where you are on that line, yes.

MEMBER POWERS: And then I think it's relatively doable. And then I've got a second question, which is -- is one that I think is more debateable. It may be even a policy question. And that is, suppose I am in a shut down mode of operation for 45 days, and my instantaneous core damage frequency, if I were to stay in that particular mode of operation for an entire year, is 10^{-2}.

Well, because I get to divide it by 12 -- or say it's 10^{-3}, I get to divide it by 12 -- then I'm down below 10^{-4} on an annualized basis. Is that what we want, or do we want them to be below 10^{-4} at any time that I would care to look at that -- have a rate, the core damage frequency rate?

I mean, these are hard numbers such that when multiplied by 365 days, I get some number less than 10^{-4}. I mean, those are two distinct questions.

CHAIRMAN APOSTOLAKIS: The first question about the order of magnitude of the shut down, risk contribution, I think the industry has done some PRA's. I think Seabrook -- didn't PLG do a --

MR. HOLAHAN: Yes.

MR. CUNNINGHAM: There have been a few, yes.

CHAIRMAN APOSTOLAKIS: And the French -- did the French do --

MR. CUNNINGHAM: The French did one more limited than ours.

CHAIRMAN APOSTOLAKIS: But PLG --

MR. CUNNINGHAM: It was probably comparable to what we did.

CHAIRMAN APOSTOLAKIS: And they found that the contribution again was roughly the same?

MR. CUNNINGHAM: I think it was, yes.

CHAIRMAN APOSTOLAKIS: So --

MR. HOLAHAN: The staff has recently redone the shut down PRA to go along with the proposed shut down rule that you'll see in the near future. I don't remember exactly what the dates are. And it's a little bit complicated as to how do you do the analysis and how much credit do you give for voluntary programs.

Because this is not just a PRA to figure out where you are. It's also -- it's a regulatory analysis to figure out what should be required. And I would say my recollection is that the core damage frequency numbers are in the range of 10^{-4} to 10^{-6}, depending upon what assumptions you use.

They're 10^{-4} if you assume that licensees are not going to voluntarily continue to do the, you know,

improved practices they've put in over the last few years. But they could be as good as 10^{-6} if your -- if they're really cautious about how to handle the few problematic things that happen during shut down.

CHAIRMAN APOSTOLAKIS: And if I could expand the question -- again, as we approach the vertical line from the left, then we have to worry about what's left out as well, not just the shut down condition -- what's not modeled by the PRA.

Well, let's stick to a definition of CDF.

MEMBER POWERS: Well, you have also the problems of external events to consider here.

MR. HOLAHAN: Well, I think a lot of your comments go to the question of should there be, in addition to the sort of average CDF concern, an instantaneous limit which is --

MEMBER POWERS: That question, yes.

MR. HOLAHAN: -- that's in -- it is addressed in the EPRI guide. We've thought about it. We don't currently have a limit. I personally am a little bit less concerned about that because I think it's pretty hard to get high instantaneous values while you're preserving the safety margins and defense in depth and meeting the principles that we've got.

CHAIRMAN APOSTOLAKIS: No, but that implies

that all the principles apply at all times. We have never said that, did we?

MEMBER POWERS: I think the principles they articulated do apply at all times. But on the other hand, --

CHAIRMAN APOSTOLAKIS: Yeah, well --

MEMBER POWERS: -- I'm told by those who claim to know about these things that one can calculate that there are times when core damage frequencies calculated for a given day go up 10^{-2} and higher.

MR. RUBIN: Well, we've had -- this is Mark Rubin. We've had programs going developing methodologies looking at configuration of risk at one of the labs. And the industry has also been very active in doing it. And, as you pointed out, very large swings on a day to day basis can take place. It's implicit in the tech spec LCO's that your normal levels aren't the same.

But having said that, it's still very important that you do control the magnitude and the time durations of those risk spikes. Should there be a different criteria for temporary versus permanent? Well, we're working in that area now. But clearly, from operational experience, you see a lot of variation.

And if you start with the plant having nominally 10^{-4} CDF given the assumed maintenance

unavailabilities, you take things out of service over the year, it is going to go above that, sometimes by quite a bit. But how much quite a bit is acceptable, we have to work on -- develop further criteria on.

MEMBER POWERS: I think that in formulating advice to the Commission, either directly pertinent to this issue or our general advising of the Commission on the issue of safety goals, we're going to have to bring this question to their attention. And we're going to have to offer some sage words on this.

Certainly the approach that was adopted in the tech specs for this -- very interesting approach how they went about getting their number. They got their number by looking at the regs as they stand now and saying what's the -- I know this wasn't invented based on risk; but if it were, what would be the risk criterion that it was based on.

And so they worked backwards to get the number. I thought that was very clever myself. And since you have to draw a judgement some way, that was as good a way to draw a judgement as I could think of offhand. Unfortunately, I think if you apply it to shut down, you come up with some very big numbers.

CHAIRMAN APOSTOLAKIS: That's why I thought we should have a discussion of this subject, because -- I

mean, there was some rationale behind what they did, but I'd like to understand it better and its implications.

MEMBER SEALE: Should we ask or should we perhaps think about whether or not you want a statement in this guide that stressed the applicability of the principles at all times since it's kind of an afterthought here or --

MR. HOLAHAN: Well, it's a fair issue. I don't think it's an afterthought, because we did identify it in the first draft. We just haven't figured out what to do with it. I was asking Bob, and he pulled out the EPRI guideline. And they effectively have a 10^{-3} instantaneous --

CHAIRMAN APOSTOLAKIS: It's not instantaneous though. Let's not use that word. It's not instantaneous.

MR. HOLAHAN: It is the value which, if it existed for a while year, would contribute --

CHAIRMAN APOSTOLAKIS: It's an incremental kind of thing, but it's not --

MR. HOLAHAN: No, it's a rate.

CHAIRMAN APOSTOLAKIS: I don't think it's --

MR. HOLAHAN: It has the units of per year.

MR. JONES: The way this is written is take the configuration that -- whatever this temporary configuration is, assume it existed for the year, what

would your risk be. And it's a 10^{-3}, so --

CHAIRMAN APOSTOLAKIS: So it's still an average.

MR. JONES: Yeah. And then they have -- similar to what you heard in the tech spec discussion, they do have an incremental core damage probability set of limits also which, in what they call non-risk significant, is 10^{-6} as opposed to 10^{-7}.

CHAIRMAN APOSTOLAKIS: What page is that?

MR. HOLAHAN: This is in the EPRI PSA applications guide. This is not -- this is page 4-9.

CHAIRMAN APOSTOLAKIS: 4-9?

MR. HOLAHAN: 4-9.

CHAIRMAN APOSTOLAKIS: See, the CDF we're calculating standard PRA's average over time, over lots of things. So I think the real question is could you tolerate an average core damage frequency which is very high for a very short period of time.

That's really accurate statement. Now if you multiply it by that time, then you get an average probability that something may go wrong in that interval. But it's still average. It's not -- instantaneous would mean that you take exactly the configuration that you have and the condition of the equipment, and you do the probablistic calculation, which we don't do.

We still assume explanation of distributions, we sti'l assume average lambdas. That's what I mean, that it's really an average in that sense. It's just that it's for very short periods of time.

MR. HOLAHAN: I think it is instantaneous in the sense that when the calculations are done, you don't assume average unavailabilities. You look and see what equipment is in service and out of service.

CHAIRMAN APOSTOLAKIS: For the whole plant?

MR. HOLAHAN: For the whole plant. Now, you are using average reliabilities for the things you don't know.

CHAIRMAN APOSTOLAKIS: That's right.

MR. HOLAHAN: But for things that you do know, --

CHAIRMAN APOSTOLAKIS: Yes.

MR. HOLAHAN: -- you put in the -- what's known in service and what's known out of service.

CHAIRMAN APOSTOLAKIS: It's a different configuration.

MR. HOLAHAN: Yes.

CHAIRMAN APOSTOLAKIS: But still the calculation is an average frequency in the sense that the probabilities are average. It's not instantaneous. So that's the real question. How high can that be in a short

period of time?

MR. RUBIN: It might be worth pointing out that --

MR. HOLAHAN: Well, what I would say is what we know is that the instantaneous value is zero. Because in that instant, the core hasn't melted.

CHAIRMAN APOSTOLAKIS: Yes, yes. Mark?

MR. RUBIN: Oh, I was just going to say that earlier versions of the EPRI applications guide had a 10^{-2} value as a possible upper limit for most -- for temporary situations. And after some discussion, it came down to 10^{-3}.

There's always an uncertainty on restoring equipment. And the maintenance planning cycles assume what those return rates are. And if you can't achieve them, you could end up in a very high risk rate and have not many options. So the points that have been brought up are certainly valid, that it needs to be controlled and looked care carefully.

CHAIRMAN APOSTOLAKIS: Is this, in your opinion, Dana, something that is a showstopper here? Or is it something that the staff can think about while the reg. guides they have developed so far can be leased and so on?

MR. HOLAHAN: Or is it a good subject for

public comment?

MR. KING: Which is the way we're handling it now.

MEMBER POWERS: You have explicit questions in this regard?

MR. KING: We can do that.

MEMBER POWERS: You know, I guess if you had asked me six weeks ago about whether you should go out and just solicit public comment, my reaction is not without -- not without a lot more way to guide that public comment. But maybe now, I tend to say well, why not. At the very least, that adds fuel to a debate which has an inherent subjectivity to it.

And so, I guess I don't have any terrible trouble --

MEMBER KRESS: I think Dana's put his finger on it, that this is inherently a subjective issue. It's just like picking the quantitative health objectives. And if you want to talk about short time limits on it, I don't think there's any way you can sit down and make an analysis and derive that number

CHAIRMAN APOSTOLAKIS: No, no; it's a policy issue. You're right.

MEMBER KRESS: That's a policy issue. And I think we just have to

MR. HOLAHAN: But you can derive some of the numbers and look at the implications and look at how consistent it is with other decisions.

MEMBER KRESS: And that's what the QHO's --

MR. HOLAHAN: For example, we have lots of known situations that look like -- that produce instantaneous concerns. And technical specifications -- you know, taking one piece of equipment out of service -- you say well, that produces an order of magnitude increase, so you're -- probably that gets you, in the worse cases, from 10^{-4} to 10^{-3}.

Most technical specifications, when you take redundant -- both pieces of redundant equipment out of service, require an immediate shut down. And that immediacy is so short -- you know, such a small fraction of the year, that I think it basically says that those configurations are not tolerable. And that sort of sets the boundaries.

CHAIRMAN APOSTOLAKIS: So what you're saying is that is already a de facto acceptable risk from these configurations.

MEMBER POWERS: Well, that's certainly what the people in the tech specs did was they said de facto, there's something hidden here. It's just that at the time the people did it, they didn't understand --

CHAIRMAN APOSTOLAKIS: That's right.

MEMBER POWERS: They understood risk just fine. They didn't understand how to quantify it. But they effectively did that, and so they back calculate it. And it might be interesting to see if you back calculate it, what numbers you came up with.

MR. JONES: It's about 10^{-3}. I did it when we had the conversation. And it's roughly -- they said a five hour repair time was the assumption. That's a standard repair time. If you use that number and the 5 x 10^{-7}, it basically means that that configuration risk can be on the order of 10^{-3}.

CHAIRMAN APOSTOLAKIS: But I might point out that there is nothing sacred about it just because we've been doing it that way when we still decide to change it.

MR. JONES: No, I understand that. I'm just saying that that -- just to give you the basis for the numbers, it's what that basically works out to be. Now, I would -- I did want to make one comment, and I don't want to seem like I'm sloughing off the comment you made, Dana.

It's -- when we wrote the general reg. guide, we were looking at very permanent changes to the licensing basis. So we were looking at something that we felt would be -- you know, through the plant, impact the risk and would be dealt with in its normal -- just like you deal

with any other risk change.

That was one of the reasons why this draft took out temporary, because we said it didn't apply to the type of changes we were dealing with. When we thought about tech specs, we said those are temporary. And so, the approach we used happens to be the 5×10^{-7} CDP kind of thing to deal with this kind of an issue, which is -- again, we thought that was sufficient for the interim.

If we got an application in this area, we would have to deal with it. But at this point, we didn't think that the telegraph we're sending out for the change to the licensing basis -- permanent changes basically -- didn't need that guidance at this point.

MR. HOLAHAN: I think this would become a huge issue if we decided at some point in the future that we didn't need technical specifications. All we needed was risk informed configuration management. Because I think what you have now is controls -- individual controls on the redundancy of equipment for the most important equipment in the plant.

And it probably puts a cap on what, you know, risk situations would be allowed.

CHAIRMAN APOSTOLAKIS: One thing that makes me a bit uncomfortable is that we are placing probabilities at any level -- requirements and limits -- when we don't

know what else to do. And again, that principle of setting criteria at as high a level as possible, I don't see it followed, like, you know, when we -- they presented the tech spec thing, they said -- you know, I think they said for each component, the probability should not be --

MR. JONES: For each AOT.

CHAIRMAN APOSTOLAKIS: For each AOT. Why for each one? I mean, why not for something else at a higher level? I mean, --

MR. JONES: It was temporary. It was a decision you make on that given change. And then they had the other controls for the tier two, tier three. And they're saying that AOT's -- while we're allowing the change, AOT's are something that are somewhat periodic. But they're still relative in a short time as a whole, so they don't integrate to a whole lot.

And that's why they've done it that way. And with the configuration controls, that was felt to give you a good enough set of controls. And that's why you don't have that same content.

However, if you did a lot of on line maintenance and if it affected equipment availabilities, then we would anticipate and expect -- and maybe even the right word is demand -- that the baseline risk profile for that plant, if that's what they're doing, should reflect

that operation.

MR. RUBIN: For a number of the pilot programs, the issue of the impact of configuration states on short term risk spikes is going to be factored into the decision process. So it is being considered to that degree. It's also worth pointing out that these techniques are very effective at managing the configuration of risk states; and in fact, is being used quite effectively by the industry; and is also an element in the maintenance rule follow up inspection program looking at the techniques they're using to assess the safety impact of taking equipment out of service on line.

So it's being very actively looked at, pursued, and it's evolving.

CHAIRMAN APOSTOLAKIS: So again, maybe it's obvious to you guys, but what kind of flexibility are we giving to the licensees with this? Let's take the tech specs. What is the flexibility? What kind of -- I mean, they request an extension of the AOT, and we grant it, say, --

MR. HOLAHAN: Right.

CHAIRMAN APOSTOLAKIS: And that's it.

MR. HOLAHAN: In effect, what I see is -- in tech spec area, and probably in a lot of other areas, what we're talking about is searching out those pieces of the

regulations which aren't accomplishing much with respect to safety and where there's some value to the licensee which justifies the cost of the analysis -- I mean, those will be -- those can be changed.

So, I mean, we talk about 10^{-5} changes and maybe letting them -- a few times 10^{-5}. But in large part, I think that's -- we're going to be dealing with smaller changes than that because there are probably many things as regulatory requirements now that aren't accomplishing very much.

And to find those and to minimize their impacts is what I think a lot of these applications will be.

MEMBER SEALE: Gary, this is going to be a pretty busy candy store, isn't it? I mean, --

MR. HOLAHAN: Perhaps.

MEMBER SEALE: -- at least all these tech spec changes and so on.

MR. HOLAHAN: Yes.

MEMBER SEALE: And I would imagine there are going to be quite a few of those. And there's going to be similar things in other areas as well.

MR. HOLAHAN: Yes.

MEMBER SEALE: We have a set of preconceptions that have been very influential in guiding what we think

goes in this map or whatever else we put together and so on. And yet, when we heard about the one this afternoon, we found that the bottom line was it was bigger than that.

And perhaps even more intriguing to me was the fact that the risk rather nimbly moved out of the operating into the shut down regime in the sense that you accepted a slightly higher risk on doing certain things or not doing certain things -- no, in doing certain things during the operating regime so that you had the availability of equipment to reduce the risk during the shut down mode.

I wonder if it wouldn't be very worthwhile to think about it a little bit and try to come up with a way of keeping score on these individual cases as we go along and to try to check out intuition against the accumulation of reality as you go through all of these; and perhaps we could learn a little bit about how well we understand the case.

But more than that, I think it would be useful also to tell us, you know, has this exercise been worth the incredible investment that's gone into it to now and in the future. You know, that doesn't help us right now, except that if there are things we could do that could help us keep score, we might want to do that if it doesn't represent any significant increase in effort for anybody.

It just strikes me that might be something we'd like to know.

MR. HOLAHAN: I believe somewhere along the line we made a commitment to the Commission to keep a data base or something of changes granted through this sort of process.

MEMBER SEALE: But, you know, we see here in this one case that there's some really interesting things going on in the process.

MR. HOLAHAN: The part that would be interesting, I think, would be to learn from the individual reviews what you want to change in the regulations so that if you do one or two reviews and then you don't want to do the other 23, you may be better off to make a change in the regulations, or in the regulatory guidance document, or in the standard technical specifications.

MEMBER SEALE: And that's another way to --

CHAIRMAN APOSTOLAKIS: So it seems to me that with the current series of case studies -- let's call it another way -- the real benefit of performance based regulation would not be realized. We would remove, as Gary said a few minutes ago, the unnecessary burden where it's obvious and some analysis demonstrates that.

But the real benefit of establishing

performance criteria to a certain level and then tell the licensees use the method of demonstrating that you met them -- and I was relieving them now from other burden -- would not be realized. And that's fine. I mean, as long as we appreciate that fact.

And later on, when we address the larger question of risk informed and performance based regulation independently of applications, then we may address that.

MR. HOLAHAN: I think realistically, you know, we're setting out some guidelines and we're calling for performance monitoring and treating this as being very important. But if you look at the applications, whether it's graded QA or reduced tech spec requirements, what we're doing is we're talking about performance monitoring of the least -- the very least important equipment in the plant.

CHAIRMAN APOSTOLAKIS: Yes.

MR. HOLAHAN: Okay, and so I don't think that aspect of it is going to be tested very stringently.

CHAIRMAN APOSTOLAKIS: Now, do you think that we may start thinking about the other larger issue in a year or six months from now, or is that way into the future?

MR. HOLAHAN: I think that depends on the Commission's decision on the strategic assessment.

CHAIRMAN APOSTOLAKIS: Okay.

MR. HOLAHAN: This is a decision issue -- what's the name?

CHAIRMAN APOSTOLAKIS: 12, I think. Issue 12.

MR. HOLAHAN: Issue 12. Yeah, how fast do you go in searching out these kind of activities.

CHAIRMAN APOSTOLAKIS: I think we're going to discuss it with them on the 6th of December -- yeah. Now, I have another question coming back to the issue of shut down and other modes that I think is related to that in the sense that it deals with a contribution to risk that is not one -- has not been quantified.

Addressing the issue of the completeness of the PRA, we keep talking about it -- what's left out, what's left out. So, how close should we come -- or should we allow ourselves to come to the 10^{-4} vertical line given that we know that the PRA is incomplete? And do we have any basis?

I mean, yeah -- but you still allow me to do a detailed PRA gamma. If I do that, would you allow me to hit 10^{-4}? See, that's the question. I do it full blown. I do the shut down, I do external events, I do everything you want.

MR. HOLAHAN: Full scope, but still recognizing there's still things you don't know until --

CHAIRMAN APOSTOLAKIS: Exactly. There are still things that I have not quantified and --

MR. HOLAHAN: Sure.

CHAIRMAN APOSTOLAKIS: -- they're outside. And as somebody said this morning, we are constantly surprised, --

MR. HOLAHAN: Yes.

CHAIRMAN APOSTOLAKIS: -- although the level of surprise keeps going down, I think.

MR. HOLAHAN: Well, we're not always surprised in the bad direction.

CHAIRMAN APOSTOLAKIS: Yeah.

MR. HOLAHAN: There's some balance of surprises.

CHAIRMAN APOSTOLAKIS: That's correct.

MEMBER KRESS: There's one school of thought that the 10^{-4} choice already incorporates that uncertainty.

CHAIRMAN APOSTOLAKIS: Well, if that's the case, let's state it in the open and say that yes, everything we can quantify can go all the way up to 10^{-4}. The problem is, the methodology keeps improving. So let's say now, in an ideal world, that a year from now we can quantify the impact of management and organizational factors.

If that is true -- if what Dr. Kress just

said, we should move that line to the right.

MEMBER KRESS: Or maybe there should be some uncertainty confidence level.

CHAIRMAN APOSTOLAKIS: At this time though, what kind of margin would you be comfortable with, or you wouldn't mind going as close to 10^{-4} as possible?

MR. HOLAHAN: This guideline says you can go all the way up. Well, we did have -- remember, we had a -- no, there was -- the CRGR, we had the argument that said well, really, if you get within -- past 9×10^{-5} --MEMBER KRESS: You're not going to get any further.

MR. HOLAHAN: Then the next step would take you over the line, and you wouldn't really want to do that. But aside from that, if you really had, you know, felt that everything that was -- that you knew how to model could be - was modeled appropriately for the decisions you were making, I think you go -- that's what the analysis says.

You go up to the limit -- excuse me, guideline.

(Laughter.)

CHAIRMAN APOSTOLAKIS: Well, there you are. There you are.

MEMBER FONTANA: This is shades of ECCS. When you go up to 2,199, you're okay; and if you're 2,200 --

you spend $2 billion dollars on research for something they should have had a more acceptance band in that. That's where you need to be careful. That 10^{-4}, I think we just got used to the number over the years.

CHAIRMAN APOSTOLAKIS: So you answered -- just answered the question of this morning, whether you want to say something about not only the rate at which you approach the limit, but also where you are.

MR. HOLAHAN: Well, I think the problem with trying to refine it more is that if you're trying to define regions close to this limit, you get into even more difficulty of trying to be precise in a region that you don't want to be too precise. But do you really want to treat .9 different from one?

CHAIRMAN APOSTOLAKIS: Don't we have a logical problem there, though? I mean, if the QHO's and the subsidiary goals are assumed to apply to all modes and all things considered, --

MR. HOLAHAN: Yes.

CHAIRMAN APOSTOLAKIS: -- then we have a problem if we -- part of the things considered.

MR. HOLAHAN: No, I only have that problem if I assume that the things I don't know have a negative impact -- have a net risk increase. The things that you don't know, you know, could very well make some things

better and some things worse.

CHAIRMAN APOSTOLAKIS: Well, that's kind of --

MR. HOLAHAN: You're not saying that because I know I'm this close, then I necessarily know I am really over. I don't think that follows. It might be true, but there's no way to say that.

MEMBER FONTANA: If you look past experience, you know, over the years that people have done PRA's and found something they hadn't thought of before, that hasn't always been negative, has it?

MR. HOLAHAN: No.

CHAIRMAN APOSTOLAKIS: Actually, in real life, the Browns Ferry fire --

MR. HOLAHAN: In real life, the TMI core was still in the vessel. Okay, I mean, we continue to learn that all things are not always as bad as your analysis says.

MEMBER FONTANA: That was a Level 2 analysis.

MR. HOLAHAN: In that case, Level 2.

CHAIRMAN APOSTOLAKIS: So what you're saying is that there is really this unknown territory there. I don't know whether it's bad or good or neutral.

MR. HOLAHAN: Right. However, I'd like Mr. --

CHAIRMAN APOSTOLAKIS: I might as well do nothing about it.

MR. HOLAHAN: Right. Since I'm a little more optimistic than Mr. Murphy on the subject, I'd really like to have a little broader view of the staff expressed.

Mr. Murphy, you have a view on how big our unknowns/knowns are?

MR. MURPHY: I can remember being asked that by this committee many years ago when Dr. Okrent asked me for a list of the things I hadn't thought of yet.

(Laughter.)

I still have as much list of this -- luck at presenting this list as I did then.

I want to emphasize a point that Gary made. It's not really answering the question he asked me. But if you look at the difference between NUREG-1150 and WASH 1400 on the Surry plant analysis, we found out that after WASH 1400, we had left out a major contributor -- the reactor coolant pump seal.

And that changed the frequency of small breaks by a substantial amount, and basically caused a significant increase in what, for that kind of sequence, you would have for core damage. Yet, when we got done with 1150, the final number was slightly lower than it was in WASH 1400.

And the reason was that while we had that one feature that we had not included because we didn't

recognize the significance of it, that drove the number up. There were a whole bunch of other things that had to do mostly with operational practices, and there were a number of small things that drove the number down.

So the history -- at least that one data point would indicate that they balance out pretty well. Now, how true that is overall, who knows. But we haven't that many -- done that many where we've done multiple PRA's on the same plant.

But in that one instance, it balanced out pretty well. How significant are these things? That we don't know. These things that we know we included in the model. I prefer to talk in terms of decades or half decades. And I'd say it might have an effect of half an order of magnitude. I would be surprised if it would be as much as an order of magnitude.

I'm thinking in terms -- things of organizational factors, errors of commission, things of that sort. I'd expect on the order of --

CHAIRMAN APOSTOLAKIS: What's half an order of magnitude?

MR. MURPHY: Half an order of magnitude, to me, is a factor three, because -- in logarithmic space.

CHAIRMAN APOSTOLAKIS: So what you would do then, you would say gamma there -- you should not enter

gamma.

MR. MURPHY: Well, the --

MR. KING: I was going to quote you from the Commission's safety goal policy statement where I think they've addressed this issue, and I think the way Gary interpreted it is --

CHAIRMAN APOSTOLAKIS: Go ahead, please.

MR. KING: I mean, they've excluded risk from fuel cycle, from sabotage, and diversion of nuclear material. And they go on and say, "With these exceptions, it's the Commission's intent that the risks from all the various initiating mechanisms be taken into account to the best of the capability of current evaluation techniques."

To me, that's --

CHAIRMAN APOSTOLAKIS: So that's also to Dr. Kress' interpretation that this refers to what we can quantify.

MR. KING: Well, if, you know, a year from now we can quantify organizational factors risk, then yeah, that would be part of the Region III or --

CHAIRMAN APOSTOLAKIS: No, we should move 10^{-4} to 3×10^{-4} following Murphy's recommendation.

MR. KING: No, --

CHAIRMAN APOSTOLAKIS: We gain half an order of magnitude.

MR. KING: We use the best techniques we have today, and it essentially --

MR. JONES: But if you address organizational factors, you can get some plants that are going to do better and some plants that are going to do worse.

CHAIRMAN APOSTOLAKIS: Yeah, but how about my goal though? My goal is universal.

MR. JONES: Well, I think if you believe your goal and you're applying it on an individual plants, you would say those plants that have lousy organizational factors, they probably ought to do something about it. You may want to look at back fitting something.

CHAIRMAN APOSTOLAKIS: Well, let's read again what Tom just read. That to the best -- how did you put it?

MR. KING: All various initiating mechanisms be taken into account to the best of the capability of current evaluation techniques.

MR. JONES: And that is on the industry as a whole. Now, you know, recognize the safety goal policy statement was written for the industry as a whole. So arguably, there's a distribution on organizational factors which we can't deal with quantitatively. We tried to deal with with our SALP processes and management processes, whatever.

And I won't say -- you know, we do the best we can. I don't know whether I want to say how good or bad we do on all of those. Now when we start to do this on an individual plant and make decisions on an individual plant, that's obviously a problem for us. We can't make these decisions generically.

It just doesn't work. I mean, I think with that decision we've already -- we've proposed a response to that to the Commission and presented it to you back in the summer. And we agreed -- you guys agreed with us.

CHAIRMAN APOSTOLAKIS: But is -- was the intent of the Commission, when they put those words down, that the 10^{-4} is stated -- or is intended to apply to what we can quantify at this time? Is that how we should --

MR. KING: That's the way I interpret this. That's the way we've been interpreting it in this reg. guide.

CHAIRMAN APOSTOLAKIS: But then it stands to reason that if I can quantify more, I should revisit the 10^{-4}, does it not?

MR. KING: No.

CHAIRMAN APOSTOLAKIS: It does not?

MR. KING: Why would 10^{-4} change? What you -- the scope of what you analyze to see whether you meet the 10^{-4} would be different, but the 10^{-4} would be the same.

CHAIRMAN APOSTOLAKIS: No, but -- I mean, again, if the Commission intended the 10^{-4} to bound what you could quantify, and now you can quantify much more, why should the 10^{-4} be cast in stone?

MR. SHERRY: Because there are two ways to interpret. If you interpret it as a surrogate for the safety goal, then in the implementation, the Commission stated because of uncertainties in the analysis, they recognize that there was conservatism in that number relative to the safety goal QHO's.

So in that case, if you improve your analyses, you could change that value -- sort of remove the conservatism.

However, if you're treating the CDF as a fundamental goal, you might not want to raise that number.

CHAIRMAN APOSTOLAKIS: Then you are not allowed to go as close to it as you like now, if that's the case, because you know you are leaving some things out of your assessment. Either way, you have a consequence that we don't like.

MR. JONES: But you're leaving it out both ways. And I think there is some difficulty to say whether organizational factors change that number -- how that changes that number to either side. Because there are good plants arguably and bad plants.

MEMBER SEALE: Well, you basically recognize that when you said you want a -- and I'll use your new terminology now -- you want a gamma level analysis for the things that are in the vicinity. There's another point here.

The other day, we had a presentation from AEOD on the events program. And out of that came the idea that somewhere between every two and three years, there was something that showed up that really didn't quite fit on any of the existing event trees.

And it strikes me that that's a kind of measure of at least the frequency of what we don't presently understand too well. If we could tie a risk associated with those events now that you can look at them in more detail, then maybe we could get an idea of what the risk is involved, and maybe we ought to go back to AEOD and talk about how close these new problems are landing to 10^{-4}.

MR. JONES: If you use that, I think my simplistic numbers would say that's a 10^{-5} issue -- 10^{-4} to 10^{-5}.

MR. HOLAHAN: Point estimate?

MR. JONES: Well, let's say one in every two years, that's at one plant that it shows up, 100 plants.

MR. HOLAHAN: But that issue might apply to

all the plants.

MR. JONES: But its frequency -- its frequency is about once every two years.

MR. HOLAHAN: Maybe the frequency of discovering the problem may not --

MR. JONES: We usually do something about it if it -- yeah. But I take it one in 100 plants with a 10^{-3} conditional failure probability.,

CHAIRMAN APOSTOLAKIS: How about aging?

MR. JONES: That's 10^{-5}, so you say 10^{-4} to 10^{-5} -- I think that's the range you're talking about simplistically, Bob.

MEMBER FONTANA: I forgot. What is your definition of core damage for these purposes?

MR. HOLAHAN: We didn't provide one. There's no one --

MEMBER FONTANA: There's no one?

MR. KING: There's no --

CHAIRMAN APOSTOLAKIS: It's the one that the PRA's use, right?

MR. HOLAHAN: The one that the PRA's use. Yeah, well, --

MR. SHERRY: The PRA's use many.

MEMBER KRESS: You have a success criteria on the ECCS. It recovers the core damage over a certain

amount of time.

MR. HOLAHAN: Yes.

MEMBER SEALE: Yes.

MEMBER FONTANA: What I was driving at is that a lot of core damage events are not really risk significant -- they're not recoverable because you're talking about a little bit of fuel failure.

CHAIRMAN APOSTOLAKIS: Yeah, but we made that a fundamental goal. We don't want that to happen.

MEMBER FONTANA: The thing -- well, we probably shouldn't get into this, but -- at a core damage frequency of 10^{-3}, if you have 100 plants, that mean -- you could probably have a -- you could have a failure every ten years, right?

CHAIRMAN APOSTOLAKIS: Yeah, that's what the Commission --

MEMBER FONTANA: No, so that means if each plant -- if you get a core damage that costs you a billion dollars, and each of 100 plants kicks in a million dollars a year, they can cover the cost of losing the core every ten years. That's not a lot. Seems okay to me.

(Laughter.)

You know, if it doesn't have any health significance.

MEMBER MILLER: If there are no societal

concerns about core damage, you could handle one every ten years.

CHAIRMAN APOSTOLAKIS: So what's the conclusion then? We will use the 10^{-4} as applying to what we can quantify, and we will go as close as we can and ignore -- neglect or ignore the fact that there may be other contributors.

MR. KING: You can come up with a laundry list of things we don't consider. You mentioned aging. There's -- you know, people implement digital I&C systems, we want to quantify that; design and construction errors.

CHAIRMAN APOSTOLAKIS: But isn't it true though, Gary, that every time we manage to develop a new model for something we didn't -- we haven't quantified until that time that the numbers look worse -- they become worse. They only add things. I mean, we did this recovery thing about some time ago which probably was a positive impact.

But from now on, it seems to me every time we quantify something, the core damage frequency is pushed up. Is that true?

MEMBER POWERS: But George, I think it's probably true that every time you add in a new model, it should make the numbers look worse. But every time you refine a model, you typically make the numbers look

better.

CHAIRMAN APOSTOLAKIS: So initially, the model will be crude. We'll push the numbers up, and the people will look at it again --

MEMBER SEALE: Sharpen their pencils.

CHAIRMAN APOSTOLAKIS: But ultimately though, it still adds to the risk.

MEMBER POWERS: But they're improving the models across the board all the time. So whereas you get one -- on thing adds; but when you add it in, then you go through and approve everything else, it's the Murphy phenomena. It kind of averages out.

MR. SHERRY: With regard to off site risk, I think, you know, a number of phenomena were added between WASH 1400 and 1150: direct containment heating, BWR liner melt through -- phenomena which were though to be very significant. And over the years, research has indicated maybe they're not that significant.

And I think the 1150 consequence analysis is much lower than WASH 1400 with the addition of these new phenomena.

MR. HOLAHAN: Yes. I think there's also a bias in the analysis that we search out things that might make things worse, and not necessarily things that might be better.

MEMBER KRESS: Well, actually, you have a plant out there, and it has a risk status. And no matter what you do to the models, if you don't change the plant, it still has that same risk status. The NUREG-1150 exercise was an attempt to try to find out what the mean value of that risk status might be and quantify the uncertainties about that mean value.

Now, you can argue with how well it did that, and did the uncertainties, in its determination, using present set of codes that they're dealing with is what they were trying to talk about. And improving the models in the codes and doing a better job and sharpening your pencil doesn't change that.

All it does is you still have relatively the same mean value. You're just going on the uncertainty.

MEMBER FONTANA: You just know where you are better.

MEMBER KRESS: You just how where you are better. And it may be that one had in mind that especially since Oakland, where it had a big -- lot to do with developing these things -- he may had in mind that what the uncertainty range already was and our ability to assess it, and may have accounted for that in his choice of 10^{-4}.

CHAIRMAN APOSTOLAKIS: He didn't choose it.

MEMBER KRESS: Well, whoever chose it. But, you know, changing your models and improving the PRA doesn't change the risk status.

MR. HOLAHAN: But it could change the decision we make about an application.

MEMBER KRESS: Well, if you did the uncertainty evaluation correctly, then --

CHAIRMAN APOSTOLAKIS: But we don't.

MEMBER KRESS: We don't do that correctly.

CHAIRMAN APOSTOLAKIS: Sure, we don't take the existing uncertainty and say now because of things we left out, it was stretched out.

MEMBER KRESS: Well, they did in 1150. They -- that's part of 1150.

MEMBER SEALE: We haven't written the equivalent of LER's to cover the things that have made plant availabilities go from 65% to more than 75% either.

MR. HOLAHAN: Right.

MEMBER SEALE: And that's reality.

MR. SHERRY: Actually, I think with the positive distributions that characterized the uncertainties in core damage frequency and risk, that if you reduce the uncertainties in an unbiased fashion, you will tend to drive the means lower. It will drive it towards the medians.

MEMBER KRESS: Yeah, I think you're right there.

CHAIRMAN APOSTOLAKIS: So I get the feeling then that there's more or less consensus in this room that we shouldn't worry about things we haven't thought of.

MEMBER SEALE: No.

CHAIRMAN APOSTOLAKIS: I'm confirming once again that the answer depends very much on how the question is phrased. Whose the line -- don't go too close to it. Gary says no, I'll go as close as I like; and nobody says anything.

MEMBER POWERS: George, just -- the answer can't be given right now because we haven't seen Mr. Murphy's list of the things he hasn't thought of.

MEMBER KRESS: We're going to wait on that list before we do it.

CHAIRMAN APOSTOLAKIS: Shall we ask Joe to come back in ten weeks for things he hasn't thought of?

MEMBER SEALE: But these guys have done some -- I mean, they've taken a very constructive step in here. What they've done here is said hey, you -- the last seven nominal size bites you take to get yourself to 10^{-4} will require a very detailed analysis. And I can't imagine that when you do those seven analyses, you're going to be looking at the same thing every time.

I have an idea you'll pretty well cover the waterfront in the things that are involved in core damage frequency as you go through the process of going from 3 x 10^{-5} to 10^{-4}.

MR. HOLAHAN: I don't think it will ever happen.

MEMBER SEALE: Well, I don't either; but I'm --

MR. HOLAHAN: I don't think you can find a plant out there that you want to add seven 10^{-5}'s.

MEMBER KRESS: I don't think so either.

MEMBER SEALE: Yeah, but you don't -- what I'm saying is you don't whistle your way down the yellow brick road in getting there.

MR. HOLAHAN: I understand. If you were to go there, that's the road it would take.

MEMBER POWERS: But if you take the broad brush view of the IPE insights, you haven't got a chance. I mean, there just isn't any plant -- because that's strictly operations. And if we take your half order of magnitude and then we take a double into account for external events, everybody is up on the other side of 10^{-4}.

MEMBER KRESS: Already.

MEMBER POWERS: Already, right.

MEMBER KRESS: And I think you're supposed to

include those when you enter that thing. Your other question may not. I think those are supposed to be including to decide where you enter that chart.

MEMBER POWERS: Well, I believe that's --

MEMBER KRESS: Yes.

MEMBER POWERS: I believe that is the answer. And again, what I was saying, Tom, was not --

MR. KING: We showed these the last time. But the IPE results which, you're right, are not external events -- this is BWR.

MEMBER POWERS: Tom, you didn't understand -- I said the broad brush. That meant I just looked at the box of all of them added together and where it was located, not each individual plant. I agree with you on each individual plant, that there are a few of them that are very, very low.

But my poor focus view was that they were all up in the top. I grant you that there's some that are low in the box, and there's some that are high in the box.

MEMBER KRESS: And you're saying when you add in though the --

MEMBER POWERS: Well, certainly you'd take those eight plants that are in the Region III --

MEMBER KRESS: All BWR's, right?

MEMBER POWERS: This happens just to be the

BWR --

MEMBER KRESS: It's all BWR's.

MEMBER POWERS: You take those eight plants, you add in external, and you add in shut down to above 10^{-4}, --

MEMBER KRESS: Yes.

MEMBER POWERS: -- the next 14, I can't tell.

MEMBER KRESS: But they're close to --

MEMBER POWERS: But they're certainly not where they are plotted there. And you take the last 12, and you go in and carefully scrutinize what they used as failure and success criteria, you'd probably move them all up into where the other 14 are.

But if you read the insight report, it's fairly critical of what people have done to get low.

CHAIRMAN APOSTOLAKIS: So I still don't know what people think about this. Or do people need more time to think about it?

MEMBER POWERS: Well, as I understand it, there are really two schools of thought. There is the Kress school of thought which says the criterion already has built into it all the things that it needs to, and so you just calculate. And there is --

MEMBER KRESS: Yeah, but going along with that is, in order to enter into that thing, you do need to

include shut down risk, seismic external events, --

CHAIRMAN APOSTOLAKIS: And you would not change the criterion if we started quantifying something that clearly was outside the scope of PRA so far? Somebody comes up with a great model or --

MEMBER POWERS: Organizational factors.

MEMBER KRESS: Organizational factors.

CHAIRMAN APOSTOLAKIS: We beat that to death. For deregulation, right? That was not there.

MEMBER POWERS: Taking that view --

CHAIRMAN APOSTOLAKIS: -- probabilities like crazy. You would not move the 10^{-4}?

MEMBER KRESS: No.

MEMBER POWERS: But taking that view is not inconsistent with the rest of the goal which gives you -- gives things as a percentage of the accidental death rate. And that's a number that keeps going down all the time because society becomes safer and safer all the time, and at a pretty predictable rate too.

So your ability to calculate gets better and better, more expansive; and the standard you're getting is going down. So clearly -- it clearly is a rational view.

CHAIRMAN APOSTOLAKIS: Now you said there was a second point of view. What's that?

MEMBER POWERS: The second point of view, the

Apostolakis point of view, is that as you expand your horizons and your calculations, you add -- or you add whenever you're going to take into account those things that you don't now take into account.

CHAIRMAN APOSTOLAKIS: Yeah, either by not going too close to 10^{-4}, or by moving the line to the right, one or the other. But it seems that most people feel that that's not the correct interpretation.

MEMBER POWERS: Well, it seems to me it's a pragmatic issue.

CHAIRMAN APOSTOLAKIS: Let's talk about the steam generator rule for a while.

(Laughter.)

MEMBER POWERS: The one thing you've done in going to these CDF and this auxiliary or subsidiary requirements is you're seeking practicality and doability. And I don't think you want to start polluting that doability with things that are conceptually difficult.

CHAIRMAN APOSTOLAKIS: What incentive does Cunningham have to spend money to quantify something we cannot quantify right now? If life is blissful, we have out criteria, we have our goals, we're happy, what incentive does he have to do that? Why doesn't the Commission eliminate the Office of Research?

MEMBER KRESS: Well, as I said before --

CHAIRMAN APOSTOLAKIS: I mean, we know what we quantify.

MEMBER KRESS: As I said before, I maintain in order to enter this chart, you need to estimate all the risks, all the CDF contributors including organizational problems, including seismic, fire --

MEMBER SEALE: Human error.

MEMBER KRESS: Including human error, including shut down risk. In order to enter that to find out where you are on the line, you need all those things. And if you don't know how to do them very well, you'll have to do some bounding and be conservative on it.

CHAIRMAN APOSTOLAKIS: Okay, so we --

MEMBER KRESS: And I'm saying you sharpen your pencil -- you move yourselves down away from those mounds, and you move down the line as far as the status of the plant is. You leave everything else constant.

CHAIRMAN APOSTOLAKIS: So we don't have two points of view. We have one point of view. Because that's what I'm advocating. I'm saying --

MEMBER KRESS: I wasn't sure that was your point of view.

CHAIRMAN APOSTOLAKIS: I am saying that based on what I can calculate now, I should not be allowed to hit 10^{-4}. Isn't that the same thing that you're saying?

MEMBER KRESS: Well, I'm --

CHAIRMAN APOSTOLAKIS: That you should do some rough estimates of the other things in essence than what you can quantify, he's not all wed to go to 10^{-4}.

MR. HOLAHAN: How can you do rough estimates of things that Joe Murphy hasn't thought of yet?

CHAIRMAN APOSTOLAKIS: Well, then you have a shaded area there, and you're saying, you know, I really am very reluctant to go close to 10^{-4} now. Don't ask me how close, because I don't know.

MR. HOLAHAN: Well, in practice, I think that happens --

CHAIRMAN APOSTOLAKIS: But the idea, the principle is the same.

MR. HOLAHAN: I think that happens, but it happens in the guidance document for a slightly different reason. Which is, as the mean value gets closer to the limit, and recognizing what the size of the uncertainties are, you get more and more concerned about the tail of the distribution which is out where you don't want it to be.

So I think even though the figure is the same, the decisions become more and more difficult as you get near the boundary.

CHAIRMAN APOSTOLAKIS: But these are the uncertainties of things you have quantified.

MR. HOLAHAN: But you're still making some judgements about --

CHAIRMAN APOSTOLAKIS: Okay, so I think we're all in agreement.

MEMBER SEALE: Could I ask --

CHAIRMAN APOSTOLAKIS: And I think Tom King agreed to put something in the fourth bullet, which is along these lines, right -- this morning?

MEMBER SEALE: Could I ask you another question which is kind of related to the direction on this curve in which we have not gone before boldly or timidly? No, down, down. Let's say that X, Y, Z plant comes in and they look at a change they'd like to make. They go into the analysis, and they very quickly decide that from a risk point of view, what they have -- they're looking at is a "no, never mind."

They don't want to have to spend a hell of a lot of money, and so they're willing to call it a wash as far as risk is concerned; but they do need your sanction on the change in their tech spec or whatever it is they're -- how low is that? How low is -- I mean, is that just alpha, or is it something below alpha?

MR. HOLAHAN: What I suspect is that licensees won't want to spend a lot of money calculating how far below the line they are.

MEMBER SEALE: Yeah.

MR. HOLAHAN: I mean -- because it doesn't make any difference.

MEMBER SEALE: That's right, that's right. But they sure would like to have the relief.

MR. HOLAHAN: That's okay. And I think the reg. guide suggested -- even the qualitative assessment, which gives you some confidence that this really is a net improvement, is good enough for that region.

MEMBER SEALE: And it remains to be defined as exactly what qualitative assessment will be "good enough."

MR. HOLAHAN: But this is probably comparable to lots of things we've done before --

MEMBER SEALE: I understand.

MR. HOLAHAN: -- in which PRA has played maybe some very minor role, but it's been mentioned.

MEMBER SEALE: We say there are a lot of things where a good deterministic analysis lays the ghost and there's no point in trying to make it into somebody's career.

MEMBER FONTANA: I think there is an incentive to -- as long as you're inside the box. But I think if you increase the power or increase the availability divided by 1%, I think it's worth around $3 million a year. I think something like that. So there is an --

MEMBER SEALE: Yeah, but if they're 10^{-7} or below, for example, Mario, that's -- you'd need a whole bunch of those to make any difference in that box.

MEMBER FONTANA: No, it isn't that. It's that if I'm down at that level and I can do something and increase as my availability 1%, --

MEMBER SEALE: What I said, they still want -- they still want the relief.

MEMBER FONTANA: Yes.

MEMBER SEALE: Yes.

MEMBER FONTANA: Oh, okay; I misunderstood what you were saying.

MEMBER SEALE: Yes, yes.

CHAIRMAN APOSTOLAKIS: Do we want to add the principle that we should use common sense when we can?

(Laughter.)

It seems to me that we are trying to be awfully prescriptive again. We have this urge. No, anyway, we have to keep time here. And so the only thing that came out of the last 15 minutes of discussion is that Joe will come back at the next subcommittee meeting with a list of the things he hasn't thought of, and we'll make sure that Dave Okrent will be an invited expert so he will finally get his answer.

(Laughter.)

So we will see you again tomorrow at 8:30, right? Or wherever it is. Oh, industry presentation first. EPRI initiatives. What? I'm sorry, what?

MEMBER SEALE: They come back at 10:00.

CHAIRMAN APOSTOLAKIS: Well, I mean, if you want to attend, you're welcome.

Okay, good.

(Whereupon, the proceedings were adjourned at 4:58 p.m.)

C E R T I F I C A T E

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: ACRS: PROBABILISTIC RISK ASSESSMENT SUBCOMMITTEE

Docket Number: N/A

Place of Proceeding: ROCKVILLE, MARYLAND

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Corbett Riner

CORBETT RINER
Official Reporter
Neal R. Gross and Co., Inc.

1

INTRODUCTORY STATEMENT BY THE CHAIRMAN OF THE
PROBABILISTIC RISK ASSESSMENT SUBCOMMITTEE
11545 ROCKVILLE PIKE, ROOM T-2B3
ROCKVILLE, MARYLAND
NOVEMBER 21-22, 1996

The meeting will now come to order. This is first day of the meeting of the ACRS Subcommittee on Probabilistic Risk Assessment. I am George Apostolakis, Chairman of the Subcommittee.

ACRS Members in attendance are: John Barton, Mario Fontana, Thomas Kress, Don Miller, Dana Powers, Robert Seale, and Bill Shack

ACRS Senior Fellow in attendance is: Richard Sherry

The purpose of this meeting is to continue our discussion of the NRC staff's approach to codify risk-informed, performance-based regulation through development of Standard Review Plan (SRP) sections and associated regulatory guides. The Subcommittee previously met to discuss these matters on October 31-November 1, 1996. The Subcommittee will gather information, analyze relevant issues and facts, and formulate proposed positions and actions as appropriate, for deliberation by the full Committee.

Michael T. Markley is the Cognizant ACRS Staff Engineer for this meeting.

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* on November 13, 1996.

A transcript of the meeting is being kept and will be made available as stated in the Federal Register Notice. It is requested that speakers first identify themselves and speak with sufficient clarity and volume so that they can be readily heard.

We have received no written comments. However, we have received a request from Mr. Bob Christie of Performance Technology for time to present his views on NRC review of licensee submittals for risk-informed, performance-based regulation. He provided a document entitled, "Call to Action: Pilot Programs for Performance-Based Regulation," which was forwarded to all Members of the ACRS.

(Chairman's Comments-if any)

We will proceed with the meeting and I call upon Mr. Bob Christie to begin.

2

PRESENTATION

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

SUBCOMMITTEE ON PRA

"PERFORMANCE BASED REGULATION"

Bob Christie

Performance Technology

November 21, 1996

Topics of Discussion

- Performance Based
- Units of Measure
- Criteria for Acceptance
- Role of Probabilistic Risk Assessment
- Examples

Performance Based

- What do we mean by performance?
- How do we measure performance?
- What is the current level of performance?
- What is the acceptable level?
- How do we trend performance to stay within acceptable range?

Performance Based Elements

- Measurable parameters
- Objective, quantitative criteria to define acceptable performance
- Flexibility
- Monitoring process
- Cost effective corrective action

REGULATIONS

Provide Adequate Protection of Public Health and Safety.

ADEQUATE PROTECTION

In August 1986, the Nuclear Regulatory Commission published Safety Goals for the Operation of Nuclear Power Plants.

NRC SAFETY GOALS

Qualitative

Individual members of the public should be provided a level of protection from the consequences of nuclear power plant operation such that individuals bear no significant additional risk to life and health.

Societal risks to life and health from nuclear power plant operation should be comparable to or less than the risks of generating electricity by viable competing technologies and should not be a significant addition to other societal risks.

NRC SAFETY GOALS

Quantitative Objectives

The risk to an average individual in the vicinity of a nuclear power plant of prompt fatalities that might result from reactor accidents should not exceed one-tenth of one percent (0.1%) of the sum of prompt fatality risks resulting from other accidents to which members of the United States population are generally exposed.

The risk to the population in the area near a nuclear power plant of cancer fatalities that might result from nuclear power plant operation should not exceed one-tenth of one percent (0.1%) of the sum of cancer fatality risks resulting from all other causes.

Prompt Fatality Accidents in USA.

Approximately 100,000 accidental deaths per year in a population of approximately 200, 000, 000 people. This equates to approximately 1 in 2000 per year.

Latent Cancer Fatalities in USA.

Approximately 400,000 cancer deaths per year in a population of approximately 200,000,000 people. This equates to approximately 1 in 500 per year.

PROBABILISTIC RISK ASSESSMENT

- How we measure
- Fission products from reactor core
- WASH 1400
- Individual Plant Examination

Damage to Core

- Unit Specific
- Transients/Small LOCA's
- Multiple Failures
- "Frontline-Support" Systems
- Human Interaction

SYSTEM IMPACT

- Fussell-Vesely
- System Variation
- CDF(new)/CDF(base) = 1 + FV(RATIO - 1)

TABLE I

(System Impact on Fermi 2 Core Damage Frequency (CDF))

PIS	Description	Fussell-Vesely of System	System Base Failure Probability	System Historical Review-Variation in Failure Probability	System base failure probability multiplier for doubling core damage frequency.	Multiplier Times Base Failure Probability
C7100/C1100	RPS ATWS	0.32	0.0000108	no system failures	4.1	4.4E-5
E4100	HPCI	0.21	0.15	0.08 - 0.16	5.8	0.87
E1151A	Div I RHRSW	0.15	0.0206	0.0004 - 0.0043	7.7	0.159
E1151B	Div II RHRSW	0.15	0.0206	0.0011 - 0.0229	7.7	0.159
E5100	RCIC	0.15	0.0913	0.05 - 0.12	7.7	0.703
C4100/G3300	SLCS	0.14	0.0360*	0.001 - 0.003 (Human error not considered.)	8.1	0.292
P4100	GSW	0.12	0.00593	no system failures	9.3	0.055
R3201/R1600	ESF DC A	0.11	0.000837	no system failures	10.1	0.0084
R3201/R1600	ESF DC B	0.11	0.00126	no system failures	10.1	0.0084
N2000/P1100/ N2003	Condensate/ Hotwell	0.09	0.0269	Always had at least one pump	12.1	0.325

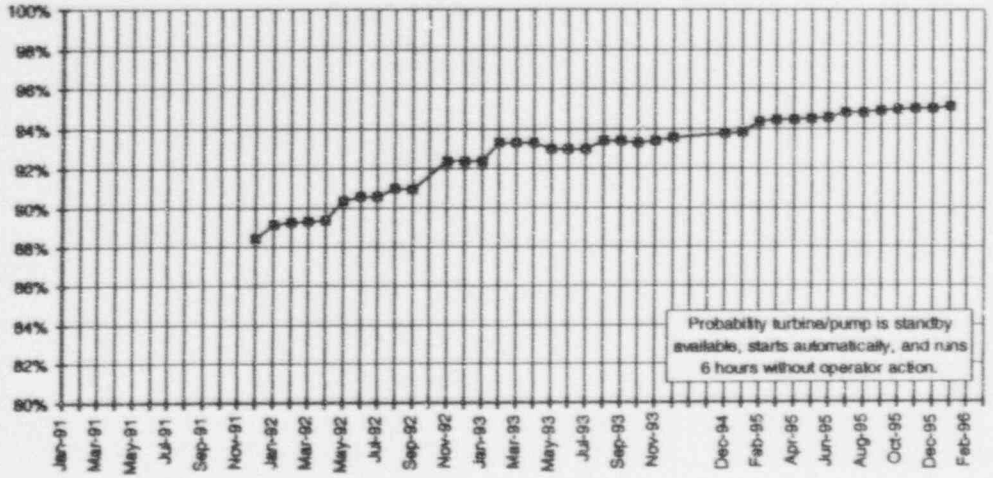
*Human error to start pumps is 0.0118, human error of misalignment is 0.0169.

Absence of Line Marker Indicates an Outage Month

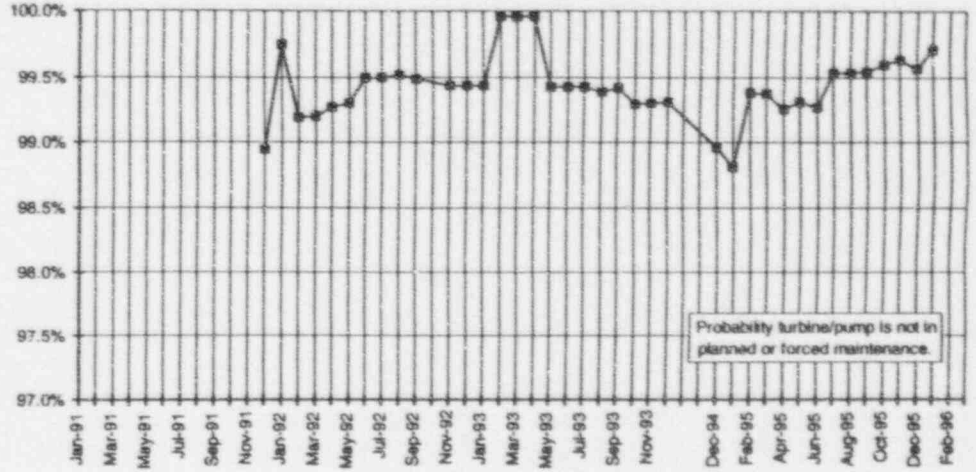
FERMI SYSTEM RELIABILITY PROGRAM - *RCIC*

Performance Technology 9/27/96

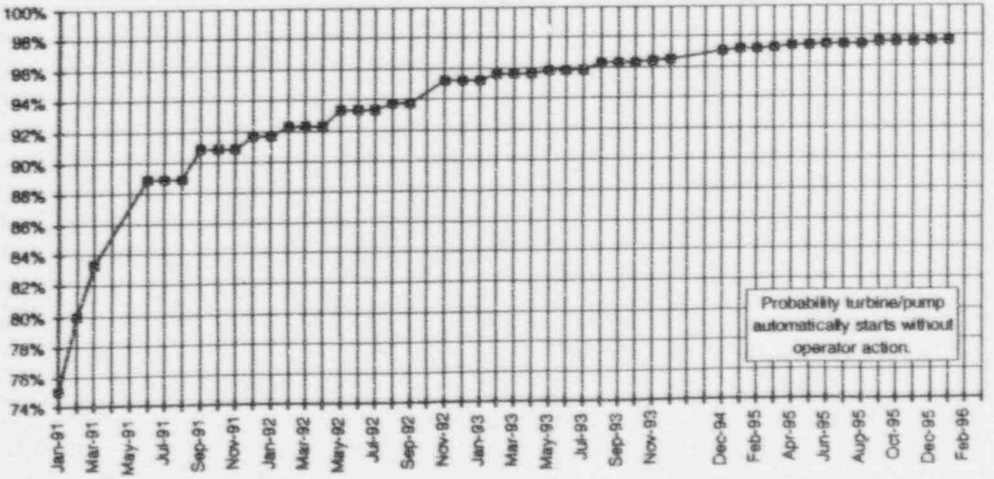
FERMI 2
RCIC CONDITIONAL PROBABILITY
MODES 1, 2, 3



FERMI 2
RCIC STANDBY AVAILABILITY
12 MONTHS SLIDING - MODES 1, 2, 3



FERMI 2
RCIC START PROBABILITY
CUMULATIVE - MODES 1, 2, 3



FERMI 2
RCIC RUN PROBABILITY
CUMULATIVE - MODES 1, 2, 3

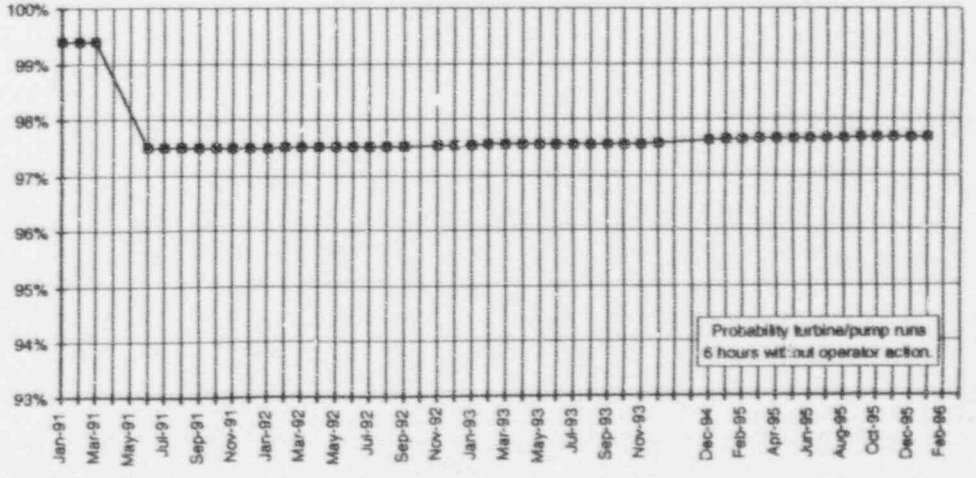
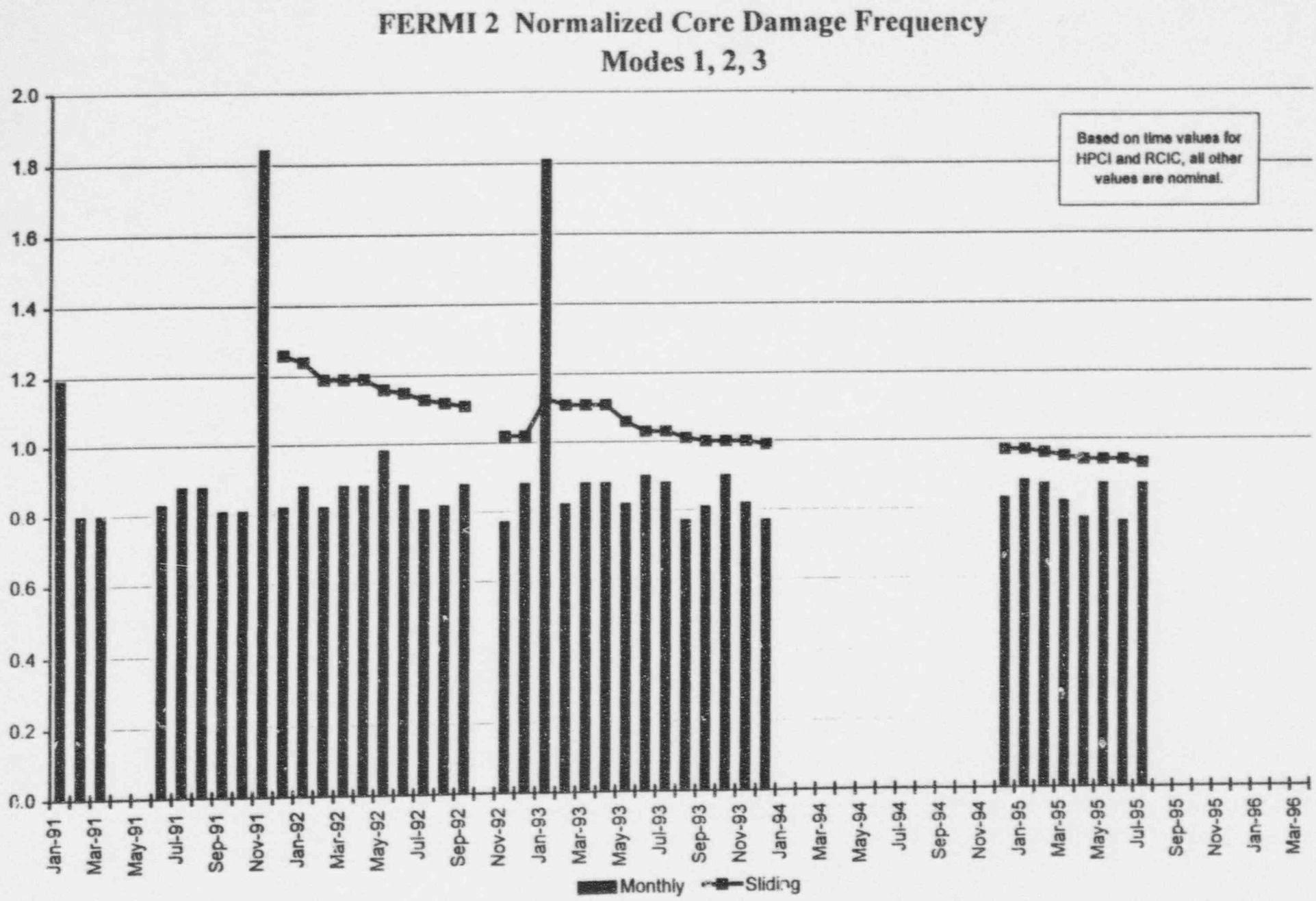


Figure 1


FERMI 2 Normalized Core Damage Frequency
Modes 1, 2, 3
Based on time values for HPCI and RCIC, all other values are nominal.
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Jan-91
Mar-91
May-91
Jul-91
Sep-91
Nov-91
Jan-92
Mar-92
May-92
Jul-92
Sep-92
Nov-92
Jan-93
Mar-93
May-93
Jul-93
Sep-93
Nov-93
Jan-94
Mar-94
May-94
Jul-94
Sep-94
Nov-94
Jan-95
Mar-95
May-95
Jul-95
Sep-95
Nov-95
Jan-96
Mar-96
Monthly
Sliding

Consequence Modeling

MACCS

(MELCOR Accident Consequence Code System)

Input

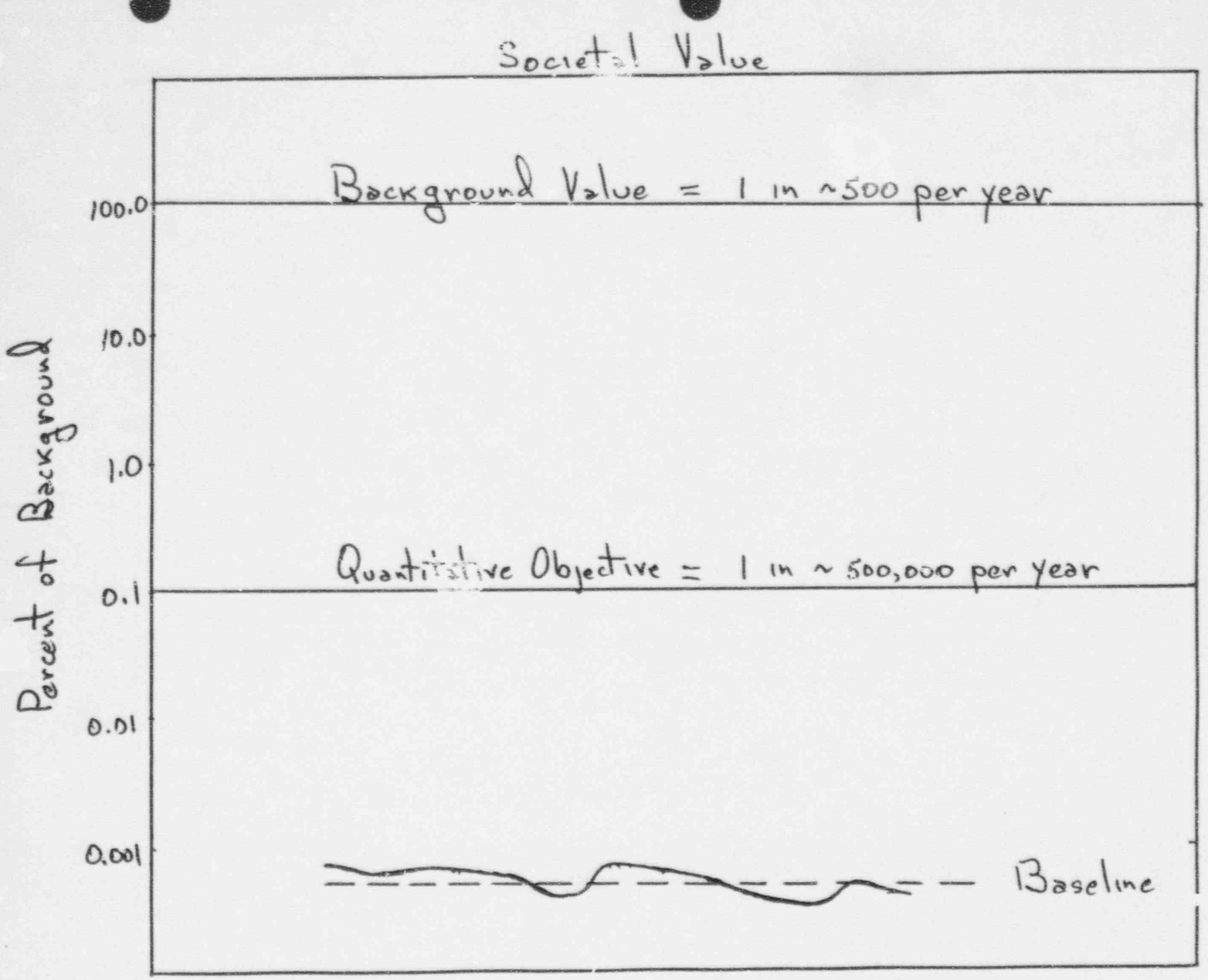
Plant Damage States

Population Densities

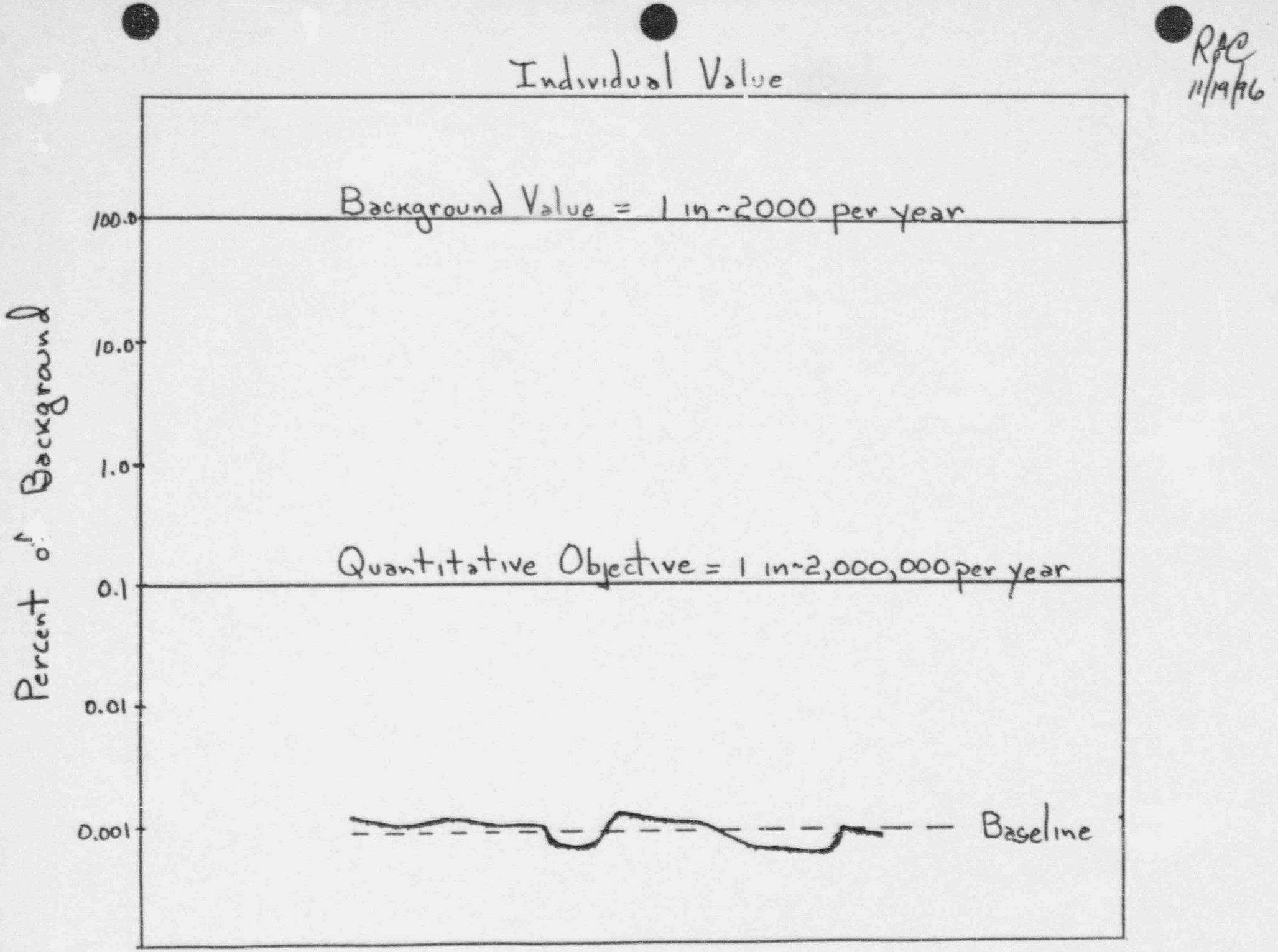
Meteorology

Evacuation schemes

RJC
11/19/96


Societal Value
Background Value = 1 in ~500 per year
100.0
10.0
1.0
Quantitative Objective = 1 in ~ 500,000 per year
0.1
0.01
0.001
Baseline
Percent of Background

RAC
11/19/96


Individual Value
Background Value = 1 in ~2000 per year
Quantitative Objective = 1 in ~2,000,000 per year
Percent of Background
100.0
10.0
1.0
0.1
0.01
0.001
Baseline

Uncertainties

- Have always existed.
- PRA can quantify.
- Can be trended.
- If quantified and trended, will get smaller.

FERMI 2 - RCIC SYSTEM
PROBABILITY OF START

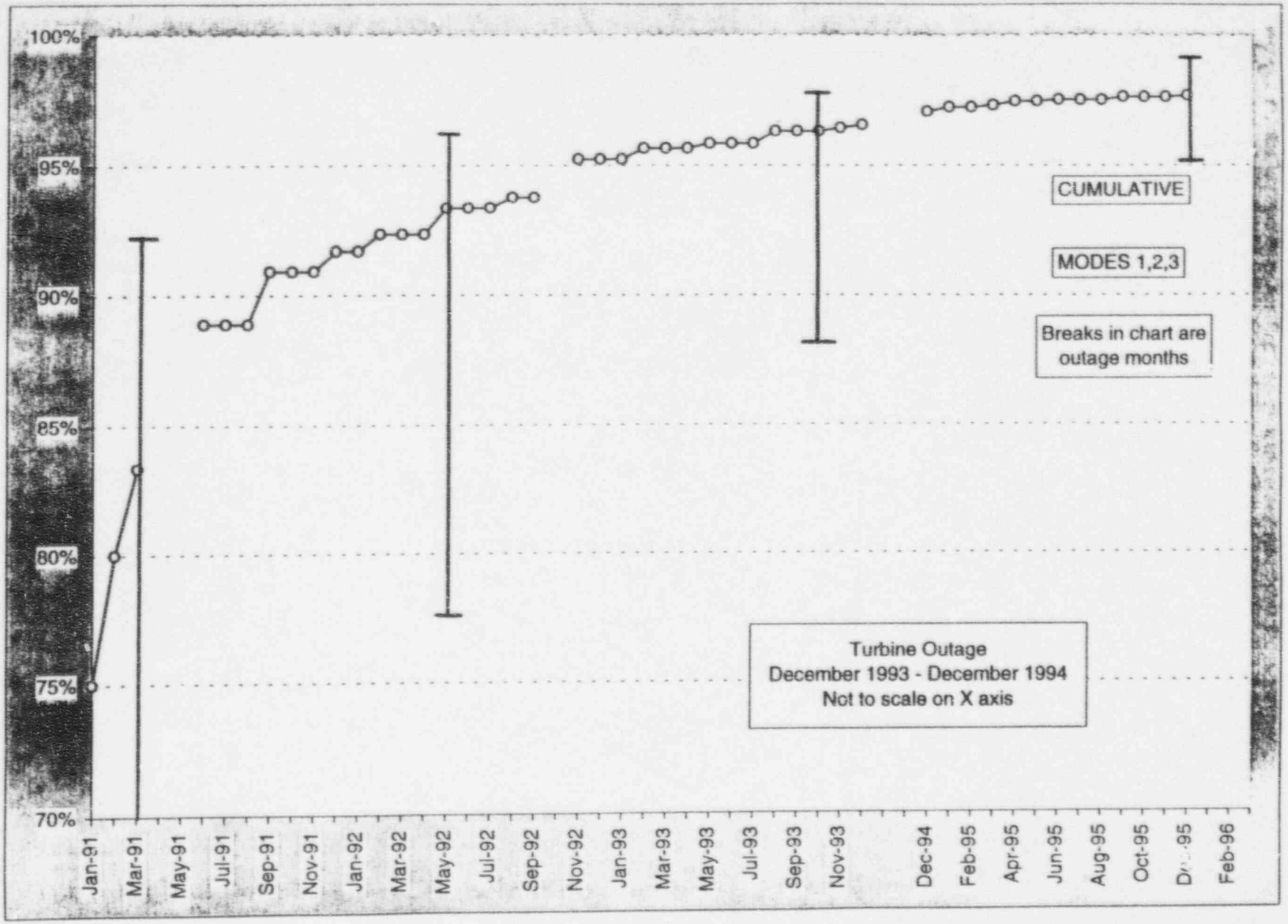


FIGURE 6.0-4

FERMI 2 - RC SYSTEM
CONDITIONAL PROBABILITY

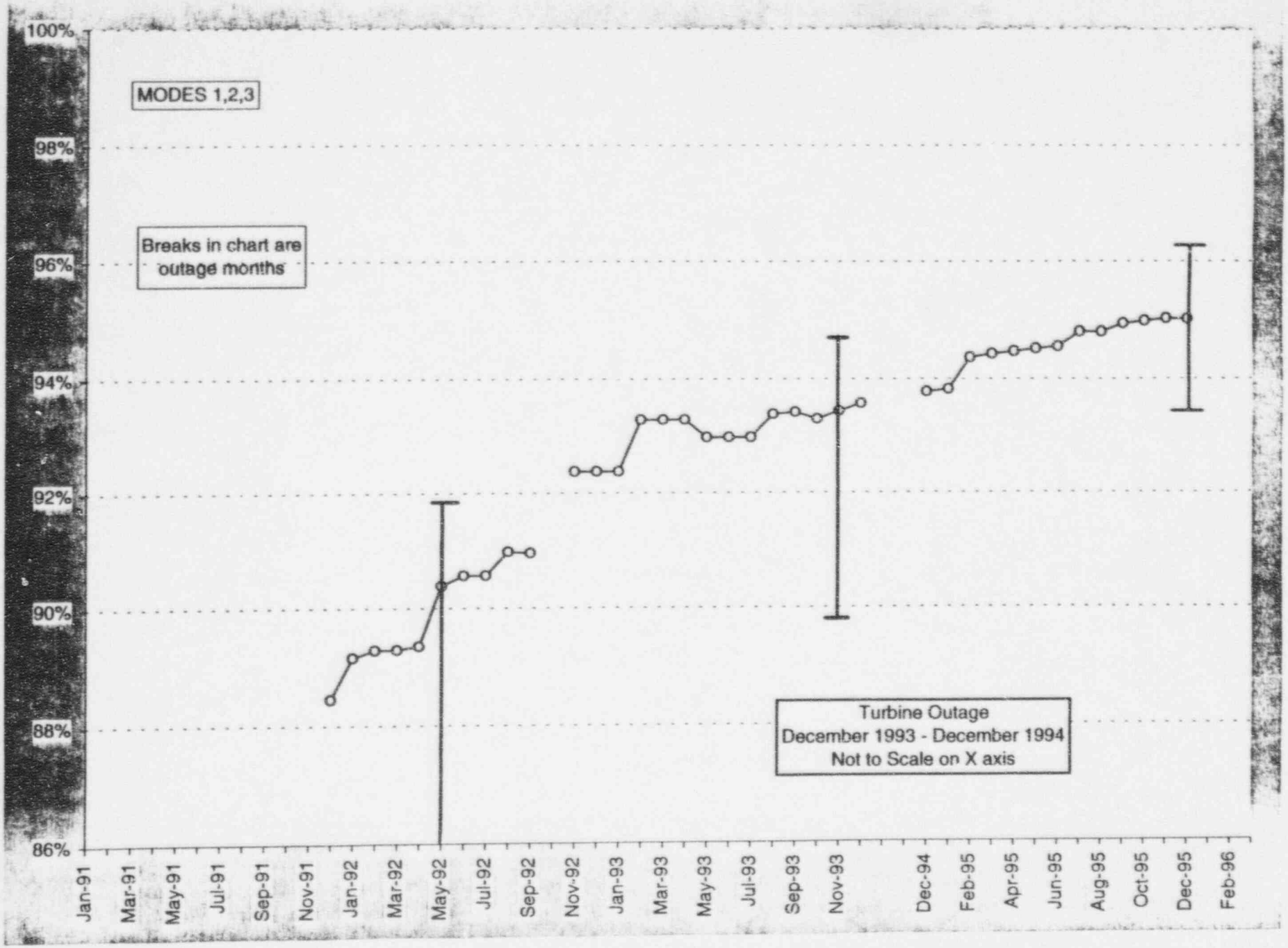


FIGURE 6.0-1

Model Verification

- Actual Events
- Test Results
- Consensus of "Experts"

"If you are so smart, why aren't you rich?"

What are the rewards for the staff of a nuclear electric generating unit to go to Performance Based Regulation?

What are the rewards for the staff of the Nuclear Regulatory Commission to go to Performance Based Regulation?

IMPEDIMENTS TO SUCCESS

- Culture
- More Regulations
- Adversarial Relationship
- Morale/Future
- Loss of Regulatory Jobs

BUILDING BLOCKS FOR SUCCESS

- NRC Safety Goals
- Trained People
- Operating Experience
- Methodologies

SUMMARY

- Keep it simple.
- Use NRC Individual and Societal objectives.
- Quantification and trending of Individual and Societal objectives are possible.
- Utilities will use flexibility to evolve to more cost effective decision process.

2A

CALL TO ACTION; PILOT PROGRAMS FOR PERFORMANCE-BASED REGULATION

Bob Christie

Performance Technology

September 30, 1996

at

PSA 96

Park City, Utah

" CALL TO ACTION: PILOT PROGRAMS FOR PERFORMANCE-BASED REGULATION "

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Performance Technology
P. O. Box 51663
Knoxville, TN 37950-1663
(423) 588-1444
(423) 584-3043 FAX

ABSTRACT

This paper recommends the trial use of performance-based regulation at a minimum of two existing nuclear electric generating units in the United States on an accelerated basis as pilot programs for the eventual use of performance-based regulations in all the nuclear electric generating industry. Such a step would represent a significant cultural change in the regulatory process.

The objective of performance-based regulation should be to make better decisions primarily by using the mean values for public health risk and factoring in the uncertainty when necessary. If we accurately define and measure performance and feedback operating experience into the quantitative models, performance will improve and nuclear electric power generation will be more cost effective. The ultimate test of success will be if new nuclear units are ordered in the United States and the United States nuclear industry continues to exist and increases its share of the electric power generation.

I. BACKGROUND

The present challenge for the United States nuclear electric power industry is for U. S. nuclear electric generating units to achieve "adequate protection of public health and safety" in a more cost effective manner. In the United States over the last 15 years, nuclear electric generating units have lost their once clear economic advantage over the majority of other means of electric generation. Since 1989, six operating nuclear units have been shutdown before their license expired (Table 1), mostly for economic reasons, and no new nuclear units have been ordered. This trend will continue and the United States nuclear electric power industry will disappear unless significant changes are made in the way the nuclear utilities can allocate their resources.

Much has been done during the last few years in the areas for which the nuclear utilities have control of their resources with the result that the efficiency of most of the existing nuclear units has increased significantly. It appears that the upward climb in Operations and Maintenance expense per Megawatt-Hour generated has been halted, at least for the time being, by increasing the production from each nuclear unit while holding the O & M costs fairly constant. However, it is getting increasingly difficult to achieve substantial increases in generation. Now the approach to cut costs is to maintain high levels of generation while "downsizing" the number of people.

The key area remaining for cost effective change is the regulatory process. The traditional regulatory framework, based on deterministic criteria to identify what is important to "safety" and detailed prescriptive regulations for "safety related equipment," resulted in adequate protection of public health and safety at the expense of the economic advantage of the nuclear units. These prescriptive regulations did not stop the loss of the reactor core at Three Mile Island 2 in March 1979. In fact, these prescriptive regulations actually contributed to the event occurring according to the committees that investigated the accident at TMI 2. The accident at TMI 2 in March 1979 did not impact public health and safety but the accident had a clear negative impact on the economics of the entire United States nuclear electric generating industry.

The insights and recommendations of the Rogovin Report, the Kemeny Commission, and other independent organizations that reviewed the regulatory process after the loss of the reactor core at Three Mile Island 2 did not slow the issuance of new rules, regulatory guides, bulletins and generic letters in the 1980's. At best, the insights and recommendations of these committees have been implemented in a piece meal fashion on a delayed time scale. The 1980's saw the cancellation of approximately 50 proposed nuclear units

(Table 2) and an expanded construction time for the ones that were finally completed.

Most of the new technological advances in the nuclear field are being made by foreign utilities and foreign companies because they are the ones building new nuclear plants. Foreign utilities achieve economic advantage with their nuclear units. Foreign nuclear plants are built in a far short[illegible] time than United States nuclear plants and there is mi[illegible]al fear that the plants will be prevented from oper[illegible]ng because of litigation and regulatory action. Foreign regulatory agencies and utilities cooperate with each other to assure that the best plant is constructed and operated. Some of the more economically viable United States nuclear utilities are expanding into the operation of foreign plants because they believe by running foreign plants (both nuclear and fossil), they can be assured of a better rate of return on investment than they can get building new nuclear plants in the United States. People in the United States nuclear industry, which started the entire world nuclear industry, are now in the position of having to expand their craft primarily in foreign lands.

The United States nuclear electric power industry is now a mature industry. With the current rate of nuclear plant permanent shutdowns and with no new nuclear units, the United States has over 1/3 of all the commercial nuclear plant operating experience it will ever get. The nuclear industry has the operating experience and the trained people necessary to make cost effective changes in the way money is spent if allowed to do so. However, timing is now critical. A significant portion of the trained people are being "downsized" and others are leaving because there is limited future advancement. Few new people are entering the industry.

Without substantial change now, these adverse trends concerning trained nuclear personnel and investment capital will get worse in the United States. There is no economic incentive in the United States for people to either start to work in the nuclear industry or to invest capital in the nuclear industry. The existing nuclear units will survive on the cash flow the existing nuclear unit can generate and by reducing costs by reducing people where possible. When the cash flow becomes negative or a large amount of new capital is needed, the nuclear unit will be permanently shut down and replaced with cheaper power from other generating sources.

Several nuclear industry and NRC efforts over the last few years have sought to improve the current regulatory process by trying to jointly work together refining the prescriptive regulations to make them a little less onerous. However, the adversarial relationship between personnel from the Nuclear Regulatory Commission and personnel from the nuclear electric generating industry persists and the prescriptive regulations change incrementally if at all. Current efforts to blend prescriptive regulations and performance-based regulations are not going to help the nuclear industry. The nuclear industry can not afford another layer of regulation on top of the existing regulations.

II. OVERALL NUCLEAR PLANT PERFORMANCE

Performance at a commercial nuclear electric generating plant is generally defined as generating the maximum amount of electricity with the lowest feasible cost and acceptable health risk. As such, performance at a nuclear electric generating unit is measured by three major parameters:

1. Amount of power generation.
2. Worker/public health risk.
3. Cost.

III. PERFORMANCE-BASED REGULATION

This paper proposes to begin using performance-based regulations at a minimum of two nuclear units as pilot programs to address public health risk. Performance-based regulation is defined and characterized as a regulatory approach that focuses on results as the primary means of regulatory oversight, and that has the following attributes:

1. Measurable parameters which identify performance.
2. Objective criteria to define acceptable performance which are agreed to by all parties.
3. Flexibility to determine how to meet the objective criteria.
4. An objective, quantitative monitoring process to determine acceptability of actual performance.

5. A cost effective corrective action process if the actual results are not acceptable.

It is believed that the performance-based approach offers a more objective regulatory process and affords the licensee more flexibility in developing cost-effective measures to insure adequate protection of public health and safety.

The current regulatory activities are centered around all aspects of a licensee's work practices and operations. In this culture, the regulations specify both what the licensee must do: i.e., the requirements (10CFR), and how the licensee must do it: i.e., the Standard Review Plan, the Regulatory Guides, the Branch Technical Positions, etc.

Performance-based regulation specifies what the licensee must accomplish but performance-based regulation leaves the how up to the licensee. In performance-based regulation, the NRC would define the measurable parameters that identify the relevant performance and the objective criteria that would define adequate protection of public health and safety for commercial nuclear electric generating units. The Nuclear Regulatory Commission has already done the majority of this work in the setting of the Safety Goals for the Operations of Nuclear Power Plants back in August 1986. These Safety Goals will form the backbone of any nuclear electric generating industry performance-based regulatory process.

The Licensees in the pilot programs will implement an objective, quantitative monitoring process to determine what levels of performance actually exist at the nuclear unit and compare the actual performance to the objective criteria. If a nuclear unit's public health and safety performance is acceptable when compared to the objective criteria, the NRC will observe and audit the monitoring process to make sure that the nuclear unit remains in the acceptable area. If a nuclear unit's performance is unacceptable when compared to the public health and safety criteria, personnel at the nuclear unit would define cost effective corrective action and make the changes necessary to bring the nuclear unit into the acceptable range. Personnel from the NRC could assist in this process to define cost effective corrective action. Personnel from the NRC would be carefully monitoring progress in any case. The effort should be cooperative rather than adversarial because as stated at the beginning, "As a nation, our economic viability in a world economy demands that the government become a participant in the quest to remain competitive in all areas."

The monitoring process would confirm that the changes result in acceptable performance after the changes are implemented. If the nuclear unit's performance remains unacceptable when compared to the public health and safety criteria and no cost effective options to change the situation are available, the nuclear unit would be shutdown. Fines would be imposed on the utility only if the utility falsified information or deliberately tried to mislead the NRC as to the actual performance of the nuclear unit.

Performance-based regulation for United States nuclear units will be very plant specific. The public health risk from radiation from each nuclear unit appears to be unique. Only accidents that damage the reactor core and allow fission products from the core to be transported to the public have any measurable impact on public health risk and these accidents are unique to each nuclear unit. There will be no standard review plan for performance-based regulation. There will be a decision process that will be based on the specific public health risk profile of each unit. Commonality will exist only in that each nuclear unit will have the same objective criteria, the NRC Safety Goals. How the Safety Goals are met is left to each nuclear unit and each unit will have its own cost effective program to meet the Safety Goals.

IV. NRC SAFETY GOALS

The parameter that has caused the nuclear plants the most trouble is Public Health Risk. The inability to monitor this parameter in a cost effective fashion has led to the decline and possible extinction of the nuclear option for electric power generation in the United States. This is in spite of the fact that there has been no injury from radiation effects to any member of the public in over 1500 reactor years of commercial nuclear electric generation in the United States and in spite of the fact that the Nuclear Regulatory Commission adopted its own Safety Goals for the Operations of Nuclear Power Plants in 1986.

In August 1986, the Nuclear Regulatory Commission published a policy statement pertaining to 10 CFR Part 50 that established goals that broadly define an acceptable level of radiological risk with regard to the operation of nuclear power plant. The Commission established two qualitative safety goals which are supported by two quantitative objectives. The two supporting objectives are based on the principle that nuclear risks should not be a significant addition to other societal risks.

The qualitative safety goals are as follows:

-- Individual members of the public should be provided a level of protection from the consequences of nuclear power plant operation such that individuals bear no significant additional risk to life and death.

-- Societal risks to life and health from nuclear power plant operation should be comparable to or less than the risks of generating electricity by viable competing technologies and should not be a significant addition to other societal risks.

The following quantitative objectives are to be used in determining achievement of the above safety goals:

-- The risk to an average individual in the vicinity of a nuclear power plant of prompt fatalities that might result from reactor accidents should not exceed one-tenth of one percent (0.1%) of the sum of prompt fatality risks resulting from other accidents to which members of the United States population are generally exposed.

-- The risk to the population in the area near a nuclear power plant of cancer fatalities that might result from nuclear power plant operation should not exceed one-tenth of one percent (0.1%) of the sum of cancer fatality risks resulting from all other causes.

The Safety Goals for the Operations of Nuclear Power Plants are rarely used by the staff in the Nuclear Regulatory Commission because of the distrust of Probabilistic Risk Assessment by most of the NRC staff. It is stated in the General Considerations for the NRC Safety Goals, "In particular, because of the present limitations in the state of the art of quantitatively estimating risks, the quantitative health effects objectives are not a substitute for existing regulations." Today, 10 years later, the same rationale is cited by staff of the NRC when people suggest the use of the Safety Goals. However, this position may be changing.

V. PROBABILISTIC RISK ASSESSMENT

In order to apply the Safety Goals, one must be able to measure the public health risk (what can happen to impact the health of the public, how often does it happen, what are the consequences if it happens) to the individual and to society. The nuclear industry does this through the use of Probabilistic Risk Assessment (PRA). These Probabilistic Risk Assessments address accidents at the nuclear units that can damage the reactor core. Only accidents that damage the reactor core and allow fission products from the core to be transported to the public have any measurable impact on public health risk.

The first major Probabilistic Risk Assessment of nuclear units was completed in 1975 and was called the Reactor Safety Study (WASH 1400). Since that time, there have been many PRA's completed and today all nuclear units have at least an Individual Plant Examination (IPE) which satisfies the requirements of NRC Generic Letter 88-20. The conclusions of all these studies has been that the nuclear units represent a very small incremental risk to the public health. All nuclear units are believed to meet the quantitative objectives defined in the NRC Safety Goals.

Even though the Probabilistic Risk Assessments of nuclear units show that the nuclear units represent a very small incremental risk to the public, some of the staff of the Nuclear Regulatory Commission have been very reluctant to use these PRA's in the regulatory process.

VI. WILL PRA'S EVER BE GOOD ENOUGH TO USE?

Probabilistic Risk Assessments have a huge advantage over the existing prescriptive, "conservative" calculations. This advantage is that the Probabilistic Risk Assessments quantify the state of knowledge about public health risk from radiation at the nuclear units and quantify the uncertainty in the PRA calculations and display the uncertainties for all to see. The prescriptive, "conservative" calculations do not do this.

The PRA's can allow operating experience to feedback into the data and methods used in the PRA's and requantify the absolute values and the uncertainties about these absolute values on a continuing basis. A living Probabilistic Risk Assessment can tell you whether you are getting better or worse with respect to public health risk and quantify the amount you are better or worse. This cannot be done in the prescriptive, "conservative" calculations. By using prescriptive, "conservative" calculations, one never knows where the mean values lie with respect to public health risk or what the distribution about the means looks like.

The advantage of quantification and uncertainty analysis is treated as a disadvantage by those who advocate continued use of prescriptive, "conservative"

calculations. These people point to the PRA uncertainties, which for a rare event such as a core damage event can range from a factor of 5 to 20, and say that we can't make decisions using these tools because they have too much uncertainty. These people prefer not to be presented with the uncertainties. They might acknowledge that some uncertainty exists in the "conservative" calculations but it has to be much less than the PRA's because it is "conservative." In fact, prescriptive, "conservative" calculations have an uncertainty of infinity. For instance, core damage events are not explicitly considered in the current regulatory process. A core damage event is theoretically precluded by the prescriptive, "conservative" regulations. Thus we have the dilemma that the only significant portion of public health risk, that which comes from core damage events, is not even acknowledged as possible in the current regulatory prescriptive rules. When an event such as the March 1979 core damage event at Three Mile Island 2 occurs, it just means that you need more prescriptive regulations which will preclude such events from happening.

There is no such thing as a risk free electric generating industry. Probabilistic Risk Assessments are always good enough to use. The very act of quantifying risk increases the understanding of the risk. To imply that you have eliminated risk by prescriptive, "conservative" calculations is to ignore the real risk. Successful technologies all use Probabilistic Risk Assessments and operating experience to refine the technology to make it successful even if the technology does not document the risk assessment. In most cases this is called cost/benefit analysis. The nuclear industry has long passed the point where Probabilistic Risk Assessments are "good enough to use." We should have paid more attention to the Reactor Safety Study in 1975.

VII. EXISTING BUILDING BLOCKS FOR SUCCESS

The nuclear industry and the NRC already have most of the tools necessary to implement a performance based regulatory process. These tools are:

1. Nuclear Regulatory Commission Safety Goals for the Operations of Nuclear Power Plants.

2. Trained people. Most nuclear units have people with 10-20 years of "hands on" experience in the units. The success the nuclear units have had in the past is due to the efforts of these people. Future success will continue to depend on their efforts. These people can make performance-based regulation work if given the chance. The people in the nuclear units are some of the most highly trained and motivated people in the entire electric generating industry. A lot of them have worked in the fossil units and can truly appreciate the benefits of nuclear electric power. Most of them have not yet given up trying to help the nuclear industry survive and even prosper.

3. Over 1500 reactor years of commercial operating experience including the event at Three Mile Island 2. As stated earlier, over 1/3 of the operating information that will come from United States nuclear units now exists if no new units are built and the present rate of existing nuclear plant shutdowns occur. This operating experience identifies what is important and what has been successful. There is a wealth of valid data in the nuclear plant records which is fairly easily retrieved for use in Probabilistic Risk Assessments. The nuclear industry also has recently developed an extensive research data base on severe accident phenomena based on the Three Mile Island 2 accident.

4. Methodologies exist to evaluate the impact of rare events on large, complex technical facilities and quite a bit of experience has been built up in the last 20 years with the applications of these methodologies. Every nuclear unit has completed a Probabilistic Risk Assessment/Individual Plant Examination. The nuclear industry has people trained in the use of Probabilistic Risk Assessment.

VIII. IMPEDIMENTS TO SUCCESS

The road to achieving cost effective change to the regulatory process by means of performance-based regulation involves significant cultural changes in both the nuclear industry and the NRC. Personnel in the nuclear industry and the NRC will have to accept new technologies and approaches. The principal obstacle to improvement will be to overcome the culture that has grown around the traditional regulatory framework in both the industry and the NRC.

Some people at the nuclear units and at the NRC believe that the only thing wrong with the regulatory process is that there are not enough regulations. They do not believe that the traditional prescriptive regulatory process leads to increased cost, accidents similar to TMI 2, existing nuclear plants shutdown for economic reasons before their license expires, no orders for new nuclear

units in the United States, and "downsizing" for existing personnel in the nuclear industry. These people want even more prescriptive requirements added to those that already exist to cover every concern that they believe exists. An example is the effort for more prescriptive regulations for shutdown and low power operation. These people fear "relaxing" the existing regulatory process especially in the areas for which they are responsible. They worry that they will no longer control the actions of others who need to do what "experts" tell them to do.

Some people also believe that there must be an adversarial relationship between the industry and the NRC. These people have the attitude that the people at the nuclear units who operate and maintain the units cannot be trusted and that the people at the nuclear units are concerned only with electric power production and not with "safety." This is in spite of the fact that Chernobyl dramatically taught us that it is the plant workers who will be the first to die if the reactor core is damaged long before any member of the public is harmed.

It also appears that morale may be falling at the existing commercial nuclear units. "Downsizing" while capital and people flow overseas is one of the reasons for deteriorating morale at the United States nuclear units. Very few nuclear workers see much future for the United States nuclear industry. The fact that the nuclear industry is thriving in some foreign countries exacerbates the situation.

Finally, there is the recognition by the thousands of people who are involved in the current regulatory process that if it is true that a performance-based regulatory process will be more efficient than the existing regulatory process, there will not be the need for as many people to regulate the nuclear units. The result will be more "downsizing." This is a very real concern for the individuals involved in the regulatory process. What these people need to recognize is that if the nuclear units could recover their cost advantage over the majority of other forms of electric generation in the United States and the regulatory process were more efficient, utilities would be more likely to order more nuclear units. Then the nuclear industry would need more workers and nuclear utilities would be hiring, not "downsizing."

IX. SUMMARY

The nuclear industry needs to immediately start pilot programs to implement a performance-based regulatory process at a minimum of two nuclear units in the United States. The pilot programs must be a total change in the regulatory process by people who are committed to making the change work. We cannot "nickel and dime" the changes. We have been doing this for 17 years and the incremental changes have not had any significant impact on the regulatory decision process for the reasons stated above in Section D. - Impediments To Success.

Performance-based regulation will be simple. The implementation will be very plant specific. Documentation will consist of a Probabilistic Risk Assessment and monitoring programs. There will be detailed probabilistic calculations and uncertainty calculations for each unit.

Performance-based regulation is not perfect but the method tries to avoid the situations where decisions are made on the basis of "My judgment is better than your judgment." Performance-based regulation will have the advantage of quantifying the uncertainties involved in the process. The method also allows the use of operating experience to feedback directly into the decision making process. This feedback is especially critical because the most important element of any program to improve performance is the ability to monitor performance and feedback operating experience into the decision process. This element is lacking in the present regulatory process.

The intent of the pilot programs is to demonstrate that performance-based regulation can lead to more cost effective operation of the nuclear units. The pilot programs will require a significant effort because no one can presently say exactly what structure the new regulatory process will take. The pilot programs will succeed if they have trained people who have the proper tools and the people are motivated to make the new regulatory process work. This motivation will have to be present in all personnel involved in the pilot programs including personnel from the Nuclear Regulatory Commission.

No one can assert with any degree of certainty that performance-based regulation will alleviate the economic pressures on the nuclear units. Even if performance-based regulation is successful in making the nuclear units more economically competitive, there is no guarantee that the nuclear utilities will order more nuclear

units for the United States. However, one can be pretty well assured that without a more cost effective regulatory process, there will be no new nuclear units in the United States and the United States nuclear electric generating industry will eventually disappear. To prevent this disappearance, we need a regulatory process that is more objective, efficient, and cooperative. We need it now.

This trial use of performance-based regulation should be a major step in fulfilling the words of Donald W. Edwards, who stated in June 1992, while working for the Yankee Atomic Electric Company, in his paper *Regulatory Improvement: Which Way?*: "As a nation, our economic viability in a world economy demands that the Government become a participant in the quest to remain competitive in all areas. This includes regulation of nuclear generated electricity. Performance-based regulation offers a viable mechanism to achieve effective risk reductions within limited NRC budgets as well as permit cost-effective responses by licensees."

TABLE 1

Operating Nuclear Units Shutdown Since 1989

Year Shutdown	Unit	Utility	Years between low power operating license and shutdown
1989	Fort St. Vrain	Colorado Public Service	16
1989	Rancho Seco	Sacramento Municipal Utility District	15
1991	Shoreham	Long Island Lighting	6
1992	Yankee Rowe	Yankee Atomic Electric	32
1992	San Onofre 1	Southern California Edison	25
1993	Trojan	Portland General Electric	18

TABLE 2

Planned Nuclear Units Canceled Since 1979

Year Announced	Units	Utility
1967	Midland 1, 2	Consumers Power
1969	Hope Creek 2	Public Service Electric & Gas
1969	Zimmer	Cincinnati Gas & Electric
1970	Bellefonte 1, 2	Tennessee Valley Authority
1970	Watts Bar 2	Tennessee Valley Authority
1971	Harris 2, 3, 4	Carolina Power & Light
1971	North Anna 3	Virginia Electric & Power
1971	River Bend 2	Gulf States Utilities
1972	Allens Creek	Houston Lighting & Power
1972	Blue Hills 1, 2	Gulf States Utilities
1972	Clinton 2	Illinois Power
1972	Hartsville 1, 2, 3, 4	Tennessee Valley Authority
1972	Seabrook 2	Public Service of New Hampshire
1972,73,74	WNP 1, 3, 4, 5	Washington Public Power Supply System
1973	Black Fox 1, 2	Public Service of Oklahoma
1973	Grand Gulf 2	Mississippi Power & Light
1973	Marble Hill 1, 2	Public Service of Indiana
1973	Skagit 1, 2	Puget Sound
1974	Carroll County 1, 2	Commonwealth Edison
1974	Cherokee 1, 2, 3	Duke Power
1974	Perkins 1, 2, 3	Duke Power
1974	Pebble Springs 1, 2	Portland Gas/Pacific Power
1974	Phipps Bend 1, 2	Tennessee Valley Authority
1974	Yellow Creek 1, 2	Tennessee Valley Authority
1976	Vandalia	Iowa Power & Light

United States
Nuclear Regulatory Commission

INTRODUCTORY COMMENTS CONCERNING THE PROCESS TO DEVELOP RISK-INFORMED REGULATORY GUIDES AND STANDARD REVIEW PLANS

Gary M. Holahan, NRR
Thomas L. King, RES

Presentation to the ACRS Subcommittee on PRA

November 21, 1996

WHY ARE WE HERE?

- To continue the constructive dialogue. ACRS comments assisted in:
  - Developing principles and defining a more integrated process
  - Focusing and simplifying the guidance
  - Promoting appropriate balance between qualitative and quantitative assessments

- Discuss significant changes to the general Regulatory Guide and Standard Review Plan

- Discuss graded quality assurance, inservice testing, and technical specifications application-specific RGs and SRPs

- Identify major issues and significant comments

PROCESS FOR FINALIZING GUIDANCE

- Complete ACRS and CRGR reviews of DRAFT documents
- Forward to EDO in mid-December 1996
- Formal public comment period -- Winter/Spring 1997
- Resolve public comments and revise documents -- Summer 1997
- ACRS/CRGR review proposed final documents -- Summer/Fall 1997
- Forward proposed final documents to Commission -- Fall 1997
- Publish final guidance documents -- December 31, 1997

WORKING ISSUES

- Decision guidance for large early release frequency
- Restructuring Reg Guide, SRP and NUREG
- Treatment of uncertainties

WHAT DO WE WANT?

- Major issues and concerns identified by November 22, 1996
- A letter from the ACRS in early December 1996 that supports making the documents available for formal public comment period
- Comments from the ACRS concerning issues or aspects of the documents that the staff should specifically seek public comment

3A

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

November 18, 1996

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

Dear Chairman Jackson:

SUBJECT: PLANT-SPECIFIC APPLICATION OF SAFETY GOALS

During the 436th meeting of the Advisory Committee on Reactor Safeguards, November 7-9, 1996, we discussed the application of Safety Goals on a plant-specific basis. This subject was also discussed at meetings of our Joint Subcommittees on Probabilistic Risk Assessment and Plant Operations on July 17-18, 1996, and of our Subcommittee on Probabilistic Risk Assessment on August 7, 1996. We also had the benefit of the documents referenced.

In a Staff Requirements Memorandum dated June 11, 1996, we were requested to provide recommendations on how the Commission's Safety Goals and Safety Goal Policy should be revised to make them acceptable for use on a plant-specific basis.

The Safety Goal Policy Statement made it clear that the Quantitative Health Objectives (QHOs) and the subsidiary Core Damage Frequency (CDF) goal were to provide standards for the NRC staff to judge the overall effectiveness of the regulatory system. That is, if the risk posed by the population of plants on the average proved to be less than the Safety Goals, then the staff (and presumably the public) would deem that the regulatory system had functioned appropriately to protect the health and safety of the public.

The Safety Goals quantified "how safe is safe enough" for the population of U. S. plants. For an individual plant, however, the acceptable level of risk is determined by the concept of "adequate protection," which in the final analysis means compliance with the body of regulations. Risk-informed analyses would provide a more rational basis for making regulatory decisions regarding plant-specific requests for exemptions from the rules or for changes to the licensing basis, and the acceptability of new regulations.

In our August 15, 1996 report, we stated: "the safety goals and subsidiary objectives can and should be used to derive guidelines for plant-specific applications. It is, however, impractical to rely exclusively on the Quantitative Health Objectives (QHOs) for routine use on an individual plant basis. Criteria based on core

damage frequency (CDF) and large, early release frequency (LERF) focus more sharply on safety issues and can provide assurance that the QHOs are met."

In developing plant-specific criteria, it is important to consider the regulatory needs in the near future and to ensure that the process will be evolutionary rather than so revolutionary that it might discourage the licensees from using this approach. It appears that most of the anticipated licensee requests for changes to their current licensing basis will deal with Level 1 probabilistic risk assessment (PRA) issues, e.g., inservice inspection, extension of allowed outage times. Furthermore, most licensees have only recently familiarized themselves with Level 1 PRA methodology for the narrow regime of power operations. They are just beginning to integrate findings of such Level 1 risk assessments with the safe operation of their plants. Even the NRC staff is still coming to grips with the implications of Level 1 risk assessment results for regulation of nuclear plants. Many licensees do not have access to the technologies for facile conduct of full-scope Level 2 or Level 3 PRAs that treat power operations, low power/shutdown operations, as well as accidents initiated by external events. Commonly accepted standards for such extensive, in-depth analyses do not exist.

An evolutionary and pragmatic approach for using Safety Goals on a plant-specific basis would be to use the CDF as the primary criterion for evaluating proposed changes along with a qualitative or quantitative evaluation of the possible Level 2 and Level 3 PRA issues raised by these changes. For a quantitative analysis, the following two options are offered:

1) Full-scope Level 2 PRA (with fission product transport capability).

To use this option, a conservative value for a LERF criterion must be determined. This value, along with the CDF criterion, will provide an acceptable basis for decisionmaking. We note that both the NRC staff and the Electric Power Research Institute, in its, "PSA Application Guide," are proposing the use of LERF as an acceptance criterion.

2) Full-scope Level 2 PRA (without fission product transport capability).

To use this option, conservative values for early containment failure frequency criteria for different reactor designs must be determined. These values, along with the CDF criterion, will provide an acceptable basis for decisionmaking.

In the longer term, we believe the agency should move beyond the evaluation of risk associated with proposed changes to individual plant licenses and apply the Safety Goals to assess the

acceptability of plant-specific risk. This could be done in terms of the QHOs, along with the CDF, or in terms of the CDF and LERF. To use the QHOs directly, it would be necessary to have full-scope Level 3 PRAs. We believe that the use of Level 3 PRAs in the future should be encouraged.

Sincerely,

T. S. Kress
Chairman

References:

1. Staff Requirements Memorandum dated June 11, 1996, from John Hoyle, Secretary, NRC, to John T. Larkins, Executive Director, ACRS, Subject: Meeting with ACRS, Friday, May 24, 1996
2. ACRS report dated August 15, 1996, from T. S. Kress, Chairman, ACRS, to Shirley Ann Jackson, Chairman, NRC, Subject: Risk-Informed, Performance-Based Regulation and Related Matters
3. Electric Power Research Institute Report TR-105396, "PSA Application Guide," prepared by ERIN Engineering and Research, Inc., August 1995

United States
Nuclear Regulatory Commission

OVERVIEW OF REGULATORY GUIDE DG-1061 AND SRP CHAPTER 19

MARK CUNNINGHAM
ROBERT JONES

PRESENTATION TO ACRS SUBCOMMITTEE ON PRA
NOVEMBER 21, 1996

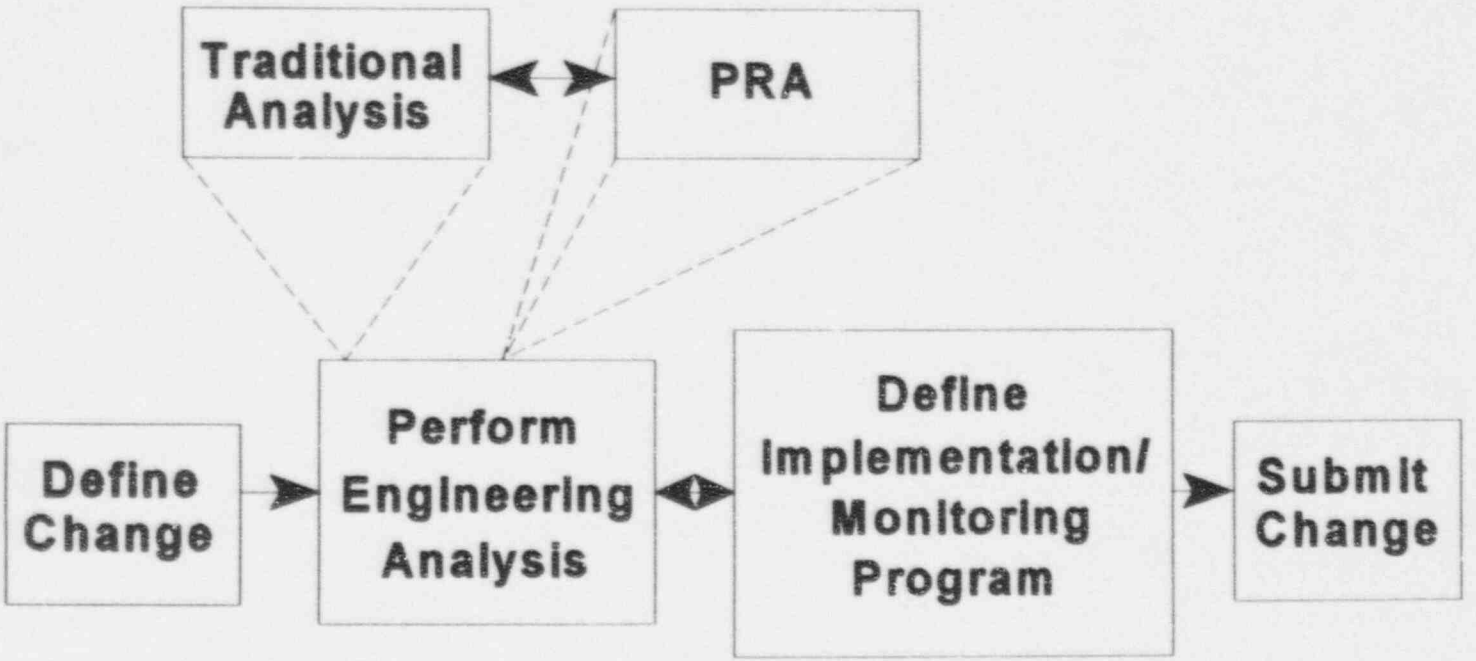
Proposed Principles for Risk-Informed Decisionmaking

- The current regulations are met unless the change is related to an exemption or rule change
- Adequate defense-in-depth is maintained
- Adequate safety margins are maintained
- Changes do not result in individual plant risk exceeding the safety goals and the subsidiary objectives
- Changes result in only small increases in calculated plant risk
- Performance-based implementation and monitoring strategies will in part account for uncertainties in analysis models and data

Staff Expectations of Evaluation Process

- All safety impacts of the proposed change are evaluated
- The analyses are appropriate for the nature and scope of the CLB change and are based on the as-built, as-operated and maintained plant
- Uncertainty is considered
- Decisionmaking is integrated
- The PRA is subjected to peer review
- Areas where requirements should be increased are also identified
- Data, methods, and assessment criteria are scrutable and available for public review

Four-Element Process



Element 1: Define the Proposed Change

Objectives:

- **Provide groundwork for evaluation of safety impacts of the proposed change**

Activities:

- **Identify all SSCs, procedures, and activities that are covered by the proposed CLB change**
- **Identify available engineering studies, PRA findings, etc. relevant to the proposed CLB change**
- **Describe the CLB change and outline the method of analysis**

Element 2: Conduct Engineering Evaluations

Objectives:

Evaluate proposed changes to ensure that:

- **Defense-in-depth is maintained**
- **Safety margins are maintained**
- **Calculated plant risk does not exceed safety goals and their subsidiary objectives**
- **Calculated increase in plant risk (if any) is small**

Element 2: Conduct Engineering Evaluations

Activities:

- **Assess defense-in-depth using traditional methods or risk analyses techniques**
- **Assess the adequacy of safety margins**
- **Assess plant risk impact**

Element 2: Conduct Engineering Evaluations

Objective: Maintain Defense-In-Depth

- **Preserve the balance among prevention of core damage, prevention of containment failure, and consequence mitigation**
- **Avoid over-reliance on programmatic activities**
- **Account for expected frequency and consequences of challenges to the system**
- **Maintain defenses against potential common cause failures**
- **Maintain independence of barriers**
- **Maintain defenses against human errors**

Element 2: Conduct Engineering Evaluations

Objective: Maintain Safety Margins

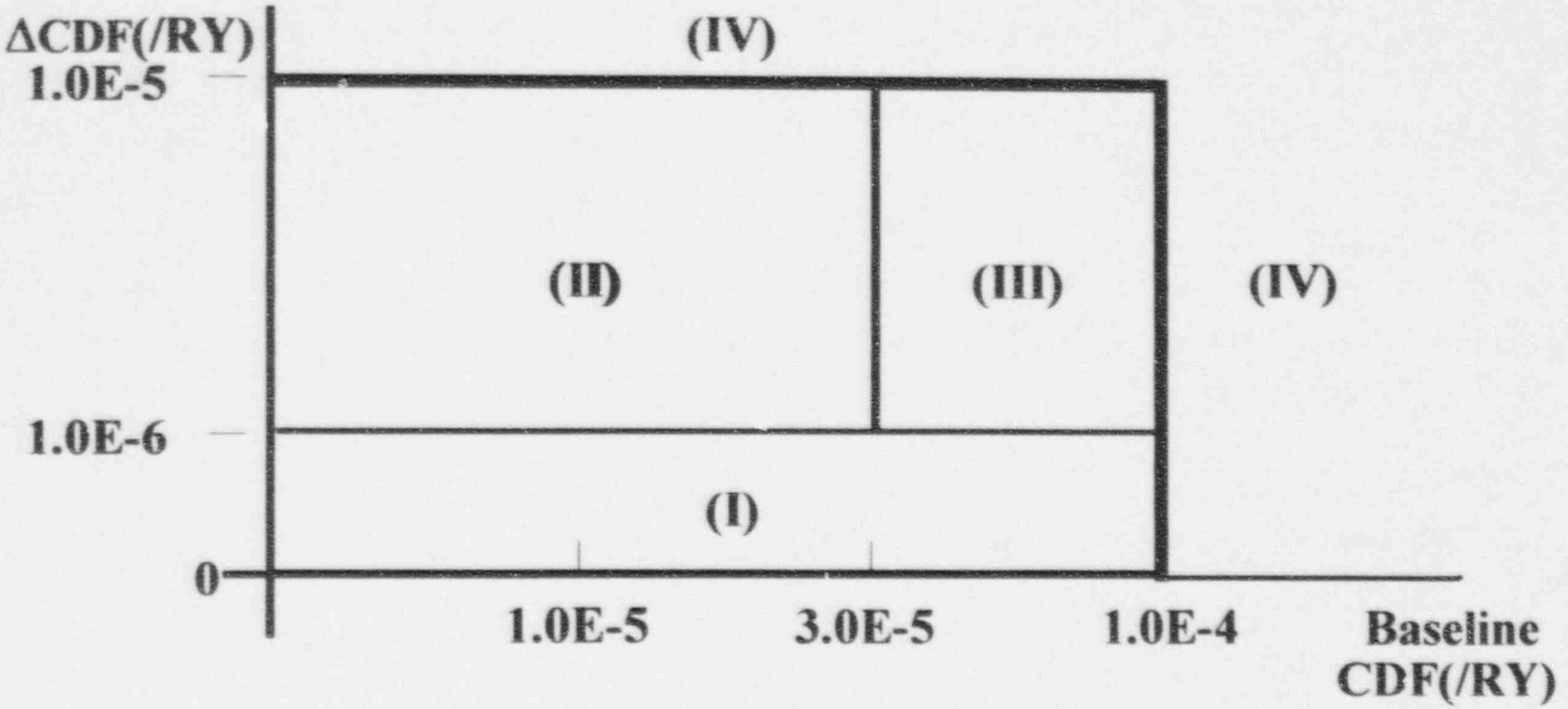
- **Meet codes and standards or alternatives approved for use by the NRC**
- **Maintain adequate controls to prevent sabotage and materials diversions**
- **Maintain ALARA principles**
- **Meet safety analysis acceptance criteria**

Element 2: Conduct Engineering Evaluations

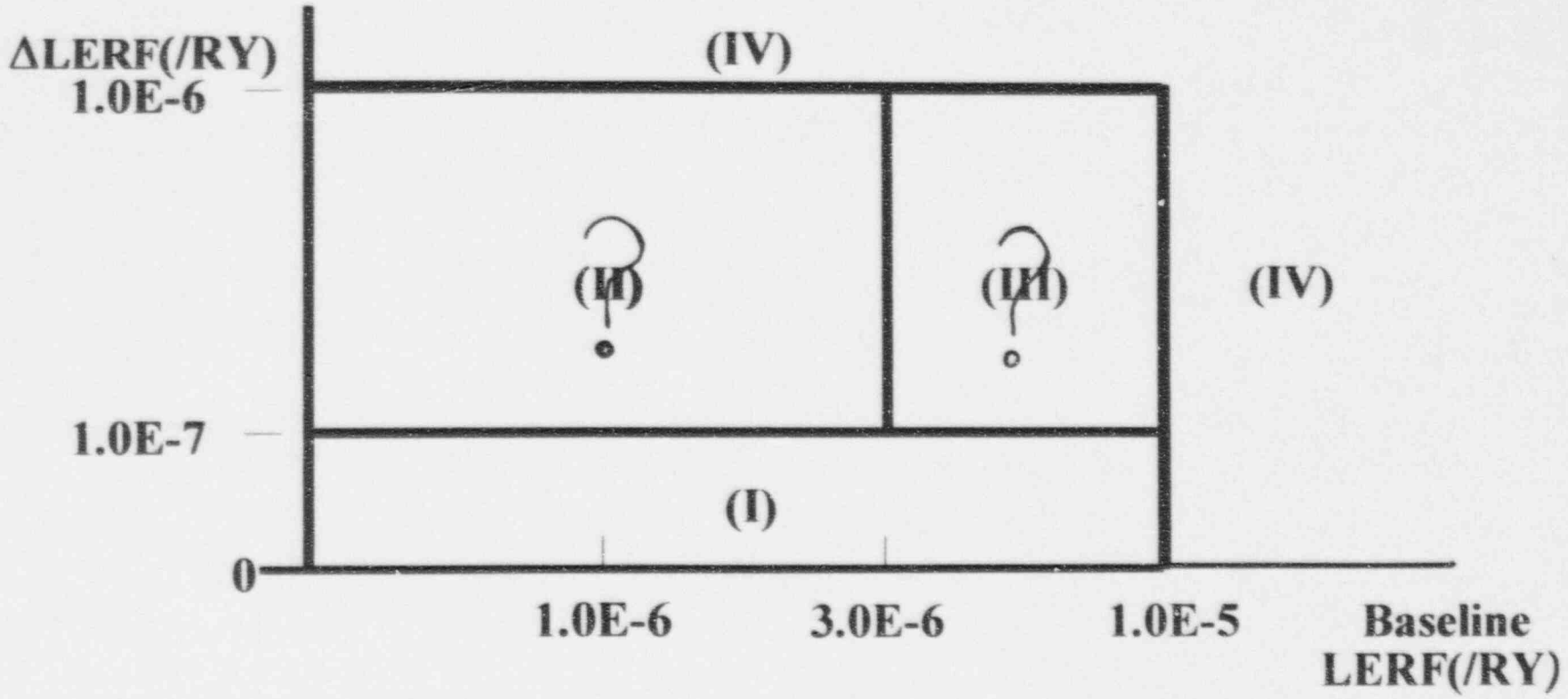
Objectives: 1. Changes do not result in undue plant risk exceeding the safety goals and subsidiary objectives

2. Changes result in only small increases in calculated plant risk.

- Proposed change is appropriately characterized in the risk analysis
- The scope and quality of the risk analysis is appropriate for the nature and scope of the change
- Risk assessment is based on the as-built and as-operated and maintained plant
- PRA used to support decisions has been subject to appropriate peer review



Decision Guidelines For Changes in CDF



Decision Guidelines for Changes in LERF

Treatment of Uncertainty in Quantitative Risk Assessment

- Types of uncertainty to be addressed
  - parameter uncertainty
  - model uncertainty
  - uncertainty due to limit in scope (completeness uncertainty)

Element 2: Conduct Engineering Evaluations

- Analysis of uncertainty
  - Parameter uncertainty: Use mean as measure of central tendency, and check tail of distribution (e.g., 95th percentile) and the source of the uncertainty
  - Model uncertainty: Demonstrate insensitivity of decision to alternate reasonable assumptions
  - Completeness uncertainty: Include margin when establishing the acceptance guidelines
  - Source of uncertainty has to be factored into the integrated decision and implementation strategy

Element 3: Develop Implementation and Monitoring Strategies

Objectives:

- **Ensure that performance-based implementation and monitoring strategies account for uncertainties in analysis models and data**

Element 3: Develop Implementation and Monitoring Strategies

Activities:

- **Develop implementation strategy commensurate with uncertainty**

- **Develop monitoring strategy to evaluate the performance of the plant elements affected by the proposed change. An acceptable approach has the following attributes:**

  a) measurable parameters to monitor plant performance

  b) objective criteria to assess performance

  c) prevents unacceptable consequences.

- **Develop a feedback mechanism and a corrective action plan**

Element 4: Documentation and Submittal

Objectives:

- **Archival documentation of the evaluation process and findings is maintained and available for audit and review**

- **Submittal includes sufficient information to support conclusions regarding the acceptability of the proposed CLB change**

Element 4: Documentation and Submittal

Activities:

- **Documentation and submittal should be sufficient to show that the proposed CLB change is consistent with the key principles of risk-informed regulation and NRC staff expectations**

- **Documentation of the analyses conducted to support proposed changes to a plant's CLB should be maintained as lifetime records in accordance with Reg Guides 1.33 and 1.88**

On-going Staff Activities

- Decision guidelines for LERF are still being discussed
- More guidance on the treatment of uncertainties is being incorporated into DG-1061 and SRP Chapter 19
- Guidance on the PRA peer review process is being added to DG-1061 and removed from draft NUREG-1602
- An appendix summarizing SSC categorization according to safety significance is being added to DG-1061
- Draft NUREG-1602 is being reformatted for readability and to ensure that it is not unnecessarily prescriptive
- DG-1061 and SRP Chapter 19 are being revised to incorporate CRGR comments
- Continue to ensure consistency among SRPs and RGs

- Major changes
- Rationale for level of guidance
- Example of a restructured task description
- Other improvements and changes

MAJOR CHANGES

- New title "Guidelines for Use of PRA in Risk-Informed Applications"
- Minimal prescriptiveness
- Improved structure and readability
- Orientation toward users and usage

  Clear statement of objectives

  Baseline PRA guidance

  Considerations for risk-informed applications

RATIONALE FOR LEVEL OF GUIDANCE

- Wide variety of risk-informed applications
- Each application imposes different requirements on supporting PRA (scope, level of detail, quality...)
- The most complex applications impose the most demanding requirements.
- Less demanding applications may deviate (with justification).

EXAMPLE OF RESTRUCTURED TASK

Accident Sequence Initiating Events:

- **Introduction**
- **Task Objectives**
  - **State-of-the-art guidelines against which baseline PRA is compared**
  - **Issues to be considered for a risk-informed application**
- **Guidelines for baseline PRA**
  - **Scope**
  - **Screening**
  - **Grouping**
- **Risk-informed application considerations**
- **Documentation**

OTHER IMPROVEMENTS AND CHANGES

- Revised peer review appendix moved to DG-1061
- Appendix A revised, companion appendix for qualitative prioritization (ranking) being developed for DG-1061
- Expanded discussion being developed for uncertainty analysis and sensitivity analysis

RISK-INFORMED TECHNICAL SPECIFICATIONS

DRAFT REGULATORY GUIDE & STANDARD REVIEW PLAN

ACRS PRA SUBCOMMITTEE

NOVEMBER 21, 1996

Roy Woods, RES/PRAB
Nanette Gilles, NRR/TSB
Millard Wohl, NRR/SPSB

Key Principles of Risk-Informed Philosophy

1. The current regulations are met by the proposed change.

2. Adequate defense-in-depth is maintained.

3. Adequate safety margins are maintained.

4. Changes to CLB and regulation do not result in individual plant risk exceeding the safety goals.

5. Changes to CLB should be done in a fashion that results in only small increases in calculated plant risk.

6. Performance-based implementation and monitoring strategies are proposed that account for uncertainties in analysis models and data.

Four-Element Approach to Integrated Decision Making
Element 1: Define the Proposed Change

- Focus on changes to allowed outage times & surveillance test intervals
- Licensee must demonstrate need for request
- Acceptable reasons for change request
  - Improvement in operational safety
  - Consistency of risk basis in requirements
  - Reduction of unnecessary burden

Four-Element Approach to Integrated Decision Making
Element 2: Conduct Engineering Evaluations
Traditional Engineering Evaluation

- Compliance with licensing basis
- Evaluation of defense-in-depth attributes
- Evaluation of safety margins

Four-Element Approach to Integrated Decision Making
Element 2: Conduct Engineering Evaluations
Probabilistic Engineering Evaluation

- Three-tiered approach to risk-informed technical specification evaluations
  - Tier 1: upper bound changes on quantitative risk measures
  - Tier 2: avoidance of risk-significant plant configurations
  - Tier 3: risk-informed plant configuration control

Four-Element Approach to Integrated Decision Making
Element 2: Conduct Engineering Evaluations
Probabilistic Engineering Evaluation
(continued)

- Tier 1 acceptance guidance
  - General RG guidance for CDF/ΔCDF & LERF/ΔLERF
  - Additional guidance for technical specifications:
    - small incremental conditional core damage probability (~5.0E-7)
    - small incremental conditional large early release probability (~5.0E-8)

Four-Element Approach to Integrated Decision Making
Element 2: Conduct Engineering Evaluations
Probabilistic Engineering Evaluation (continued)

- Tier 2 acceptance guidance: Demonstrate appropriate restrictions on dominant risk-significant configurations associated with the change

- Tier 3 acceptance guidance: Implement a risk-informed plant configuration control program & procedures to utilize & maintain the program

Four-Element Approach to Integrated Decision Making
Element 2: Conduct Engineering Evaluations
Probabilistic Engineering Evaluation (continued)

- Additional PRA issues for technical specifications
  - Quality: cross-comparisons vs. peer review
  - Modeling
  - Sensitivity & uncertainty analysis

Four-Element Approach to Integrated Decision Making
Element 3: Develop Implementation & Monitoring Strategies

- Three-tiered implementation approach
- Monitoring through Maintenance Rule

Four-Element Approach to Integrated Decision Making
Element 4: Document Evaluations & Submit Request

- Description of & reasons for change
- Traditional engineering evaluations performed & results
- PRA evaluations performed & results
- Description of process to meet three-tiered approach