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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

494TH MEETING

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WEDNESDAY

JULY 10, 2002

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ROCKVILLE, MARYLAND

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

COMMITTEE MEMBERS PRESENT:

DR. GEORGE E. APOSTOLAKIS, Chairman

DR. MARIO V. BONACA, Vice Chairman

DR. THOMAS S.KRESS, Member-at-Large

DR. F. PETER FORD, Member

DR. GRAHAM M. LEITCH, Member

DR. DANA A. POWERS, Member

DR. VICTOR H. RANSON, Member

DR. STEPHEN L. ROSEN, Member

COMMITTEE MEMBERS PRESENT: (CONT.)

DR. JOHN D. SIEBER, Member

DR. WILLIAM J. SHACK, Member

DR. GRAHAM B. WALLIS, Member

ACRS STAFF PRESENT:

DR. JOHN T. LARKINS, Executive Director

SHER BAHADUR, Associate Director

HOWARD J. LARSON, Special Assistant

SAM DURAISWAMY, Technical Assistant

I-N-D-E-X

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

(8:30 a.m.)

CHAIRMAN APOSTOLAKIS: The meeting will now come to order. This is the first day of the 494th meeting OF THE Advisory Committee on Reactor Safeguards. During today's meeting, the Committee will consider the following:

Pressurized Thermal Shock Reevaluation Project: Risk Acceptance Criteria.

Draft Final Revision 1 to Regulatory Guide 1.174, "An Approach to Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," and the Associated Standard Review Plan, Chapter 19.

Discussion of topics for meeting with the NRC Commissioners.

Risk-informed Regulation Implementation Plan; and Proposed ACRS Reports.

The ACRS will meet with the NRC Commissioners from 2:00 until 4:00 p.m. today in the Commissioners' Conference Room, One White Flint, North, to discuss topics of mutual interest.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act; and Dr. John T. Larkins is the

Designated Federal Official for the initial portion of the meeting.

We have received no written comments or requests for time to make oral statements from members of the public regarding today's sessions. A transcript of portions of the meeting is being kept, and it is requested that the speakers use one of the microphones, identify themselves and speak with sufficient clarity and volume so that they can be readily heard.

At the request of Westinghouse, video teleconferencing arrangements have been made for Westinghouse to observe the meeting session on the Pressurized Thermal Shock Reevaluation Project: Risk Acceptance Criteria.

I would also draw the attention of the members to the items of interest that was handed out to you earlier. There are four speeches by the Commissioners, and one interesting item is that on page 39, the preliminary agenda for the nuclear safety research conference this coming October is given.

And on the second page, you will find the session on formal decision methods, and nuclear safety research, that makes the Chair very happy.

MEMBER POWERS: And the rest of us know

which session to avoid.

CHAIRMAN APOSTOLAKIS: And the rest of you don't know. The first session this morning, unless someone has any comments, is the Pressurized Thermal Shock Re-Evaluation Project, Risk Acceptance Criteria, and I understand that Mr. Mayfield will open it, and Dr. Kress will lead the committee through this.

MEMBER KRESS: Thank you, Mr. Chairman. Of course, the reason that I am leading this session is because of my extensive background in structural mechanics and fracture toughness.

You guys are all aware that the PTS reevaluation project is going to lead to a distribution of frequencies through all cracks, which may or may not be a LERF, but it will lead to a LERF.

So the question is what value of that is acceptable, and that is the subject of today's meeting, and with that as an introduction, I will just turn it over to Mike.

MR. MAYFIELD: Thank you, Dr. Kress. We appreciate the opportunity to come back with the Committee. This is one of several meetings we have had, where we have had the opportunity to come and describe to you what we are doing, and the progress we are making.

This morning, we are wanted to do two things. To start off with Mark Kirk to give you a brief overview of the project and where we are on the status; and then Nathan Siu to get into the heart of the discussion on the PTS acceptance criteria.

We note that there is time reserved for the discussion of a letter. We had not particularly anticipated a letter, but if that is where the committee chooses to go, we would welcome your feedback as always. With that, Marc.

CHAIRMAN APOSTOLAKIS: Have these two gentleman ever told us who they are? Does the Committee know who they are?

MEMBER KRESS: No, we have never encountered the people at all.

CHAIRMAN APOSTOLAKIS: Nathan and Mark, do we know? Okay.

MEMBER ROSEN: We know when Mark is giving a presentation by the viewgraph.

CHAIRMAN APOSTOLAKIS: But this is Nathan's presentation.

MR. SIU: Well, I copied your format. Well, I get the lead-in, in terms of the structure of this presentation. I will be giving the overview and status, which is the pretty easy part, and then I pass

it over to Nathan, who is going to talk about the PTS acceptance criteria, and in particular, the information that went into the SECY later, and then we will be talking about the next steps for the project, and the acceptance criteria in particular.

The current rule, meaning 10 CFR 50.61, is focused on defining the allowed degree of reactor pressure vessel embrittlement to permit safe continued operation of the vessel.

As is pointed out here on the slide, there is a multi-tiered structure to 10 CFR 50.61. The licensee starts of by comparing a deterministically computed RPV embrittlement metric, namely RT PTS, again a screening criteria which is currently 270 degrees fahrenheit for axial welds or plates, or 300 degrees fahrenheit for circ. welds.

So you take the most embrittled material and compare it to those screening limits. If you are below that, everything is fine and dandy. If you are not below that, the first step that is generally taken is -- and these are words that are stolen from 10 CFR 50.61, is to employ reasonably practical flux reduction measures which many licensees have in place.

Again, to get their embrittlement metric below the screening criteria. If that doesn't work,

safety analyses are performed according to Reg Guide 1.154 to justify continued operation.

In practice, 1.154 submittals have been few and generally regarded as being unsatisfying, which is why both the NRC and the nuclear power industry has had an interest in using our improved state of knowledge as developed in the 20 or 25 years since this rule was put in place to update the rule.

In terms of our use of risk information, we are exploring the risk implications of the screening criteria that was developed as part of the original technical basis.

And just for reference, something that everybody knows, the current acceptance criteria is a through wall cracking frequency of 5E minus 6 per year.

The objective of the overall PTS reevaluation project is to reevaluate the technical basis for 10 CFR 50.61 in light of what we know now relative to what we knew in the early 1980s. We are looking at the lessons that have been learned, and an application of the rule in Reg Guide 1.154, and as I have said a number of times, the research results that have been developed since 1983.

MEMBER WALLIS: Remind me what a through

wall crack means.

MR. KIRK: A through wall -- and I'm sorry, this is going to sound really circular, but a crack to penetrate all the way through the thickness of the reactor pressure wall.

MEMBER WALLIS: And so it is just a crack. So this means that it drips? What happens when you get a through wall crack?

MR. KIRK: We don't address that.

MEMBER WALLIS: You don't address that?

MEMBER KRESS: It is a hypothetical crack. It is calculated to go through.

MR. KIRK: That's just --

MEMBER WALLIS: Well, I envision this as a real crack, and it is a little thing which reaches the outside, but it doesn't grow around the vessel or anything. It is just a little thing that goes out to a point?

MR. KIRK: Yes.

MEMBER WALLIS: And what happens after that?

MR. MAYFIELD: This is Mike Mayfield from the staff. Dr. Wallis, previous analyses, which go back to the late '80s, suggested that for an axial crack, once it penetrates the wall, there will be

sufficient driving force, and the pressure will be sufficiently high, to cause the crack to extend axially basically from the nozzle shell course to the lower head.

So you will have a large axial split in the vessel wall. So that was what those analyses indicated. For circumventional cracks, it gets to be significantly more complicated, and the confidence in the calculations goes down remarkably.

But it is not likely that you are going to get something that just drips a bit of water.

MEMBER WALLIS: It is hard to evaluate something without knowing its consequences.

MR. KIRK: I think the sub -- well, two things. Some of that discussion is going to occur later, in terms of selecting, and that gets into Nathan's part of the discussion, selecting an appropriate risk goal consistent with what we think happens later, and that gets into picking the number.

MEMBER WALLIS: Thank you.

MR. KIRK: In terms of what we are doing here in the project, right now we are evaluating the frequency of PTS induced RPV failure at four pilot plants; namely, Oconee -- and I will say these in the order that we are completing them.

But Oconee, Beaver Valley, Palisades, and Calvert Cliffs. We are developing quantitative estimates of the annual reactor vessel failure frequency, including due consideration of uncertainties.

And in the course of this project, we will be identifying the key contributors to the failure frequencies and the uncertainties. Also, one of the key steps in the program, which is again currently ongoing, is understanding and developing a rationale for extending these results on the four plants where we are doing plant specific analyses to all other pressurized water reactors.

And then we finish up by identifying and evaluating the potential PTS risk acceptance metrics and criteria, which is what the topic of today's discussion is.

The first two major bullets are what you have been briefed on many times before by the fractured mechanics folks. In terms of project status, you have seen this slide before, and we have changed around a few things, and I can go into more detail on dates if that is of interest to the committee.

Oconee. As you know, we presented results

on Oconee to you back in December, and since that time, all three of the major technical disciplines went back, as is fairly common in engineering calculations, and found both some errors, and found some things that in the light of day we decided could be done better.

Those analyses have been largely rerun at this time, and we are assembling the results.

Palisades. The licensee is currently revising the PRA. We have had first cut runs through thermal hydraulics and PSM. According to our current schedule, the final PRA and thermal hydraulics should be available for probablistic fracture mechanics runs later in this -- I'm sorry, but I am talking about Beaver Valley now.

The final cut on PRA and thermal hydraulics should be available later in this month. Palisades follows those analyses by about another month, and then Calvert will be completing in the fall or winter time frame.

MEMBER POWERS: My recollection the last time that you presented here is that you were doing a variety of sampling type calculations to develop distributions.

MR. KIRK: Yes.

MEMBER POWERS: And a question emerged, is that when you set various levels in the distribution, like your 95 percentile, or even your main, or your 5 percentile, a question emerged of what was the level of uncertainty associated with those limits on the percentiles. Have you sorted that out?

MR. KIRK: That is currently underway, and I think I might defer this one to Nathan, because we talked about your question yesterday.

MR. SIU: Well, my understanding right now is that -- I mean, I guess I would phrase it a little differently, Dr. Powers. We are developing distributions for many of the parameters in the models, the key parameters, and through the use of parameters, we are also addressing some of the model uncertainties.

Those distributions are being developed in the case of some of the parameters through expert judgment. So you have subjective distributions, which are what they are. There is no uncertainty in that, and you propagate those distributions through the entire model.

Now, in terms of the sampling scheme that we are using, I believe we were using a latin hypercube, and there were some questions about whether

there was variance reduction associated with that. So I believe we were also going to look at more direct Monte Carlo sampling methods.

But frankly, I am not quite sure how far we are on that.

MEMBER POWERS: Well, I mean, for instance, I see a variety of plots here, and on the forthcoming viewgraphs that have 95th in mean listed on them, which I am going to guess are speaking of the 95th percentiles, the mean, and the 5th percentile, and some result in distribution that you get.

MR. SIU: Yes, that's correct.

MEMBER POWERS: And these things are plotted as though they were known with high precision, when in fact in any kind of finite sampling scheme, you only know those to within an uncertainty interval.

And what I am asking you is do you know what that is uncertainty interval is?

MR. SIU: No, I don't know that. Given -- and as you will see from those plots, which we will get to some time later in the presentation, the spread is considerable. And I guess off the top of my head that the uncertainty associated with the sampling scheme would be significantly smaller than that spread.

MEMBER POWERS: Well, I doubt it. I suspect that it is inherent in your distribution that your finite sampling scheme gives you 95th percentiles that have a pretty wide uncertainty band on them.

MR. SIU: Well, again, it is in the mechanics of how you are sampling these things. Roy, are you here? Roy Woods. Do you know how many samples we are running in the Monte Carlo trials, in the Latin hypercube trials?

MR. WOODS: Okay. Roy Woods, and I work with Nathan. The question was?

MR. SIU: The uncertainty sampling. Do you know how many trials we are using in the Latin hypercube sampling?

MR. WOODS: I'm sorry, I don't.

MR. SIU: Okay. So the question still is there then.

MEMBER KRESS: Dana, you are looking for the 95-5 are you?

MEMBER POWERS: Well, that could be. I mean, that would be one possibility. But typically as you are aware when we did a lot of this work for the source term, we got distributions, and when we went with -- well, we had to go to fairly sizeable sample sizes in the Monte Carlo method to get meaningful

uncertainties.

MEMBER KRESS: Well, it was like 10,000 samples or so.

MEMBER POWERS: Well, I typically like to get over 300 if I can, and sometimes we went to thousands when it was feasible to do so. I mean, you have got a problem. They have got multiple calculations they have to hook together here.

And each one of them is not that easy to do. And the last time they were here, they were talking to us about sample sizes on the orders of 80. And then you do that, it just blows the uncertainty in your -- and especially your 95th percentile, and it becomes kind of a -- yeah, you get a number, but it is not very useful.

MR. SIU: We will check on that. My recollection -- and the whole uncertainty integration is being done through favor, and we are not talking -- I am surprised that we mentioned sample sizes of 80. I was under the impression that we were doing many thousands.

CHAIRMAN APOSTOLAKIS: But there is a difference, you know. I mean, 80 is reasonable when you are doing Latin hypercubes, and Dana is talking about thousands when you are doing straight Monte

Carlo, and they are two different things.

MR. KIRK: I think we might be dancing around the question. I am not sure what I can say, which is true, and I don't know if this helps, is that I just went ahead in the slides to show you the examples of the current calculations that we have run for Oconee.

Our convergence criteria is that in favor -- we track the mean values, and we terminate the calculation when the mean values stop changing by less than one percent.

So, for example, we don't check for at that same time currently how much the 95th percentile is changing or the 99th.

MEMBER POWERS: Well, I think I asked you --

MR. KIRK: We don't force convergence into detail.

MEMBER POWERS: I think I asked you to go through and just do a simple exercise on a square distribution, zero to one flat distribution, and see if your one percent criteria on your mean -- and then compare that to how much your variance was changing on that simple exercise.

And I think you will find that your

variance, which is in some measure your 95th percentile, and you can use the 95th percentile, is going to be changing pretty radically there.

MR. KIRK: So that we clarify the question, because --

CHAIRMAN APOSTOLAKIS: I don't understand what you just said. You said that favor looks at the estimate of the mean value, and stops when you are within one percent.

MR. KIRK: Yes.

CHAIRMAN APOSTOLAKIS: So you are not calculating a 95th and a 5th percentile?

MR. KIRK: Well, we are calculating -- and what underlies --

CHAIRMAN APOSTOLAKIS: Well, that is the criteria for stopping, but you are still calculating the --

MR. SIU: What underlines it, that's right.

CHAIRMAN APOSTOLAKIS: I think that is a good idea. Would you please give him microphone.

MEMBER POWERS: The other thing, George, is that I would disagree that 80 samples is reasonable for a hypercube sampling, simply because Latin hypercube inherently reduces the variance, and then

thus will inherently reduce the 95th percentile.

CHAIRMAN APOSTOLAKIS: No, but the whole point of Latin hypercubes is to have a small sample, right? And I think they used the 18 in the big studies, the 1150 and so on.

MEMBER POWERS: That's fine if you are looking for a mean. If you are looking for this 95th and 5th percentile, then I think you are just asking for trouble going to a latin hypercube, and I personally don't believe it saves you anything.

MEMBER KRESS: That is an interesting point, Dana, because I have not seen anywhere where they plan on using the 95th and the 5th. I think they plan on using the mean.

MR. KIRK: That is -- I think that is a question that I think Nathan will be addressing later, is what are these various -- that favors a great computer code, and like all great computer codes, it spits out way more numbers than you can use.

That is something that we could -- you know, in terms of the folks who run FAVA, certainly use feedback on what are these numbers that we are using, and then of course force convergence to that.

But to answer Dr. Apostolakis' question, we track convergence of the mean value, but we are

carrying along -- the whole distribution comes along with that.

And certainly if -- and, I mean, in any calculation, you want to track convergence of the value that you use in the end. So if the message comes back from this type of discussion that we want to be looking at the 95th percentile, we can track convergence on that certainly.

CHAIRMAN APOSTOLAKIS: But as far as myself now, I agree -- I think that the prevailing view among the risk analysts is what Nathan said; that the epistemic uncertainties here overwhelm the numerical uncertainties.

Now, if Dana thinks otherwise, I would be curious to look at a simple example to understand this better.

MEMBER POWERS: Well, the epistemic uncertainties are built into this. I mean, what Nathan says is that they build these subjective distributions, and that's fine. I mean, that is the only thing you can do, and so what else is there possible.

And then they propagate them through in a sampling process. Now, what happens is -- and the joy of a Monte Carlo sampling technique is that indeed you

get the convergence of the mean in a relatively small number of samples.

And the last time they were here, there was talk on something of the order of 80, and I can't remember exactly what the number was, that was the appropriate number to get a pretty decent mean, and that is not unusual.

I think that the criteria that they maybe advanced, they were 95 percent confident that 95 -- that they had found the 95th percentile, or something like that, and there was a lot of fun and games seeing if that was the right number, because it was a little different than what we had used in the source term definitions.

And what they were doing was fine, but the problem is that as you add in epistemic uncertainties in various parameters, that the width of the uncertainty associated with any quintal of the distribution -- and not the mean, but any of the quantities of the distribution, gets wider, and you have to use a larger number of samples in order to know those within any precision.

And these are indicative of the epistemic uncertainties.

CHAIRMAN APOSTOLAKIS: Right, but if I

already have -- well, if you look at the right figure there, a difference of at least two orders of magnitude between the 5th and 95th, how much of a numerical uncertainty affect that? Would that make it three orders?

MEMBER POWERS: No, no, what it will do is that 95th percentile that they are looking at up there could be anywhere between 10 to the minus 8th and 10th to the minus 4th.

CHAIRMAN APOSTOLAKIS: Well, if that is the case, then obviously they have to address it, but I would be surprised if that happened.

MEMBER POWERS: Oh, I think it is very easy to happen.

CHAIRMAN APOSTOLAKIS: Okay.

MEMBER POWERS: As you add in hypothermic uncertainties -- and especially the 95th percentile.

CHAIRMAN APOSTOLAKIS: Four orders of magnitude?

MEMBER POWERS: It is very common to have very wide uncertainty bands, and especially on the 95th percentiles. I mean, it is just not very unusual to get very big numbers there when you use small samples.

Now, when you get up into the thousands,

of course that converges right now, and it is no longer a sampling problem.

MR. SIU: We will definitely go back and look at this. I am under the distinct impression that we have on the order of thousands of samples from through FAVA, where we have numbers on the order of 80 or so, is when we talk about thermal hydraulic bins, and how many RELAP runs we have done.

And we have used those to represent the many thousands of PRA event sequences, and there is certainty uncertainty in that bining process as we go along.

And the treatment of thermal hydraulic uncertainties has been done in a discreet probability distribution manner, which would certainly reduce variance. But that was done in, if you will, a deterministic and probablistic probability calculation, and that you just run that through, and that is just part of your equation.

MEMBER POWERS: I know, but it will become the limiting equation on things.

CHAIRMAN APOSTOLAKIS: The practical question is that instead of 80, if you used a hundred, would you see a difference in the results that are significant, or if you went too high.

MR. SIU: But again, just to be clear, the numbers that we are talking about, I think we are talking about the TH bins, and we have been increasing those to improve the detail of the calculation.

CHAIRMAN APOSTOLAKIS: Anyway, I think we will address that in the future obviously.

MEMBER KRESS: I still didn't get an answer to my question. I think you intend to use the means, and not the 95 percentile.

MR. SIU: So far, yes. But just to go back to the -- maybe, Mark, if -- well, just to tell you where we are coming from in this presentation. This is a status report on where we are in the acceptance criteria, and we have not decided on whether it is the mean or the 95th, or the 5th.

We have not decided on the particular criteria, or the particular matrix. So we would like to present to you where we are in this task. So this is ongoing.

CHAIRMAN APOSTOLAKIS: Do you think all of this discussion over the last 7-1/2 minutes would argue for you using the mean? I mean, if a 95th percentile is so sensitive to numerical calculations, that is an argument for using the means. That is not the only one, but it is a good argument. It is a more

robust measurement.

MEMBER POWERS: Well, I think the inception of this program was cast in doing uncertainties with a certain amount of rigor. So that now I don't think that the mean captures everything. That even if you elected to use something like a mean, you would still have to cast it in terms of what does the rest of the distribution look like, much like the plots that they are putting up here.

I mean, this is the kind of plot that one would like to see. The only difference is that one would like to see something on these percentiles that reflects how certain you are about what the values are.

And even if you ended up selecting the mean, you would want to see something that said I know this value to within an order of magnitude or something like that.

MR. SIU: I understand that, right.

CHAIRMAN APOSTOLAKIS: I can't resist. I have to make a comment. The reason why we have to do all of this alchemy is because we are not using decision theory. Let's go on. No comments. Keeping going.

MEMBER POWERS: You can't do that. Yes,

you are the Chairman, but --

CHAIRMAN APOSTOLAKIS: Because you are not using utilities, and now you are stuck. And you say that it is not a good measure.

MEMBER POWERS: You can cloud it in all the decision theory mumbo-jumble that you want to. If you don't know the numbers accurately, you still are uncertain.

MR. SIU: Okay. So what we are trying to --

CHAIRMAN APOSTOLAKIS: Do you remember where you were?

MR. SIU: I'm trying. It is getting harder every day. We would like to present to you again where we are in terms of this particular task. So, again, just as a reminder, we are providing a technical basis for a risk-informed selection of a PTS screening criteria.

This is something, of course, that we are not actually going to pick criteria in this process. If there is a rule making process following this, then the criteria would be selected as part of that, and of course there is a number of activities that would go along with that; for public comment, for example.

We provided a status report in the SECY-

02-0092, which we provided to the committee, I believe, a couple of weeks ago. And hopefully you have had a chance to look at it.

Okay. Our assumptions here -- and again as Mark indicated, this is 50.61, which is focused on reactor pressure and the degree of embrittlement. And so what we are really talking about is how to identify the allowed degree of embrittlement. There already is on the books, there is a process for complying with that rule.

And what we are trying is to see if there is a technical basis for changing that rule, and part of that would include what would be the risk implications if we do change the degree of embrittlement.

It is important to note, however, that as we are talking about the allowed degree of embrittlement that we are not affecting the conditional probability of core damage given a through wall crack, and we are not talking about or we are not affecting the conditional probability of a large release given a PTS induced core damage event.

And again this is all focused on the embrittlement of the reactor pressure vessel. Those things, they are what they are, following the crack

and possible subsequent effects. So this is one reason why the focus is on largely the through wall crack frequency.

MEMBER KRESS: You at one time talked about the possibility of quantifying those conditional probabilities. Is that still in the --

MR. SIU: Yes, we are still looking at the issues underlying what happens following the crack, because that will tell us hopefully where we should be setting our limits, or inform how we should be setting our limits. That is another important point; that as indicated in the second bullet, this is supposed to be a risk-informed application, and it is not risk-based.

So there will be other considerations that may come into play. And, in fact, if we end up being confident that the PTS risk is very low, then there might be other considerations that would come into play regarding the allowed degree of embrittlement you would have for a reactor pressure vessel, just from general engineering considerations.

So again that is something that we need to consider. We are focusing on the reactor vessel failure frequency as a metric. We are not using the through wall crack frequency terminology here if only because there is some question as to how you define

failure of the reactor pressure vessel.

And that is one of the things that we address, and that I will get to a little bit later. We do want to establish --

CHAIRMAN APOSTOLAKIS: The picture that you showed earlier, you know, that we have seen several times, ends up with an annual frequency of through wall crack cracking, right, like before? It is standard.

MR. SIU: That's right.

CHAIRMAN APOSTOLAKIS: That's not what you call reactor vessel failure frequency?

MR. SIU: That could be one definition. Another definition would be the crack initiation, which would occur before the through wall -- before the crack propagates through the wall.

CHAIRMAN APOSTOLAKIS: But are you identifying the through wall crack with core damage; is that what you are saying, or with the vessel failure?

MR. SIU: No, there are two -- what we are trying to say is that there are two possible definitions that we are exploring for reactor vessel failure.

CHAIRMAN APOSTOLAKIS: Right, I understand

that.

MR. SIU: One is through wall crack.

CHAIRMAN APOSTOLAKIS: This.

MR. SIU: This. And another one is crack initiation, which is also computed by FAVA. So we have those results already, and the question is --

CHAIRMAN APOSTOLAKIS: But that would be very conservative though to say that the initiation of a crack is equal to the vessel.

MR. SIU: Well, that is one of the questions, of course. The counter-argument is are the uncertainties in the prediction of crack arrest so large that you would want to go back to something simpler.

Now, of course, how you pick your allowed level of reactor vessel failure frequency would also reflect the fact that crack initiation isn't exactly the same thing as a through wall crack development.

MEMBER WALLIS: While we are on this figure, it is strange in the light of what we have been seeing. It looks as if you calculated the possibility of vessel failure first, and then you deduce through wall cracking.

I thought through wall cracking didn't always lead to vessel failure. It doesn't seem to

make any sense.

MR. SIU: I think we are using or I think we are mixing terminology in that figure.

MEMBER WALLIS: I think you must be.

MR. SIU: It is a conditional probability of the through wall crack.

CHAIRMAN APOSTOLAKIS: Yes, and you should correct that.

MR. SIU: Thank you.

CHAIRMAN APOSTOLAKIS: Now, you said -- and I guess it is just a question of clarification, but that you are not dealing with a conditional probability of core damage.

MR. SIU: We are saying that changing the embrittlement, the allowed degree of embrittlement, shouldn't have a major effect, if any, on the conditional probability of core damage given vessel failure.

The margin is there. We don't know what it is necessarily, but it is still there. It is the same. And again we are trying to set the vessel failure frequency, and the allowed level, consistent with what we have been doing in more recent years. Mark, the next slide, please.

MEMBER WALLIS: Are you going to explain

why the mean is outside the 95 percentile?

MR. SIU: Yes. Absolutely.

CHAIRMAN APOSTOLAKIS: There is no reason he can't. It is a pathological --

MEMBER WALLIS: Well, it must be a pathological distribution.

MEMBER POWERS: Actually, it is more common distribution than -- it is more common than the alternative.

MR. SIU: Just for the cases that we care about, right? Okay. What I want to show here is first of all on the left-hand side of the graph is a notional figure of how one might go about setting the allowed degree of embrittlement.

So on the left-hand side, we have plotted this yearly frequency of reactor vessel failure, or this is what we have termed RVFF, Reactor Vessel Failure Frequency, and on the bottom we have indicated this RT PTS, the reference temperature at the end of life.

We are not using that RT PTS in the strict way that it is defined in the regulation. This is just again a notion of embrittlement. And one could use the mean curve in its relationship between RT PTS ad RVFF to derive what an appropriate level of

embrittlement would be.

And the trick would be therefore to set what is the allowed RVFF, the allowed reactor vessel failure frequency; how much of your risk do you want to allocate if you will to pressurized thermal shock.

MEMBER WALLIS: If you used the log mean, I suppose it would have to lie in the middle, or somewhere near the middle.

MR. SIU: This is the arithmetic mean. This is computed, and it is weighted, and it is your --

MEMBER WALLIS: It is shown on a large scale.

MR. SIU: It is shown on a large scale, that's correct. And that is different from what you saw in the SECY paper, but again it is jut a notional picture, just to see what you might do.

CHAIRMAN APOSTOLAKIS: In the real calculation though the mean curve will overlap with the 95th percentile.

MR. SIU: Well, in fact it does as you see on the right-hand side, but we will get there in just a second. Okay. Well, let's get there right now. The right-hand curve indicates where we are right now with the Oconee calculation. Now I will caution you

that that curve doesn't include external events, and it doesn't include any revisions to LOCA frequencies.

So we have recently been going through this effort to develop interim LOCA frequencies, which will be followed up by a more sustained effort later on. We do plan to use the interim LOCA frequencies in an update of these curves.

We also are still looking at external events in a fairly simply manner. Now, a number of things to note on the right-hand graph. As was pointed out the mean curve does exceed the 95th percentile curve on the left-hand side.

That is just a reflection that there is tremendous uncertainties in these calculations. It is also a reflection of the fact that the mean curve is just a mathematical construct. It is indeed a weighted value of the reactor vessel failure frequency.

MEMBER WALLIS: What d you mean that it is a mathematical construct?

MR. SIU: Well, there is actually a meaning in my mind to something like a 95th percentile, where you are saying or you are stating with 95 percent confidence that the RVFF is lower than that value.

The mean value is just an integral, and it has some measure of the -- it incorporates uncertainty in a way, but there is no way that it should be in the middle of the distribution, for example. There is no physical reason.

CHAIRMAN APOSTOLAKIS: This actually is not just an indication of a lack of uncertainty. As I said earlier, it is an indication of very long tail.

MR. SIU: That's right.

CHAIRMAN APOSTOLAKIS: And it means now that the issue of numerical uncertainty becomes much more important now because changing the tail a little bit makes the mean jump up and down, you know, and that is very disturbing actually, because the distribution is pathological.

If you can imagine a log normal, it will go a long way, and then it drives the mean way up there, and you change it just a little bit, and it is just crazy, but that is the way that it is. I mean, if that is the way it is, then that is the way that it is. You have to deal with it.

MEMBER KRESS: It is the selection of your distribution parameters that drives it.

CHAIRMAN APOSTOLAKIS: Or your state of knowledge I would say. It is not a matter of

selection.

MEMBER KRESS: If you use a log normal, that almost automatically does that to you.

CHAIRMAN APOSTOLAKIS: It depends on the log normal, but some log normals are better than others. But if you really have a long tail, you have this problem, which means now that the whole thing is up in the air really.

MR. SIU: Well, again, one of the messages also to take away, the first three points on the right-hand curve represent 32 effective full-power years, and 60 effective full power years, and a hundred effective full-power years.

So the extrapolation out beyond that is well beyond, of course, what you would expect with any operating system. Why are we showing extrapolation? Just to show the relationship to some of the figures of merit that we are going to be talking about later at 10 to the minus 6th and 10 to the minus 5th.

So one of the takeaways could be that despite the very large uncertainties, you are still quite confident that you are below these levels. Now, again, Dr. Powers' point about the sampling will make absolutely sure that we don't have these tremendous uncertainties, numerical uncertainties, associated

with the 95th percentile.

CHAIRMAN APOSTOLAKIS: And it is not when the mean becomes greater than the 95th that you have a problem. If it is so close, the problem is there, even if it is slightly below, and you still have that instability so to speak.

MEMBER POWERS: Well, I guess I just get very concerned that when you input your thermal hydraulic results to this, that you have these uncertainties, and you are bending in the means on those distributions and not the uncertainties in those distributions.

And then you could run 10,000 FAVA calculations and say I know this incredibly well, when in fact you don't, and it is driven by the thermal hydraulic uncertainties.

MR. SIU: Yeah, right, and so part of the strategy that we are trying to use to deal with these are certain sensitivity calculations as well, and looking some of the specific modeling assumptions built into the TH analyses.

But again that seems to be a subject of another discussion here.

MR. KIRK: There is a briefing of ACRS scheduled in December on thermal hydraulic

uncertainty.

CHAIRMAN APOSTOLAKIS: Is that an hour or two?

MEMBER WALLIS: Only in connection with PTS?

MR. KIRK: David?

MEMBER POWERS: Well, one would hope that it just in connection with PTS.

MR. KIRK: I believe so, that it does focus on the PTS.

MEMBER RANSOM: When you talk about the thermal hydraulic uncertainties, is this just pressure temperature for the vessel?

MEMBER POWERS: Heat flux.

MR. BISSETT: The answer is yes.

CHAIRMAN APOSTOLAKIS: And would you identify yourself?

MR. BISSETT: David Bissett, from the Office of Research.

MEMBER RANSOM: I also had a question. How many parameters are there in this analysis that have epistemic uncertainties?

CHAIRMAN APOSTOLAKIS: Nathan wrote a nice white paper some time ago.

MEMBER RANSOM: Well, what are some

examples?

MR. SIU: Yeah, we have looked at epistemic uncertainties in all three major aspects of this analysis, and so that is on the PRA. For example, you are looking at typical equipment failure rates. You are also looking at human error probabilities, initiating event frequencies, and things of that sort.

And some of the hydraulics now, there is a -- in the -- well, I guess in the February briefing, we had a table showing some of the key parameters. So you would look at such things as the flow rate through the break.

You looked at the heat transfer coefficients. You looked at what we would consider auditory issues, such as the temperature of the cooling water that you are injecting, which is of course affected. If it is an outside tank, it is affected by the season.

So off the top of my head, I can't give you the full set, but it wasn't -- I don't believe it was hundreds or thousands. It was more like tens of parameters that were addressed. Dave, do you want to comment on that?

MR. BISSETT: How about the vessel itself.

MR. SIU: Well, yes, on the reactor pressure vessel, of course. We looked at quite a number of the parameters, and such things as copper intent, the flaw distribution. We looked at --

MEMBER RANSOM: You have correlations that give you the cracking properties, I guess, with all of those variables?

MR. KIRK: I think within -- and as Nathan said, there is parameters, and there are relationships which are uncertain within each of the major areas. I mean, since fracture mechanics is my area, the number there is -- I mean, I never sat down to count it.

But I am sure that it exceeds 10, and I am also pretty sure that it is below 50. The other areas are probably similar.

CHAIRMAN APOSTOLAKIS: Does it take the 95th percentile?

MR. KIRK: No.

MEMBER KRESS: Let me get us back, because all of these are very valid comments on the PTS overall project, but it has very little to do with acceptance criteria. And I would like to get us back to the acceptance criteria.

MR. SIU: Thank you.

MEMBER WALLIS: But I think how uncertain you are must have some influence on your thinking about it.

MEMBER KRESS: Well, it will have some effect on your thinking, but you can produce acceptance criteria completely in the absence of that. So --

MEMBER WALLIS: When you get a weird distribution, or a distribution of this type, not necessarily weird, but whether a mean can be way outside the 95th percentile, then you get this problem that George is alluding to, and therefore you are more conservative.

You know that the tail can wag the dog, and you have got to be more careful maybe. So it is relevant to the acceptance criteria.

MEMBER KRESS: It has some relevance, but you can get this point over here on the left without thinking about uncertainty, but --

MEMBER WALLIS: But the left is not realistic.

MR. KIRK: And another thing to perhaps just bring up again, because it is something that I frequently forget, is once again we have mis-labeled this slide. This is not a PTS acceptance criteria.

It is a screening criteria.

So if any reactor crosses the line so to speak, wherever the line in the sand is drawn, that is not the end of the day. There are things that are then done after that which are the warning light.

MEMBER SHACK: You know, you are going to have to have an acceptance criteria for 11.54, and then a screening limit from that.

MR. KIRK: Yes.

MEMBER SHACK: But first we set an acceptance criteria.

MEMBER KRESS: That's right.

CHAIRMAN APOSTOLAKIS: So now I am confused. Is it acceptance or screening?

MEMBER KRESS: Well, they are tied together.

MEMBER POWERS: It is acceptance, I think.

CHAIRMAN APOSTOLAKIS: Acceptance in the sense that it is good enough, and if you exceed it, then it is not good.

MR. KIRK: I agree with Dr. Shack. That's right. We were not entirely clear on this. There are two parts to the use of this risk metric. One is in establishing the screening criteria for the level of embrittlement.

And the second one has to do with if as Mark indicated there is their tiered approach in 50.61, and at some point you do a calculation and compare your results against --

CHAIRMAN APOSTOLAKIS: So the RPTS star there on the left is a screening, or --

MR. KIRK: Yes, that would be a screening. That's right.

CHAIRMAN APOSTOLAKIS: Maybe we can move on to the next slide.

MR. SIU: Again, just the principles in developing options for the acceptance criteria. Clearly as you read in SECY 82.465, there was an intent in the original rule to keep the level of PTS events small, and they were comparing against the then draft safety goals, and there was also a desire to keep the relative contribution of PTS events small, say 10 percent I think was the number that they put out in that SECY paper.

So we would still have the intent to maintaining those principles.

MEMBER KRESS: Those are fairly arbitrary choices.

MR. SIU: Yes, but also within the --

MEMBER KRESS: And that is within the

nature of the acceptance criteria as a result.

MR. SIU: That's right. And that is where the discussion of uncertainties comes in.

MEMBER KRESS: Because they represent values.

MR. SIU: Yes.

MEMBER KRESS: These are your values.

MR. SIU: That's right. That's right. And of course the other principle is to be consistent with the more recent risk-informed initiatives, and that is one of the spurs for this particular task.

I mean, we could have just stuck with the original value, but the question had been raised that given the activities, including the development of 1174, should we reconsider that particular value of 5 times 10 to the minus 6 per reactor year.

MEMBER KRESS: What that does is give you a shift in values. There is a different set of values that establish that.

MR. SIU: That's correct.

MEMBER KRESS: And how you are just saying that maybe we will see how that set of values works out, in terms of acceptance criteria.

MR. SIU: That's right. So in this slide here, in fact that is all that we are doing. We are

saying that there are two issues that identify and lead to possible options.

One is how do we define reactor vessel failure frequency, and that comes -- the two options have to do with whether we are talking about a through wall crack, and that at the top bullet the sub-bullet is circular. But that is the PTS induced crack through the reactor pressure vessel.

So that is the through wall crack frequency that we are using now. The second option would be to look at crack initiation.

MEMBER WALLIS: One of these is vessel failure then?

MR. SIU: Well --

MEMBER WALLIS: One is through wall, and one is initiation of a crack.

MR. SIU: That's right.

MEMBER WALLIS: And it doesn't say anything about failure.

MR. SIU: Well, this is how the failure would be defined.

MEMBER WALLIS: I think I would like to know the connection between this and failure. If failure is extraordinarily unlikely as a result of crack initiation, then that is very important to me.

MR. SIU: One thing to point out here is that right now we are the only country that I am aware of -- and Mike can correct me -- that uses through wall crack generation as the definition of failure. Other countries use initiation, crack initiation.

CHAIRMAN APOSTOLAKIS: And, Graham, if it were extraordinarily unlikely, I don't think those guys would even consider identifying failure with crack initiation.

MEMBER WALLIS: But we need to know how likely it is though. We don't want to waffle about it.

CHAIRMAN APOSTOLAKIS: So it must be less than the --

MEMBER WALLIS: We need to know the connection, right in some numerical way?

MR. SIU: And indeed we have the predictions that show difference between crack initiation and through wall crack development.

MEMBER KRESS: And that is what FAVA gives you. It gives you both of those numbers, and you can sit there and look at them.

MEMBER WALLIS: I can think of through wall crack as essentially vessel failure. I think of

them as synonymous.

MR. SIU: Yes, and as Mike indicated earlier, it was based on earlier analyses and experiments at the heavy steel section technology research program in Oak Ridge, where they were looking at a number of -- I guess you would call them prototypical vessels, and they observed how those vessels reacted under both high thermal shock conditions, and pressurized thermal shock conditions.

And there were some cases where they indeed had catastrophic failure of the vessel. Now, there are some questions about the representiveness of those tests with respect to reactor pressure vessels, and that is something that we have got some work ongoing to deal with.

MEMBER ROSEN: Catastrophic failure of the vessel means at least complete depressurization?

MR. SIU: Yes. These were very big --

MR. MAYFIELD: This is Mike Mayfield from the staff. Some of those tests literally fragmented the vessel. You had chunks left.

MEMBER WALLIS: And are you going to explain to us what crack initiation means? There are always flaws, and when is a flaw a crack? Is that something that is understood or is it arbitrary?

MR. KIRK: In this analysis, we start with the preexisting fabrication flaws that have been identified by our work at P&L, and we got the flaw distributions from them. So those are things like lack of penetration.

Well, not so much lack of penetration, but predominantly lack of fusion, either in the sidewall fusion or the brief fusion, is what really drives these distributions. So you have those flaws that are on the order of millimeter or submilimeter, all the way up to perhaps half-an-inch to mixed units.

And crack initiation is when that crack extends due to the applied loads.

MEMBER WALLIS: When it is crack growth initiation you mean really isn't it?

MR. KIRK: I'm sorry?

MEMBER WALLIS: Initiation of crack growth. It is not the crack itself. There are always little cracks you could say, but it is the growth of the crack that you worry about.

MR. KIRK: Yes. The crack grows from that size, yes.

MR. MAYFIELD: Let's try and be precise.

MEMBER WALLIS: Yes, please.

MR. MAYFIELD: This is the initiation, the

onset of unstable crack extension.

MEMBER WALLIS: That's right.

MR. MAYFIELD: It is not subcritical crack growth like we talk about for environmentally assisted cracks.

MEMBER WALLIS: You want to be clear, because you need to tell the public that there are flaws and so on, and this is very different from the growth of cracks,and you have got to make that clear to them.

MR. SIU: Okay. So again I think we need to investigate -- and in fact that is the issue that Dr. Wallace has raised. What is the difference between this crack initiation and through wall crack development.

What is the numerical difference, and what are the uncertainties in the prediction of that difference, and that would help us determine what is an appropriate level, or what is the definition of reactor vessel failure that we would recommend as part of our technical basis document.

The three options that we have in terms of acceptance limits, and here is where I will retract a little bit from what my response earlier to Dr. Kress was about whether we are using mean values.

Clearly, if we benchmark to 10 to the minus 5th, and 10 to the minus 6th, which are the numbers that you would see in REG Guide 1174 and in some of the Option 3 framework now, those are mean values.

Again, I don't think that we would have to be locked into mean values, but it would be consistent with what we are doing in other areas.

MEMBER WALLIS: Could you help me again? Is reactor vessel failure really synonymous with LERF, or is it synonymous with PDF, or is it somewhere in between?

MR. SIU: The problem is or the belief is that it is somewhere in between, and we don't know how much. So really the question is given our state of knowledge about what happens after through wall crack development, are we sufficiently uncertain that we should equate it to a large early release?

MEMBER WALLIS: I tend to equate it to LERF, just sitting here, but not knowing very much.

MR. SIU: And that could very well be where we end up. Without -- I will get to some of the next steps, and we will try to dig into it just a little bit. But we are trying to maintain the December 2002 completion schedule that has been

mentioned, I'm sure, to the Committee, before.

So that will necessarily put a limit on what we are able to do.

MEMBER POWERS: Well, help me a little bit, Nathan. Suppose we pick one of these numbers, like 1-times-10 to the minus 5th, and we assumed that every reactor in the country was the same as Oconee.

What would be the probability that over the course of a 60 year lifetime that we would have in the country a reactor vessel failure?

MR. SIU: My problem with that is that I have trouble doing numerical immigration in my head, and what you have got is a time dependent failure probability as you would see from the graph there.

MEMBER POWERS: I don't really want an answer from you, but isn't that the kind of thinking that you would have to go through to decide among these things?

MR. SIU: Yes.

MEMBER POWERS: And have you gone through that exercise at all?

MR. SIU: Not yet, because one of the steps that we have to do is address the question does every vessel look like Oconee, and they clearly don't.

MEMBER POWERS: Yes, and you probably

wouldn't do that. You would probably say, okay, every vessel looks like as the vessels are, and do the integration in your head. And that is when you need that distribution that we discussed one slide and a half-an-hour ago.

MEMBER KRESS: Well, actually the safety goal, the practicality safety goal, to some extent was derived with that kind of thinking. And it doesn't tell you what the status is with respect to that goal. It just tells you what the goal is.

MEMBER POWERS: And that is all that we are looking for right here.

MEMBER KRESS: Yes. Well, you can set the goal and say this is what is acceptable to us, and it may very well turn out that all of the plants are way below the goal, and that's all right. I don't think that should influence the setting of the goal.

MEMBER POWERS: I think you can't take such a detached view here, because you are going to come in and you are going to say, well, I have got to pick one of these numbers.

MEMBER KRESS: Oh, yes, you have to pick some number.

MEMBER POWERS: Or some other number. But I pick a number and I would like to relate it somehow

to the frequency of things happening. I have already judged that I would really, really, really not like to have my vessels fail.

MEMBER KRESS: Yes, and my relationship there would be that I would pick the safety goals. I mean, that is how I would end that.

MEMBER POWERS: The trouble is how do you do that. Then you have got to factor in containment performance here

MEMBER KRESS: Well, you would either do that, or you would make the big jump that Graham makes and say, well, it is a LERF. And then I have got a LERF surrogate for the safety goal, but I wouldn't want just one set of sequences to equal my whole LERF. So I would have to back off on that to some extent. But that would be the way that I would approach it.

MEMBER POWERS: I think you are asking them to compound the problem too much. Why don't we just say that I really, really don't want vessels to fail.

MEMBER KRESS: Well, that is what the safety goal is. We really, really don't want to have a LERF, and that is what I am saying, is that it is already built into that.

MEMBER POWERS: So how you have to look

and say if I pick this number -- let's say I pick 1-times-10 to the minus 5th.

MEMBER KRESS: Then I would say -- well, that is for the whole LERF. And I really don't want a pressurized thermal shock to be very much a contribution to that. And here you are getting into values.

MEMBER WALLIS: But that is a 10 percent of the load.

MEMBER KRESS: Well, they said 10 percent, but I don't know if that is the right number or not.

MEMBER POWERS: Well, I suppose you have to go back and let's suppose I took 1 times 10 to the minus 5th. What is the probability that I am going to have in the course of a lifetime an event somewhere in the country?

MEMBER KRESS: I think that would be a nice number to come up with. But you have to multiply by the number of plants, and you have to have a value for each of the plants.

MEMBER POWERS: Somewhere in this you come back to those distributions that they were talking about earlier, and you know that you are going to be around one of the tails of the distribution, and that is where we get into the problem of how well do you

know the tail.

MR. MAYFIELD: This is Mike Mayfield. I think that there is something that Nathan had mentioned earlier. At some point, and if you actually started seeing vessel failure probabilities computered this way and starting to climb up to these kinds of numbers, the level of embrittlement has climbed so high that basically you would be operating a reactor pressure vessel well below its nil-ductility transition temperature, and that's just a bad engineering idea. We go to some lengths as we design and build things and not have that situation.

So there could easily become other criteria that would begin to govern the level of embrittlements that we would think is a good idea.

MEMBER POWERS: If you ran production reactors for 10 years --

MR. MAYFIELD: Sir?

MEMBER POWERS: We've run production reactors for 10 years when they were embrittled.

MR. MAYFIELD: Well, embrittled, operating below the nil-ductivity temperature.

MEMBER POWERS: Yes. They were cool. It was a bad idea.

MR. MAYFIELD: It is a fundamentally bad

idea, and that was the point that Nathan had made earlier. That there could easily become other criteria that we would start looking at in a risk-informed approach to that.

MR. SIU: Okay.

MEMBER KRESS: Those three values that you have up there, could we go back to them?

MR. SIU: Yes.

MEMBER KRESS: The first ones are the ones that you already have.

MR. SIU: That's right.

MEMBER KRESS: The 1.154, and the second one is just the overall acceptable LERF value in REG Guide 1.154.

MR. SHACK: That is a tenth of a CDF.

MEMBER KRESS: That is a tenth of a CDF?

MEMBER SHACK: If you say take a tenth of that, yes.

MR. SIU: If you could convince yourself --

MEMBER KRESS: That one really bugs me.

MR. SIU: If you could convince yourself that there was -- that you basically had the same margin between a PTS induced core damage event and your, quote, average core damage event, then you could

peg it to the core damage frequency.

MEMBER KRESS: I understand. And the other one is a tenth of the LERF.

MR. SIU: Right.

MEMBER KRESS: So you could have both of those as criteria actually because one of them is a CDF and one of them is a LERF.

CHAIRMAN APOSTOLAKIS: What do you mean both?

MEMBER POWERS: Well, they just lead you to a different conclusion.

MEMBER POWERS: Yes, but I think you are still compounding it in. You had better be able to tell me what happened after the vessel failure.

MEMBER KRESS: Well, if it tells me that if I am using this one-tenth rule of thumb that it is a LERF that is driving it, and not CDF, and then you just forget about the one in the middle and say I am really worried about LERF, and use the 1-times-10 to the minus 6th.

CHAIRMAN APOSTOLAKIS: But that is a matter of

-- I am missing something. I mean, this is a matter of choice.

MEMBER KRESS: Oh, yes.

CHAIRMAN APOSTOLAKIS: So nothing is driving it. I mean, except for your values.

MEMBER KRESS: Those criterias are always a matter of choice.

MEMBER WALLIS: I think it is very clear. You started assuming it is a LERF and then you say show me it is not a LERF, or otherwise it is a LERF.

MEMBER KRESS: You may have to get out and have a conditional LERF.

MEMBER POWERS: Before I jumped in and started pursuing that action, somebody would have to tell me what happens after a failure.

MEMBER WALLIS: Well, that's what I mean, because I don't know.

MEMBER POWERS: Because I have a feeling that the source term consequences of a prompt containment and failure associated would be radically different than anything that we have ever looked at before.

MEMBER KRESS: That's right, and that's why you worry about making one-tenth of the REG Guide 1.154 or 1.174 value, because that was based on a particular source term, and I agree with you on that.

MEMBER WALLIS: You mean it is worse than a LERF?

MEMBER POWERS: Yes, it would be a very different kind of source term. I would think there would be nothing in the calculational base that led to LERFs and CDFs that was comparable at all.

MEMBER KRESS: I agree with you on that.

MEMBER POWERS: I mean, this would be more like the LERF 1400 -- I mean, it could be. You would have to tell me more about what happens following the rupture, but it could be very much like the LERF 1400 steam explosion, first term, because you get a prompt failure error, and --

CHAIRMAN APOSTOLAKIS: Let me understand that Dana, though. If he tells you that he is very conservative, and that he is taking one-tenth of a LERF goal, even though it was not under the same oxidation conditions, and 10 to the minus 6, and he says that is or he identifies that as a crack initiation as the second thing, and so he is really conservative, do you expect that because you would have a different source term that the ultimate goal will be very different? Really? Even though he has been so conservative?

MEMBER POWERS: Well, with an S-1 source term, you would probably multiple consequences by a factor of a hundred pretty easily.

MEMBER KRESS: And once again, we don't like the idea of building your uncertainties in like this. Why don't you go to the front end and then find out exactly how your condition compares with some acceptance value, and then build your conservatism in there.

CHAIRMAN APOSTOLAKIS: So what you are saying is that the choice should not be among these three values that Nathan is showing you.

MEMBER KRESS: That's right.

CHAIRMAN APOSTOLAKIS: Because there is an important element missing to take you all the way to the quantitative help objective.

MEMBER KRESS: That's exactly right. And the idea is probably that -- well, the only right acceptance criteria you really have is the safety goals, and they are not really risk acceptance criteria. They are just safety goals.

But since we don't have any, I would say, well, let's start with the practicality. Well, you have to do a level three calculation to get it. The value in 1.174 was appropriate for what it is used in 1.174 for, but probably not appropriate for this.

MEMBER WALLIS: I think you have to worry about land contamination, too, if you are talking

about the kind of release that you are taking about.

CHAIRMAN APOSTOLAKIS: Well, I think you have to talk to these guys to revise it. I can agree with what Tom is saying, but to go beyond that --

MEMBER POWERS: I wouldn't overreact until there is a part of the calculation that is missing, the calculation sequence that is missing, and that I really don't have too much intuition on.

And that is, okay, the vessel failed and now what? I can find in the literature things like Rich Denning's calculation that says, well, the vessel jumps a little bit. I can find in the literature things like the German's calculation that says, well, the vessel goes through the roof and it is a lower orbit.

Okay. Well, then I have a very wide range of uncertainty about what happens following vessel failure here. And until I have a better understanding of that, I don't have know how to do what Tom is asking for.

MEMBER KRESS: You are exactly right.

MEMBER POWERS: All I know is that he is absolutely right. I cannot take the LERF value as it was derived from the safety goals, and I think in that case it actually was derived from the safety goals.

CDF wasn't.

MEMBER KRESS: It definitely wasn't.

MEMBER POWERS: And to start using that as some criteria.

MEMBER WALLIS: Well, if you know nothing, what are you supposed to do? Are you supposed to assume the worst or is the worst reasonable, or what?

MEMBER KRESS: Well, I will tell you what you can do. The 1.174 value is the specific white water reactor source term that is used in every site that we have, and it calculated the practicality of the safety goal, and plotted it versus LERF, and used the mean value, okay?

Now, that is probably a pretty good approach for what 1.174 is being used for. Now, when you are crafting a regulation like this, I would have used a different source term, and repeat the process, and instead of using a mean value, you use some bounding value.

And that gives me a new LERF that represents the practicality safety goal in a conservative way, and at a high level of confidence. And then use that value, some fraction of it, and maybe the one-tenth is a pretty good rule of thumb, and back down. I think it is going to give you a

number that is a low lower than any of those three.

MEMBER WALLIS: That sounds very reasonable, and then you would have to know the source term.

MEMBER KRESS: Yes. You have to know something about the source term.

MEMBER POWERS: There is nothing that would like me more than to work out that source term for them and what not. But I think there is another way to go about it, Tom. And that is to say again I really, really don't want vessels to fail, and say what is the frequency of failure within the fleet given my acceptance criteria.

MEMBER KRESS: Well, I'm afraid that gives you a value that may be too high, Dana, because I think that these probabilities are going to be pretty low.

MEMBER POWERS: Well, I mean, fracture mechanics gives you this 10 to the minus 45th. I mean, it is a number that is built into FAVA, I'm pretty sure. But the uncertainties help you here a lot.

CHAIRMAN APOSTOLAKIS: Can't you tie it to the core damage frequency though?

MEMBER KRESS: Well, my point that if you

use 10 to the minus 4, those last two bullets, sub-bullets, tells you that the LERF is the driving factor, because it is more reconstrictive than the CDF.

CHAIRMAN APOSTOLAKIS: That is always the case.

MEMBER KRESS: So let's be more constrictive.

CHAIRMAN APOSTOLAKIS: Well, wait a minute. I think the same study that we had the fellow work backwards from the goal under your deduction to LERF and CDF. And one of the conclusions that he reached was that the CDF value of 10 to the minus 4 is more restrictive than would be justified working backwards from the quantitative temperature.

MEMBER KRESS: But because there was a conditional containment failure, the probability now would be very different. It is one. According to Dana, it may be one, and you can't use that judgment.

CHAIRMAN APOSTOLAKIS: Well, if it is one, then maybe the 10 to the minus 4 goal for core damage frequency then is realistic, because it was already restrictive.

MEMBER KRESS: But that gives you 1-times-10 to the minus 5.

CHAIRMAN APOSTOLAKIS: What I am trying to avoid here is that they are doing a good job up until this point, and we are asking them to really go all the way to the QHOs, and I am trying to find a way that maybe would be reasonable, and stop earlier than that.

MEMBER KRESS: Well, in my view, CDF does not do it for you.

CHAIRMAN APOSTOLAKIS: Does not do it?

MEMBER KRESS: No. And yo have no choice but to go I think to full --

CHAIRMAN APOSTOLAKIS: Mr. Cunningham wants to say something.

MR. CUNNINGHAM: This is Mark Cunningham from the staff. The discussion that you are having is similar to the discussions that we have had internally about this issue; that at some probability of containment failure the LERF becomes dominant.

It becomes the controlling metric, and that is where we are, and that is where we are, is trying to have assessment of our own of what the probability or the conditional probability of a large early release is given this type of vessel failure.

In the Commission paper that Nathan authored a month or two ago, we laid out qualitatively

some factors that we thought would influence your conclusion of whether or not it would be a large early release.

Clearly, it is very different than your vanilla core melt if you will.

CHAIRMAN APOSTOLAKIS: So you are still thinking bout it?

MR. CUNNINGHAM: We are still thinking about it, and there is issues that go in both directions.

MEMBER POWERS: I refuse to look up on a core melt accident as vanilla.

MR. CUNNINGHAM: At any rate, there are factors that would go both ways.

MEMBER KRESS: Well, what we are trying to do is to give you the benefit of what we think it is.

MR. CUNNINGHAM: And we appreciate that.

CHAIRMAN APOSTOLAKIS: I have a question by the way which I forgot regarding the definition of reactor vessel failure frequency.

MR. CUNNINGHAM: Yes.

CHAIRMAN APOSTOLAKIS: On page 5 of the SECY, you are saying at the bottom of the page the first option uses the current definition of RPD failure. You saw that?

MR. CUNNINGHAM: Yes.

CHAIRMAN APOSTOLAKIS: In addition to being a more direct measure of the likelihood of events with potentially significant public health consequences, it has the advantage of regulatory stability.

MR. SIU: This is the current definition.

MEMBER KRESS: That is what they used before.

CHAIRMAN APOSTOLAKIS: Is that an advantage though?

MEMBER KRESS: It won't confuse the --

MR. SIU: It's one of our principles of good regulation, right?

CHAIRMAN APOSTOLAKIS: Yes, but is this what people mean by stability, regulatory stability? I mean, if you guys reevaluate the whole thing, and you show that there is a more rational approach --

MR. SIU: No, but it is --

CHAIRMAN APOSTOLAKIS: It just struck me as something that was odd, and Dr. Shack is laughing, and it is odd.

MEMBER SHACK: Well, regulatory stability means exactly what you think it means. You don't keep changing the regulation, and the regulation that hits

you now is that number.

CHAIRMAN APOSTOLAKIS: You have to speak through your microphone, Dr. Shack. How long have you been on this committee?

MEMBER SHACK: Too long, but it is coming back to Mark's. I mean, the two critical issues here are the conditional failure of the containment when you have the RPD, and what you are going to use for the source term.

I mean, you kept focusing on the conditional failure, and I don't see how you can leave the other one out. I mean, you have to convince yourself that your source term is in some way bounded by some number, and your conditional containment -- well, we can always bound the conditional containment probability.

That is the wonderful thing about it. It is not going to get any higher than one. The source term argument I think you also need to address.

MEMBER KRESS: I would be tempted on the source term to go to the spent fuel pool assessment.

MEMBER POWERS: I don't think that is adequate.

MEMBER KRESS: You think the fuel finds are --

MEMBER POWERS: I think in particular that gets to you.

MEMBER KRESS: Well, I would look at high value opinion and rethink the fuel finding and put a bigger value there. But that is really going to drive these numbers down.

MEMBER SHACK: But then you come back to Dana's argument that if you can't do it on a risk basis, and you really don't know what really, really happened, but then I don't know what really, really don't want means.

MEMBER POWERS: Well, to a big extent, we went through that exercise when we set up the QHOs. We decided what we really, really didn't want.

MEMBER KRESS: And that's why I would have started from the QHOs, because it already has it built into it.

MEMBER SHACK: But then you have to go back to the source term.

MEMBER KRESS: That's right.

CHAIRMAN APOSTOLAKIS: That's what they want.

MEMBER POWERS: Hey, chemists are important.

MEMBER SHACK: The blacksmiths can solve

the problem all by themselves.

MEMBER POWERS: I know that. They came up with 10 to the minus 45th. I know that answer.

MEMBER KRESS: We better move on, Nathan. We are running out of time.

CHAIRMAN APOSTOLAKIS: You have been given enough advice, Nathan. Would you like some more?

MR. MAYFIELD: Nathan got a lot of advice before we started this presentation. He has been getting a lot of help, yes. sir.

CHAIRMAN APOSTOLAKIS: Okay.

MR. SIU: We actually only have a few more slides anyway, and they are pretty much in the way of wrap-up.

MEMBER WALLIS: Well, I think the fact that you have up these numbers if a public meeting as far as what you are thinking of that as being realistic.

MR. SIU: Yes.

MEMBER WALLIS: And so I think it is very good that we had some discussion about what they might mean, and where they have might come from.

MR. SIU: Absolutely. Yes. And in fact, we put them in the SECY paper. So, yes, they are being seriously considered. Okay. Some of the issues

that we have got, these issues are associated again with the uncertainties in the pilot plant studies.

Part of what is driving the identification of these issues is the notion that if it turns out that the reactor vessel failure frequency is low by any measure for the degrees of embrittlement that we really would project for our operating fleet, then we would not spend a whole lot of time looking at what happens after the vessel failure.

And so we want to make sure that we understand what these sources of uncertainty are here. We have been told in a number of places that we need to be using more formal methods for looking at the sources of uncertainty, and experimental design, and how we do our calculations, and that is something that we will certainly pick up as we start closing this project out.

I would also point out that currently we are not planning on doing a formal peer review of the PTSPRA, and we may want to reconsider that. Certainly the PRA and thermal hydraulics, as well as fracture mechanics, are contributing to the numbers that you are seeing on the graphs, and we have to make sure that we understand that.

I think the committee also mentioned that

for places where we are using expert illustration, and the HRA, human reliability analysis, was one place where we wanted to take a closer look at that.

So we do need to understand where the numbers are coming from. We are planning on looking at the post-vessel failure in a very scoping manner at this point.

We have to determine whether it is feasible given the time scale that we have got and the resources that we have got, to do much digging into that.

And to identify what are the gaps in knowledge where the uncertainties are, and we have different reports saying different things, and determine if there is something that can and should be done between now and the end of the project.

There is money from my understanding budgeted to look in Fiscal Year 2003 --

MEMBER WALLIS: Well, I think there is some hydraulic uncertainty, and I think we are going with a well mixed downcomer; isn't that true, Mike? That seems to be the way that we are headed.

MR. CUNNINGHAM: That's correct.

MEMBER WALLIS: And that is a deterministic decision then. Wasn't there some

uncertainty about how well mixed it is? Is that something that you are able to calculate?

MEMBER KRESS: Wasn't that based on the apex results?

MEMBER WALLIS: Yes, but there is some uncertainty in that. So how do you figure uncertainty into how well mixed the downcomer is. Are you ready to do that or not, or are you just assuming it is well mixed, and then going with that as a deterministic conclusion?

MR. CUNNINGHAM: Well, it's not really an assumption. We have got the experiments in this CFD calculation.

MEMBER WALLIS: But there is always uncertainty about everything isn't there? Are you absolutely certain that it is well mixed?

MR. CUNNINGHAM: Well, the question is the degree of non-uniformity, and is that a significant parameter or significant variable --

MEMBER WALLIS: And can you quantify it.

MR. CUNNINGHAM: Yes, I think the answer is that we can say it is less than -- well, let's say less than 10 degrees --

MEMBER WALLIS: And so the next time you see us, you will give us a certainty on that mixing?

MR. CUNNINGHAM: We will address it, yes.

MEMBER WALLIS: I'm sorry to interrupt, but since thermal hydraulic uncertainty has been mentioned there, that's why I had asked to see an explicit number describing it next time.

MR. CUNNINGHAM: We have run some calculations through FAVA, all the way through FAVA, a couple of years ago, where we looked at the effect of non-uniformity, and any kind of non-uniformity you assume tends to get further dampened once you get the FAVA results calculated.

MEMBER WALLIS: And that seems to be not very important.

MR. CUNNINGHAM: Well, the worst flaw has to be in the coldest spot in order to make a difference.

MR. SIU: Without speaking to the specific issue, my expectation is that when we develop the final results, we will have a quantified significant portion of the uncertainty, and obviously we are making efforts to identify what are the driving sources and deal with those.

I am sure that we will have some qualitative descriptions of issues that we were either unable to quantify, or think that they are not as

important as the ones that we are dealing with. And that will be a part of the technical basis document.

I think we are making a very good whack at dealing with some of these uncertainties. But it certainly would not be the last word in doing uncertainty analysis.

I mentioned that we have to extend our pilot studies, and we have to include external events in some fashion, and we are still talking about how exactly we are going to do that.

And we have to also talk about how we are going to extend our results to the non-pilot plants, the plants that we didn't do the detailed PRAs for, because we do have to be mindful as to what is the implication for the population.

MEMBER KRESS: I don't understand the external events bullet. That is an initiating event that is related to the PRA.

MR. SIU: Yes.

MEMBER KRESS: And then you have PTS as an initiating event through your PRA. How do they relate to each other?

MR. SIU: Well, you could have a fire induced overcooling event, for example, which actually what happened at one of the plants.

MEMBER KRESS: Oh, I was thinking seismic.

MR. SIU: Well, we would have to address all possible ways that you could get to overcooling situations, pressurized thermal shock situations.

MEMBER KRESS: I'm sorry. I'm sorry, but now I understand.

MR. SIU: And the last bullet on this slide refers to a point that Mike made earlier, that let's say it turns out that the reactor vessel failure frequency associated with PTS events as calculated by our models is very, very, very small, and we are quite confident of that.

There would still be other engineering considerations that you would want to bring into play to establish the screening criteria. And how you do that now in a formal mathematical way, or even just a formal process, would be something that we would have to address.

Just to give you a head's up now, we showed some very low results for Oconee, and we are not absolutely sure that the results are going to be as low for some of the other plants that we are looking at.

And so we don't want to bias any folks right now in saying that the results are definitely

going to be low. We don't know that.

MEMBER WALLIS: I would be very interested to see what you mean by defense in depth when you have got a failed vessel.

MEMBER KRESS: Yes. I was thinking that your choice of a one-tenth contribution from the PTS events to a LERF was in itself a defense in depth concept.

MR. SIU: I'm sorry, but I didn't catch you.

MEMBER KRESS: I was just commenting that just the selection of a one-tenth contribution to LERF from PTS events as an acceptance criteria is a defense in depth concept I think.

MR. SIU: Well, you are still --

MEMBER KRESS: The lower that you make that value, the more defense in depth you have.

MEMBER SHACK: But I think he is making another argument that even if he can demonstrate that it is acceptable, he just doesn't like operating with an embrittled vessel.

MEMBER KRESS: No, he wants a structural --

MEMBER SHACK: Yes.

MEMBER ROSEN: This is a really, really

ought to have this kind of event.

MEMBER KRESS: That may go back to what my comment on that.

MEMBER SHACK: Well, just -- have you looked at where the numbers would have to fall before other considerations would take over?

MR. SIU: Not yet.

MEMBER SHACK: I am sure with all of our helpful suggestions that we can drive that frequency down so low that PTS will be a limiting event.

MR. SIU: We have not done that yet. Mark did point out in the overview that the team is running real hard just to develop the base case results. And so the implications of those results and where they are coming from also. We just have not had time to explore that.

MEMBER ROSEN: But I think your clarification that we should not expect to see results for the whole fleet, for example, like the ones that you showed us for Oconee, is important, because I certainly was headed in the direction of thinking along those lines on the Oconee line.

MR. SIU: Yes, and we just don't know at this point.

MR. KIRK: If you just want to hold a

metric in your head for the next time that we show up, hopefully with results for both Beaver and Palisades, the most embrittled weld in all of Calvert Cliffs, Oconee, and Beaver will be embrittled plate, is between 30 and 40 degrees fahrenheit.

And more embrittled, meaning a higher transition temperature at any given or equivalent fluence than in Oconee. And that is a substantial shift in the transition temperature.

So we would expect, if I have got to guess, numbers higher by probably an order of magnitude, all other things be equal, an of course all other things aren't equal.

MR. MAYFIELD: Well, this is Mike Mayfield, and one other point that I think is important to keep in mind is that when we went into this, it was more or less with the expectation that the conversatisms embedded in the original rule were such that with a better state of knowledge we could relax the screening criteria and still have the same perceived level of safety.

We recognized going in that it could go the other direction, and that is something that I think the discussion this morning on the metric gives us some food for thought.

But we are waiting to see what the calculations are really going to look like. But we have not predetermined which direction this would go, if any. It could be that we decide that we are close enough and the existing regulation satisfies interest, and you just leave well enough alone.

Or it could go either direction, but we have not pre-judged where this thing should do, in terms of the outcome.

MR. SIU: Mark, next slide, please. So our next steps, obviously as I said, we are pushing real hard to complete the pilot studies, and we have to find a way to address external events, and extension to the broader population.

We will assess the need for and the feasibility of a scoping study on what happens after a crack propagates through he wall for these postulated scenarios.

And again to see what we can do between now and December. And we are going to continue interactions with the international community, and understandings that we are participating in a PTS benchmark calculation with CSNI.

And some deterministic calculations are being done this year, and then in 2003, there will be

some probablistic calculations.

MEMBER ROSEN: I think that your third point is important, but in listening to the discussion from the members about some of the scenarios that are being discussed -- low earth orbit reactor vessels, for example -- I think that needs to be addressed.

MR. SIU: Yes.

MEMBER ROSEN: We need to understand that, the conditional probability of containment failure with a low earth orbit reactor vessel is very hard, approaching one.

MEMBER WALLIS: Well, maybe we can give it a escape velocity and we don't need to worry about it.

MEMBER ROSEN: That's right, if we could be sure that it would reach escape velocity.

MR. SIU: And I think what we can do in the time that we have got is to assess what the current state of knowledge is. We won't probably be able to make much of a dent in --

MEMBER ROSEN: I think you need to do your third bullet in a way that says that some of these scenarios are just outrageous and are not physically real.

MR. SIU: Yes. Thank you. Mark. Oh, we have one more.

MR. KIRK: We have one more. Okay.

MR. SIU: Okay. I have mentioned this already. We are scheduled to be complete in 2002, and we are looking at the risk associated with selected plants, and we are looking at the uncertainties and the drivers of those uncertainties.

We will have extension to non-pilot plants, and we will have recommendations regarding risk acceptance criteria for PTS. We have identified options, and we plan to do the evaluation of those options by December, and again this is not a risk-based approach.

So setting the limit on the reactor vessel failure frequency might not be the limiting factor in setting the allowed degree of embrittlement.

MEMBER KRESS: I guess that ends it, George, unless there are comments. Well, thank you very much. Once again, it was a very nice presentation, and we appreciate the information.

Well, I will probably jot down some of our comments and have a letter just for feedback.

MR. MAYFIELD: Good. We appreciate it.

MEMBER KRESS: Okay.

CHAIRMAN APOSTOLAKIS: Okay. Thank you, gentlemen. We will recess until 20 minutes after

10:00.

(Whereupon, at 10:00 a.m., the meeting was recessed and resumed at 10:20 a.m.)

CHAIRMAN APOSTOLAKIS: We are back in session. The next item on the agenda is the Draft Final Revision 1 to Regulatory Guide 1.174, an approach to using probabilistic risk assessment in risk-informed decisions on plant-specific changes to the licensing basis and the associated standard review plan Chapter 19.

And I see Ms. Druin in front of us. Are you leading the presentation, Mary?

MS. DRUIN: Both John and I will be presenting today.

CHAIRMAN APOSTOLAKIS: Okay. Please.

MS. DRUIN: Okay. My name is Mary Druin with the Office of Research, and with me is John Lane, also from the Office of Research. The purpose of today's presentation is to provide you a status of our Revision-1 to REG Guide 1.174.

And we would like to go out for publication on this revision, and we went out for public review and comment, and we are going to go through that. And so we are here today to request a letter from the ACRS for approval to publish Revision-

1 to Reg Guide 1.174.

MEMBER KRESS: Do you plan on subsequent revisions?

MS. DRUIN: I love someone who leads me perfectly into my next slide.

MEMBER KRESS: Sorry. Oh, what does periodically mean? Is that 5 years, or what?

MS. DRUIN: The intention is to do it every year as necessary, but the point --

CHAIRMAN APOSTOLAKIS: Every year? My goodness.

MS. DRUIN: -- is that it could be every six months. That is really going to depend on what the proposed change would be, and what we want to do, and what information comes in.

MEMBER ROSEN: This is a model of regulatory stability. Every six months?

CHAIRMAN APOSTOLAKIS: Well, presumably improving it, Steve.

MS. DRUIN: It doesn't necessarily have to be every six months, but I think we are committed in our SRM to a yearly update if my recollection is correct.

MR. CUNNINGHAM: This is Mark Cunningham. We owe to the Commission annually an update of

possible changes to this Reg Guide, and all the aforementioned risk-informed --

CHAIRMAN APOSTOLAKIS: So you have an SRM that says that?

MR. CUNNINGHAM: Yes. Now, that is a report to the commission, and that doesn't necessarily mean that we will make an update.

CHAIRMAN APOSTOLAKIS: Exactly.

MR. CUNNINGHAM: But again the frequency of changing or revising the guide depends on the extent of comment that we get on issues that come up. Six months maybe is a little quick.

MS. DRUIN: There is nothing that says that it can't be longer, although it could be quicker, depending on as Mark says on issues that we want to deal with.

And the point that we want to make is that it is a living document, and it is our intent to update it as it needs to be updated over time. We did issue Revision-1 in June, and we went out for a 90-day comment period.

We came back and we did receive comments, and we made revisions based on it based on the comments that we received. We came to the ACRS in February and no issues were raised, and our

recommendations, in terms of the revisions to Rev-1, have not changed from what we presented back in February.

And on that, we are going to go through what we had done for the public review comment version, and what we have changed based on the public review comments, and where we are on what we would like to publish.

MEMBER ROSEN: Now, wait a minute. Mary, your first bullet refers to lessons learned from ongoing issues, such as those at Davis-Besse. Is that or is there an implication that there were lessons learned about PRA from Davis-Besse?

MS. DRUIN: There is an implication that we are looking at the Davis-Besse incident to see what impact it could potentially have on Reg Guide 1.174, and do we need to make an update based on that. Right now we have no decision in that regard. We have it under evaluation.

CHAIRMAN APOSTOLAKIS: Well, since you raised the issue, I had a comment on that, and maybe we could address that now. Do you have the standard integrated decision making picture that we have? You know, do you have a slide or that?

MS. DRUIN: No, I don't, but I have it

right here.

CHAIRMAN APOSTOLAKIS: We can go to the regulatory guide. It must be somewhere in there. I mean, I'm sure that everybody -- yes, it is on page 7.

MS. DRUIN: Yes, it is on page 7.

CHAIRMAN APOSTOLAKIS: Integrated decision-making. The five inputs, defense in depth and so on. In light of Davis-Besse, and in light of the comment recently from a senior French regulator that they will never go the risk-informed way as the Americans are doing, because the PRAs will never include safety calculations and organizational issues, shouldn't there be a sixth box that says safety conscious work environment?

I mean, if it is so important as Davis-Besse showed? I mean, it is not part of the PRA, and why don't we have a six box there that says quality of the safety conscious work environment? And that would show that we are concerned about it.

MEMBER KRESS: Well, that is normally how we deal with things that aren't in the RPA anyway. We separately integrate them in their thinking.

CHAIRMAN APOSTOLAKIS: Yes, and that's why it is risk-informed, right?

MEMBER KRESS: Yes.

VICE CHAIRMAN BONACA: But it is not being measured.

CHAIRMAN APOSTOLAKIS: It doesn't matter. Other things are not measured.

VICE CHAIRMAN BONACA: Well, you put them in.

CHAIRMAN APOSTOLAKIS: Do you measure safety measures?

MS. DRUIN: No.

MEMBER WALLIS: George, this sounds like something they should consider in their next revision.

CHAIRMAN APOSTOLAKIS: I don't know. I mean, that's what matters, is future revisions, and maybe so.

MEMBER WALLIS: But they can insert it in this revision.

CHAIRMAN APOSTOLAKIS: And I would probably agree with you that it is pretty much they ought to do it in this revision, but I am planting a seed here,a nd Mr. Cunningham seems to be anxious to say something.

MR. CUNNINGHAM: I guess two things. First, the staff's review of Davis-Bessie is still under way, and I am not sure --

CHAIRMAN APOSTOLAKIS: And that's why it

is probably premature.

MR. CUNNINGHAM: Yes, and whether or not safety culture was a key factor in what happened or not, the staff doesn't have an opinion I don't believe on that. The second point is, and I guess more for discussion, is one, do you consider safety culture as part of defense in depth.

CHAIRMAN APOSTOLAKIS: I don't know.

MR. CUNNINGHAM: I guess you had in the past, but maybe it merits bringing it out explicitly.

CHAIRMAN APOSTOLAKIS: All I am saying is here is something that happened that was fairly serious. Here is some criticism of what we are doing from a foreign senior guy. I mean, it is not an average engineer, and it is related to that.

And we have the third point that Tom mentioned, that it is risk-informed, and it is integrated decision making, and if something is not in the PRA, we account for it in some other way. Why then don't we have a six box that says worry about this and do something about it.

Now, the moment that you decide to put the box there, you have to resolve all sorts of issues and understand all sorts of issues. But it seems to me that it is something that has to be addressed.

And whether it is a sixth box and you want to make it part of defense in depth, I don't know. It is way too soon to tell, but I don't think it is way too soon to actually say that we need to do something about it.

And I agree with Graham. I mean, for this revision, it is way too premature, but --

MEMBER ROSEN: I think you can consider that the seed has been planted.

CHAIRMAN APOSTOLAKIS: The seed has been planted. Very good.

MEMBER ROSEN: Well, the reason that I opened this discussion was that Mary wrote this slide that said that David-Besse underneath 1.174, and I don't know that there is a connection between what happened to David-Besse and the Regulatory Guide 1.174, the subjects of the regulatory guide.

MEMBER POWERS: Nor does the sentence claim that there is.

MEMBER ROSEN: And that's what I wanted to be sure that we all understood; that that is not a claim that bullet and the underlying words underneath it doesn't claim that there is.

MEMBER POWERS: Let me ask you something about --

MS. DRUIN: And that is correct. We are evaluating it and no decision has been made.

MEMBER POWERS: Let me ask you a better question, and they may fall in the same category. But we recently have seen some probablistic analyses about recritiality following a successful termination of a small break LOCA.

And I have a feeling that that particular sequence is not usually included in probablistic risk assessments. Is that being examined?

MS. DRUIN: In the past, or typically right now, recriticality is not a sequence looked at. I know that if you go back -- I remember back in the -- and I will say the term early days, recriticality was a sequence that was looked at.

MEMBER POWERS: But right now we have this issued raised by the owners groups themselves, and I think that they were the ones that identified it most explicitly, that in successfully terminating a small break LOCA, which is one of our relatively common sequences in most PWR accidents, that the spectrum of accidents -- that you get a recriticality. Yet, in 1150, termination is a success path.

MS. DRUIN: Yes.

MEMBER POWERS: And here there is the

possibility of a non-success path, and I suspect that it is a deficiency of not only PRAs that the agency has access to, but maybe the PRAs that are being submitted by the licensee.

And since it is under consideration by the agency, is that something that is going to be considered in either this or future revisions?

MS. DRUIN: I think that many of the assumptions that you have in your PRAs need to be in some sense reexamined. There are things that we don't include in the scope because of knowledge that we have, or the knowledge that we thought we had that we thought we could exclude it from probablistic grounds.

And I think that some of those things do need to be revisited in light of new experiences.

MEMBER POWERS: I would be interested to see this, because it is like you say, that when we first started PRAs, we spent a lot of time worrying about recriticalities.

MS. DRUIN: Yes, we did.

MEMBER POWERS: And always -- I mean, nothing ever came out of it. Everything looked fine, and so that kind of disappeared into the past legacy of the field, and we have come forward with PRAs, and where people who have little neutronic experience --

and now we are running into these things again, and it is just one of those things that we have got to remind ourselves that these are nuclear machines.

MS. DRUIN: Yes. Okay.

MR. LANE: The initial set of proposed changes to the draft guide 1.110, which was Rev-1 as we put it out last summer, were three primary changes, labeled 1, 2, and 3 on this slide, plus number 4, which was simply an example to provide some examples of risk-insights that were used in the decision-making process.

Going back to the top of the slide, the first change that we proposed was to acknowledge the staff's ability to request risk-related information if new unforeseen hazards emerged, or a substantially greater prospect for a known hazard emerges.

CHAIRMAN APOSTOLAKIS: Is this the issue that if the staff decides that the issue is related to adequate protection?

MR. LANE: Yes.

CHAIRMAN APOSTOLAKIS: And if the industry does not provide the risk information, you will develop it?

MR. LANE: If they hadn't provided the risk information as part of their submittal. In other

words, if they had made a non-risk informed submittal, the staff would have the option to go out and ask for the information.

MEMBER KRESS: Is Reg Guide 1.174 the right place to put that, because Reg Guide 1.174 almost presupposes it is a risk-informed submittal.

MEMBER POWERS: Well, I mean, that raises the question that came promptly to my mind, is suppose someone admits something that is not risk-informed, and in it he says, gee, my auxiliary feed water is going to be susceptible to flow assisted corrosion at some prodigious rate per year, like maybe seven-tenths of an inch, to pick a number out of the hat.

And shouldn't the staff be asking for risk information in that case?

CHAIRMAN APOSTOLAKIS: Yes, but 1.174 comes into the picture after the risk information is submitted. This is a different decision.

MR. RUBIN: This is Mark Rubin from the staff, and if I could clarify. This is a conforming change to guidance that has already been put out on the street, and I think which we have discussed with the committee in the past.

A regulatory information letter was issued, and which has already been discussed, and

there have been workshops with industry. This change -- and you are right. And a little is in a sense non-seculatory because it is for a non-risk informed action, but was put here for a sense of completeness to close the loop on the other documentation and notification that is already out on the street.

MEMBER KRESS: I don't see anything with putting it in there.

MEMBER ROSEN: Bug Reg Guides are not regulations, and so it doesn't have any force, but there is nothing wrong with putting it in there.

CHAIRMAN APOSTOLAKIS: But I think there is a regulation that says that the staff can do it.

MEMBER ROSEN: Sure, but putting it in there doesn't have any force of law.

CHAIRMAN APOSTOLAKIS: Well, that is how we understand it.

MEMBER POWERS: This is not what gives the staff the ability to do it. This just says that, yeah, they do, and be forewarned.

MEMBER KRESS: I guess if somebody is reading Reg Guide 1.174 and trying to make a decision whether to go risk-informed or traditionally, this comment in there would say, whoa, even if I go traditionally, they may ask me for risk information.

So you could put it in there for a reason, you know, and it gives them information. So I think it is okay.

MR. LANE: The next change that we proposed involved the issue of increases that are currently under evaluation for power level, changes in fuel burn-up rates, and the use of mixed oxide fuel.

We had put a note in the revision suggesting that risk parameters, such as LERF, may be impacted by the changes in power level that are being looked at, and possible fuel burn-up rate changes, and the use of mixed oxide fuel --

MEMBER WALLIS: Why do you use the word rate? I thought it was burn-up. Now, rate to me means a rate in time, and it is not a rate in time. It is the total burn-up that you are worried about isn't it? I don't think the word rate should be there.

MR. LANE: I will have to defer to the fuels people on that. That is the language that we had in there.

MEMBER POWERS: I think that Graham is quite right, that it is really the burn-up, though I will comment that NRR informs us that fuel burn-up is essentially irrelevant to licensing decisions.

MEMBER WALLIS: That's not a rate of anything is it.

CHAIRMAN APOSTOLAKIS: Just delete it.

MEMBER SHACK: And spell affect more correctly.

MEMBER KRESS: I presume, you know, that we know those things affect LERF.

MEMBER POWERS: I don't know that we do know that fuel burn-up affects LERF.

MEMBER KRESS: Well, I am assuming that you have a higher decay heat level if you have a higher burn-up, and so the decayed heat level gets translated into how much or when you melt to the vessel, and whether or not you have got enough energy to fail the containment.

So I think it affects LERF, but my issue here is should it affect your 1.1, or 1 times 2 to the minus 5 value.

CHAIRMAN APOSTOLAKIS: That's right.

MEMBER KRESS: That is what I am getting at.

CHAIRMAN APOSTOLAKIS: The calculation is not part of --

MEMBER KRESS: The calculation is something else.

MEMBER POWERS: But I don't think that this -- well, it doesn't seem to -- well, I will let the speakers answer the question, but it doesn't seem to me that this raises the issue over whether the 1.10 to the minus 5th level has changed.

MEMBER KRESS: Well, I don't understand it otherwise.

CHAIRMAN APOSTOLAKIS: What is the purpose of bullet number 2? What does that say, that the calculation of LERF may be affected by certain things, but the regulatory guide doesn't get into that does it?

MEMBER KRESS: No.

CHAIRMAN APOSTOLAKIS: It tells you what to do given the numbers.

MR. CUNNINGHAM: This gets to really the definition of LERF that is in there. About an hour ago, we had a discussion about whether or not certain characteristics of pressured thermal shock accidents are qualitatively different enough that you may have to rethink them in the context of a definition of large and early.

CHAIRMAN APOSTOLAKIS: Right.

MR. CUNNINGHAM: But the point here is the same. That under some circumstances, using mixed

oxide fuel, or something like that, may bring into question how we define large and early as it relates to -- and the relationship between large and early to the early fatality safety goal.

MEMBER WALLIS: Well, my colleague, Dr. Kress, has always been pointing out with power uprates that you use the same LERF value, but you have got more stuff there, and you have actually got more risk.

MEMBER POWERS: Well, I can see why one might want to be careful and say, gee, the mixed oxide fuel could have sufficiently different characteristics under accident conditions that the LERF value that we have selected may no longer be applicable. I think that is what you are saying.

MEMBER KRESS: That's what I am asking.

MEMBER POWERS: And I think that is what is Mark is saying,is to be cautious. We don't know right now, but it could be, and that it is more difficult for me to see how power level and fuel burn up would do that. But I would concede that you could be careful and say it might.

MR. CUNNINGHAM: That's correct.

MEMBER KRESS: In this particular bullet, in my opinion the LERF is a site characteristic and not a plant characteristic, and I think for multi-unit

sites, you have to think of LERF as the summation of the LERFs on the site.

Now, I see no consideration of this in Reg Guide 1.174 at all. So, LERF is supposed to be a surrogate for the practicality safety goal, and not for a site characteristic.

MEMBER SIEBER: That's where the source term has a role to play, and it is after you go through that exercise of surrogate.

MEMBER KRESS: Yes, it is not really a source term issue in my mind. It is a frequency issue for the -- for the practicality, you have to multiple the frequency times the consequence. If you have two plants, you have got the double the frequency. You know, you have to add up the frequency.

MEMBER SIEBER: And it is 10 times the frequency.

MEMBER KRESS: So, somehow I think that Reg Guide 1.174 needs to address the question of multi-plant sites, and it is silent on it altogether, and it doesn't discuss it at all. And it seems to me that that falls under that bullet, or that Item Number 2.

MEMBER SIEBER: Well, I would make it a separate item.

MEMBER KRESS: I would, too.

CHAIRMAN APOSTOLAKIS: A separate item meaning what?

MEMBER POWERS: Are you bringing up these ideas that if I have five plants on a site, then I need to change my limiting criteria if I look at any one of them?

MEMBER KRESS: Yes.

MEMBER POWERS: I think that is a good point.

MEMBER KRESS: I think it is an excellent point.

MEMBER POWERS: I think that it is time that that appear explicitly in 1.174.

MEMBER KRESS: Yes, and that is where I think it needs to be.

CHAIRMAN APOSTOLAKIS: And you should also make sure that that your calculation of CDF includes the possible influence from the other units.

MEMBER POWERS: Well, I think they do a pretty good job on that.

CHAIRMAN APOSTOLAKIS: They do.

MEMBER POWERS: I mean, not a bad job on that.

CHAIRMAN APOSTOLAKIS: And that is a

calculation issue, and it is not a 1.174 issue.

MEMBER POWERS: Well, what Tom is stating is that it is the acceptance criteria.

CHAIRMAN APOSTOLAKIS: It is an acceptance issue, exactly. Okay. Let's move on.

MR. LANE: The third change that we made was to incorporate as the Commission requested us to do, to define acceptable PRA quality as discussed in a previous SECY paper 0162, Attachment 1.

We added this to Reg Guide 1.174 as an appendix, and so it was a very detailed discussion of the scope and technical attributes that the staff felt would be required for a minimally acceptable PRA.

And as we will see in the subsequent slides, this is one of the things that was revised with the proposed final changes.

CHAIRMAN APOSTOLAKIS: Is this a good place to raise the issue of scope? I looked at the standard review plan -- and it will take me a while to get to my comments, okay?

And on page 19-14, the scope of analysis, I see again our usual attitude of trying to accommodate any kind of risk information that can be submitted by the licensees.

So we have statements here like for plant

modes and initiators not analyzed in the PRA, such as shutdowns, seismic events, fire, floods, and severe weather, the licensee should do this.

Then further up it says it is not necessary in a risk-informed regulation that licensees submit PRAs that treat all plant operating modes, and all initiating events, in all initiating events.

So then I read Commissioner Diez's speech to the 2002 Regulatory Information Conference, where he says that it is my perception that the pace of risk-informed regulation has slowed down. I am puzzled as to why. And I think that I have an answer that answers his puzzlement.

I don't believe that people trust PRAs, and the reason why they don't trust them is precisely this attitude that you can do anything that you want with them. And if you don't want to include shutdown, that's fine. You don't want to include fires, then that's fine, too. We will accommodate you.

Now it says even initiating events can be excluded from the internal list. So then people wonder why there isn't three categories, for example, in the option, too, being that the staff doesn't impose any requirements.

And then Commissioner Diez says something

that is very interesting. He says this is the year, 2002, almost 30 years after WASH 1400, and it is time that all licensees have a quality level of 2 PRA so they can effectively utilize our regulatory processes.

So what I am saying now after all of this is why don't we say here in the standard review plan, and in the regulatory guide, that if you want to come to us and take advantage of this, you must have a quality level 2 PRA.

And where quality is defined by the industry's peer review process, and by the ASMEA standards, and by the ANS standards, and so on. Why try again to accommodate people who don't do fires, and who don't do seismic, and who don't do initiating events.

If they don't do that, they shouldn't come before us, or they should have a very good story why this is irrelevant. I realize that this goes much higher than you in front of us, that is probably a policy issue that has to be resolved at some level, and maybe the division, director, or office director level, or even the Commission.

But this is not the year 1996 and 1997 when we started doing this, and naturally we didn't want to scare people that you have to have a good PRA

before you even dare come before us.

This is 2002, and when are we going to draw the line and say you have to have a quality level 2 PRA like the Commissioner says. And then it will be up to the reviewer to decide how that PRA is used and to integrate the decision making process.

Another point that has been made to me is that perhaps calling this a risk informed regulation was a mistake, because the word informed is used as an excuse not to do a good job on the PRA side.

It is risk informed and not risk based, and what do you want. We are going to take care of it in a different way. So people do sloppy PRAs. The penalty that we pay is that our own people don't believe in the results of PRAs, and then you have these debates with what do you do with risk three, and what do you do with this, and with that, because our own engineers don't have to.

Now, after all of that, I don't know what you guys want to say. I rally don't want to sound like I am blaming you.

MEMBER WALLIS: Is this another seed that you are planing, George?

CHAIRMAN APOSTOLAKIS: Sorry? No, this is not a seed anymore.

MEMBER WALLIS: No, this is a true.

CHAIRMAN APOSTOLAKIS: What I am proposing is to turn this back and say that this is now the time when you have to have a good level 2 PRA before you dare do a risk informed regulatory action.

VICE CHAIRMAN BONACA: I agree a hundred percent.

MEMBER POWERS: And so do I.

MEMBER ROSEN: And so do I.

MEMBER KRESS: Are we voting on this issue?

CHAIRMAN APOSTOLAKIS: No, no. I think it is a serious issue because it is not just the detail in the document, and again I repeat I don't want to sound like I am casting blame on Mary, or John, or others who worked on this.

This would take a major change, I think, in the way that the agency is doing its business, and naturally it will have to involve some higher level policy makers, because it is time that we said this. If you want the benefits of risk-informed regulation, forget about not having done fires and this. No, you have to do a good job.

And now that they have already done their Ips, and IPEEEs, and they have already been improved

as we are told, it shouldn't be that expensive to actually come up to speed and have a good level 2 PRA.

MEMBER ROSEN: Let me say something.

CHAIRMAN APOSTOLAKIS: Sure.

MEMBER ROSEN: Only 10 percent of -- well, I think if we have a risk-informed regulation, we must cover the sources of risk. And the sources of risk are internal events, external events, including fire, and shutdowns.

And then we must over the mitigating systems, which includes the engineer safety features, which are of course covered in the internal events, as well as the containment. So you need a Level-2 PRA to study the containments effect and its effect on LERF.

So without that, we are just playing around the edges.

CHAIRMAN APOSTOLAKIS: Exactly. Exactly.

MR. LANE: Well, the Level-2 discussions will be part of a NUREG Guide that is currently under development. There is discussions of a Level-2 acceptability at that point.

We had discussions of Level-2 acceptability in our Appendix A, which went out for draft comments, and of all of the comments that we got back, I got the most comments critical of the new

Level-2 requirements that we were discussing.

It was predominantly that they were overly prescriptive, and there were additional requirements that shouldn't be put in Reg Guide 1.174. Now, they are being revisited again, in the NUREG Guide 16 --

CHAIRMAN APOSTOLAKIS: I understand that, and in reading SECY-02-0070, you have a nice discussion of this. Several stakeholders felt that new requirements regarding Level-2, rate containment failure, were being added.

MR. LANE: Right.

CHAIRMAN APOSTOLAKIS: And then you have a nice footnote on the next page where you say in a subsequent public meeting the staff clarified that in NUREG 11.50 that late containment failure was a significant contributor, on the order approximately 30 percent, to all sources of risk.

Now, coming back to what Mr. Rosen just said, if 30 percent is due to this contribution, then I have to consider all sources of risk. It is natural. In other words, a short statement that all sources of risk should be considered when you come before us for a risk-informed decision, it seems to me that is a very rational thing to say.

MEMBER KRESS: Let's clarify some things.

1.174 had a very distinct specific purpose when it was first initiated, and that was to give a probability of allowing small changes to the licensing basis that didn't have much risk impact, and the process was set up to keep that small.

And small delta LERFs, and small delta CDFs, and in my mind at that time, for that purpose, using an LWR base source term, and a mean value, and just focusing only on CDF and LERF were perfectly acceptable, because you were limiting to small changes, and it was to give an optional way for somebody to come in and change their licensing basis.

And I didn't care much even then in having a complete PRA. I felt that you could deal with some things qualitatively because of the nature of the thing.

But now all of a sudden, 1.174 has become the paradigm for risk informing the regulations. This is the risk-informed approach, and for that purpose, I don't think that Reg Guide 1.174 is completely acceptable.

You have to have these complete PRAs, and you have to deal with things about LERF being something other than the mean. You have to talk about source terms to do the different types of sequences.

You have a whole host of issues when you say that we are going to call this thing the risk-informed approach, and use it to craft our regulations, particularly in crafting our regulations.

If we want to restrict 1.174 to its original use, I don't have all these problems with it, except that I have a little problem with the LERF for multiple plant sites. But if we are going to use it as a paradigm for crafting risk-informed regulations in general, I think it is a mistake.

MS. DRUIN: The only thing that I would add to that is that we have not used 1.174 as the paradigm. We have used a lot of stuff from 1.174 in risk-informing the regulation so that we aren't --

MEMBER KRESS: Well, what particularly bothered me was the use of the 1 times 10 to the minus 5. That tends to show up in the framework and in other things, and that particularly bothers me.

And the fact that it is based on an incomplete PRA. But I think it is all right in Reg Guide 1.174 for the intended use of small changes to the licensing basis.

CHAIRMAN APOSTOLAKIS: Another comment that I would like to make in addition to this issue of Level-2 PRAs is that we should change our attitude.

I think that our attitude as an agency the last 6 or 7 years has been let's try to accommodate people, and they have done certain analyses.

And let's not use perfection, which may be the enemy of the good enough. But I think it is time that we stop that, and I will give you another example. There is a beautiful discussion on uncertainty in the regulatory guide, Sections 2.2.5, 1, 2, 3, 4, model uncertainty.

I mean, you would read this and say, boy, those are really ahead of everybody else and they are doing great things, and then you go to the SRP. The first thing you read is, "However" --

MEMBER SHACK: Where are you?

CHAIRMAN APOSTOLAKIS: On 19-21. I mean, I am not going to lie to you. So, 19-21, parameter uncertainty. So all of these nice discussions in the regulatory guide, what we read here in the second sentence is, "However, this does not imply that the detailed propagation of uncertainty is always necessary."

Now, why do we have to do that up front? I appreciate that this may be true, but always we have to say there is a good theoretical discussion of what needs to be done. However. Well, don't need to do

that.

MEMBER WALLIS: Because you are over-responsive to public comment is one reason.

CHAIRMAN APOSTOLAKIS: Public comment in this case means industry comment really. So I think the attitude has to change, and that is broader than just 1.174. There are certain things that need to be done.

Now, uncertainty analysis is not always something that really needs to be done, but let that come as something that people know that in certain case, but not to put it up front here and undermine all this discussion in the regulatory guide.

And the same thing goes with other things. Surely you don't need to have an excellent job on HRA for every issue that comes before us, right? But that is not something that we want to put up front. And I think it is the attitude that, boy, we really have to accommodate anybody.

That they have to come before us and take advantage of this. People who want risk-informed regulation should have good risk information. So, please go ahead.

MS. DRUIN: Do you want us to continue, or --

CHAIRMAN APOSTOLAKIS: I think you should.

MS. DRUIN: -- do you want us to jump ahead?

CHAIRMAN APOSTOLAKIS: Use your judgment, Mary.

MS. DRUIN: Well, we only have two slides left. Maybe we will get through them.

MEMBER WALLIS: These proposed changes are relatively small.

CHAIRMAN APOSTOLAKIS: What?

MEMBER WALLIS: These proposed changes are relatively small.

CHAIRMAN APOSTOLAKIS: That's right. That's really what comes out of this.

MEMBER WALLIS: And you are proposing a much bigger change.

CHAIRMAN APOSTOLAKIS: And that's why I am saying that it is probably that they would probably have to involve some higher ups.

MR. LANE: Because what we have right now are the two dash lines, which consist of the changes that we are proposing for REV-1, both of which we just discussed; the risk-informed information request, and the staff's authority to do that.

And just a cautionary note, and less-

strongly worded than we had in the draft version, that potential changes in power level fuel burn-ups and mixed oxide fuel might affect the evaluations of lerf.

We have some ongoing work that is being done in the fuels area to look at the risk of these changes. There are some preliminary results, I guess, but nothing really adequate for us to really put anything in the Reg Guide at this point.

MEMBER POWERS: I guess it is a question just a little bit of wording here. And that is the impact on the LERF evaluation, and that is what you said, the wording on the slide doesn't say that.

MS. DRUIN: If you go to your viewgraph, we have two attachments there; an Attachment-1 and an Attachment-2. On Attachment-2, you will see at the top of the page that is the actual change that has been made to the Reg Guide, and those are the actual words right there.

MEMBER POWERS: Yes, and it says, "Increases in use parameters on LERF." And I guess the question is or still remains I read these words to say that it is the evaluation of LERF that you do.

MEMBER KRESS: And I read them just the opposite. I read it to mean the evaluation of the 1 times 10 to the minus 5.

MEMBER POWERS: You read it as affecting the acceptance criterion, and I think you ought to just make it explicit there. It could conceivably affect the acceptance criterion. It is very likely to affect the parameter evaluation. I just wanted to make that clear.

MS. DRUIN: Understood.

MR. LANE: The third thing that we planned to put in the Reg Guide was the SECY 01-62 Attachment-1 input regarding scope and technical acceptability of PRAs. We decided to incorporate that in a separate Reg Guide, which is under development right now. And that has a schedule for later this year to be released in draft form.

CHAIRMAN APOSTOLAKIS: So that will take into account the ASME standard?

MR. LANE: Yes.

MS. DRUIN: It will be going out on public review and comment on that Reg Guide, and our endorsement at the end of August.

MEMBER POWERS: You know, when people tell me that studies of high burn up fuel have no impact on ongoing regulatory activities like the development of Reg Guides and what not, that seems not to be true here. I mean, you are saying that -- you are very

anxious to get information on fuel burn up because it could affect what you write in 1.174.

MR. LANE: Right. And like I indicated the studies are ongoing. In fact, I think you have seen

-- at least the fuel subcommittee has seen some presentations, and they are scheduled for another one this October.

MEMBER POWERS: I hang on every development in the field.

MR. LANE: Okay.

MEMBER KRESS: Did you read the advance reactors research plan?

MEMBER POWERS: I looked at it, yes.

MEMBER KRESS: There was a comment in there that for the advanced LWRs that we don't have to do any more fuels research because we already know enough, and that includes the IRIS, which has core lifetimes of 8 years, and has a different mix of enrichment, and it has burnable poisons in it, and it goes to burn-ups of a hundred-thousand, and they said that we expect the core degradation process and source term to be similar to current plans.

MEMBER POWERS: And the 17 gigawatt day fuel that we have looked at up until now, and I can

only believe that the -- and I have it on great authority, that it is totally irrelevant to any licensing consideration.

MEMBER KRESS: I made -- in my letter that I am going to write on the research plan, that issue will be discussed.

MEMBER POWERS: Do you think it might get a little in there?

MEMBER KRESS: It might get in there in some way.

MEMBER POWERS: It might make it into the letter.

MS. DRUIN: Okay. Our final slide is back to our purpose of why we were here, and that we were asking for a letter to go ahead and approve publication of Revision-1 of Reg Guide 1.174 that has those two revisions in them.

And recognizing as I have shown there that there will be future updates of the reg guide.

MEMBER WALLIS: Well, this letter is confined to these very small changes, and it could be very short.

MS. DRUIN: Yes.

MEMBER WALLIS: And if it gets expanded, and you get all the thoughts of the committee on risk

informed regulation, it may be very long.

CHAIRMAN APOSTOLAKIS: Well, what would be the consequences or inadvertent consequences of asking you to go back and change it? I mean, if you don't publish a revision, what happens? Nothing really.

MS. DRUIN: Well, the revision that is out there is what is out there.

CHAIRMAN APOSTOLAKIS: Yes, but I mean it is not something major will be impacted.

MEMBER POWERS: George, I think we have -- well, I mean, if I was strategizing on their part, I think they would be anxious to get a letter that is Graham's short version.

I think there may be a -- it might be wise to consider expanded comments in something separate.

MEMBER KRESS: I would be tempted to combine -- to have a combined letter that says that for this revision, fine, but for the next revision, we think that these --

MEMBER POWERS: If you make it very explicit.

MEMBER KRESS: Yes.

CHAIRMAN APOSTOLAKIS: Or if you really want to have some results.

MEMBER POWERS: And make it clear to the

staff that we really don't expect a response to those ancillary things until the next draft comes out.

MR. LANE: Another reason we would like to go ahead and publish this, we did tech edit this version a little bit better. There was some minor corrections and things that we omitted by accident that we would like to correct and get this out on the street.

MEMBER POWERS: Did you put it in defense in depth philosophy?

MEMBER ROSEN: The thing that we need to do in the letter I think is to do something about the perception that people will have when they get all done reading this revision with what did I just read, and what changed.

CHAIRMAN APOSTOLAKIS: That's right. Nothing changed.

MEMBER ROSEN: All that furor and nothing; it's a tempest in a teapot. We need to say something that there are changes coming that are important. This particular revision doesn't have them in them.

CHAIRMAN APOSTOLAKIS: I want to make a point. You have to stop the publication of this to show that it is really important that we have to demand good PRAs from now on.

If you just say, well, next revision, I don't know when the next revision is coming up. The Commission wants a statement from the staff as to what could be done, and it could be done in 5 years. If you say no, don't publish this, then you are attracting attention. Unfortunately, that is the way that it is. One other thing just for the record.

MEMBER WALLIS: But, George, we have seen this before and said it was pretty good haven't we?

CHAIRMAN APOSTOLAKIS: No, we didn't say it was pretty good. We said Larkins' down.

MEMBER WALLIS: But essentially we said this is such a small matter that it is going to be a breeze.

CHAIRMAN APOSTOLAKIS: No, we said we will review it after the public comment period.

MEMBER WALLIS: Oh, is that all we said?

CHAIRMAN APOSTOLAKIS: Now, we may not have been model reviewers in this case, but at least we are not contradicting ourselves.

MEMBER ROSEN: But the point is that I am as one member of the ACRS underwhelmed by this, this particular revision.

CHAIRMAN APOSTOLAKIS: Now, would you make sure that your colleagues in reviewing power uprates

read your sentence on page 15 that says a qualitative assessment of the impact of the licensing basis change on the plant's risk may be sufficient in some cases. Make sure that they read that, and I will comment on this later on.

MEMBER WALLIS: Qualitative?

CHAIRMAN APOSTOLAKIS: Yes. They are pulling quantitative numbers out of nowhere. They don't have to do that all the time, and --

MEMBER WALLIS: Qualitative isn't the word.

CHAIRMAN APOSTOLAKIS: -- I think the guide gives them a way out.

MEMBER SIEBER: If you are referring to PRAs for power uprates like Brunswick, that one was done wrong in the first place because it didn't model the change in LERF due to the higher pressures that were created, and it did not take into account the higher level of DKE, and it did not take into account changes in the source term.

What it did take into account was what 3 minutes shorter, which is irrelevant.

CHAIRMAN APOSTOLAKIS: Irrelevant, right.

MEMBER SIEBER: And yet it went through all of this kind of review, and was included in the

application. And we wrote a letter on it, and I have to pick the right words, and the ones that I want to use. Everything I can think of is four letters. That it was not a good PRA.

And I think that there is too many ways to wiggle out of doing that extra work, you know. Those are phenomenalogical things that occur that aren't modeled right.

CHAIRMAN APOSTOLAKIS: But the point that I really want to make is that not that I want them to do more. I think that -- and like in this case with the late containment side, you have got comments from the industry that this is an extra requirement, and we don't want this with it.

What they don't realize is that they will pay the price somewhere else if they don't do it here. That there will be some additional requirements somewhere else that they will have to fight, because the reviewers know that you have not done this.

The other point that Dr. Bonaca raised in another context is the categorization scheme actually for Option 2. And you have to also worry in addition to CDF and LERF about other things. You know, the barriers, to fission product releases, and so on, and if you don't do things like that, people know that

these are not in the PRA, and they impose additional requirements.

So it is not by eliminating some of this stuff from the PRA that you are doing less. You pay the price somewhere else. If the PRA becomes very good, then eventually we will believe the categorization schemes and we will say if it is in Risk 3, then it doesn't deserve any treatment.

But now we don't, because the PRAs have holes in them, and I think that is a price that we all pay. So I think drawing the line now and saying as Diez said, a good level 2 PRA 30 years after WASH 1400 is not an unreasonable thing to demand.

MEMBER WALLIS: But, George, wouldn't it be appropriate first to give a very short letter approving this change, and then forget it, and it's finished, and then have a meeting with the staff about future changes which ought to be made? We should really seriously look at these changes that we have discussed.

CHAIRMAN APOSTOLAKIS: My problem with that is that you are postponing it for at least a year that way, because we will not meet with the staff before December.

MEMBER ROSEN: Well, maybe a partial

answer to Graham's question is the idea of a white paper brought up by Jack. A PRA white paper by ACRS could put these ideas together that we have expressed here and at other meetings.

CHAIRMAN APOSTOLAKIS: I don't think we need a detailed discussion with the staff as to what we should do. I could quote Diez, that a good level 2 PRA, and what good means, and if you ask me, it means industry peer review, and so on.

MEMBER SIEBER: Right.

MEMBER ROSEN: I think that Commissioner Diez was absolutely right on the Level-2 part, but I don't think it goes far enough. I think we are talking about covering the sources of risk.

CHAIRMAN APOSTOLAKIS: yes.

MEMBER ROSEN: And that is a broader concept than just Level-2. So if we are going to make regulatory decisions based on risk analysis, we need a risk analysis that covers all the sources of risk.

CHAIRMAN APOSTOLAKIS: Well, he didn't say exclude any. He said just the good. The question is what is good.

MEMBER ROSEN: All right. But I think he and I wouldn't disagree if we had time to talk about these things. But I think that statement is a more

limited one.

CHAIRMAN APOSTOLAKIS: Well, we can elaborate in our letter, but I really think we ought to take some drastic action with it, because as you said, publishing this doesn't help anybody. So delaying it doesn't hurt anybody either.

MEMBER SIEBER: You're right.

MEMBER ROSEN: And I don't think anyone is waiting for this in the industry.

MEMBER WALLIS: I think you may need to give your ideas some more thought before firing them off as part of a response to it.

CHAIRMAN APOSTOLAKIS: You see, I am not becoming very technical, and so I don't need to give it too much thought. All I am saying is that there exists a PRA out there that we have not taken advantage of.

MEMBER WALLIS: I think what he is saying is very important and very significant. But I am jus nervous about our over-response to what really is a very minor matter at this point, which is whether or not these changes are reasonable.

CHAIRMAN APOSTOLAKIS: No, they are. They are and I don't object to the changes. I am just saying that they don't go far enough.

VICE CHAIRMAN BONACA: I think like Graham here, that it seems as if we are ambushing Revision-1 and we are making a major change here to Reg Guide 1.174. I mean, this is a major change, and I am all for it.

But I am saying that that may be a better approach to let Revision-1 to go with whatever is being proposed, and find a different forum for bringing this position,a nd that may be a white paper.

CHAIRMAN APOSTOLAKIS: Let me give you the counter argument to that. First, you are not helping anybody with Revision-1. Nobody is waiting out there to use Revision-1. It is just something that we are doing.

So delaying it, you are not hurting anybody. Second, if you say let's find another forum, I would bet you that it would be at least two years before Mary sits in there with a new revision. Not because of her, but because that is the way that the Agency works.

For us to develop a white paper, it is not -- you know our time scale, and we are not going to do it in a month.

MEMBER KRESS: No.

CHAIRMAN APOSTOLAKIS: We will have to

discuss it in the January '2003, and then somebody will have to draft something for April. And I don't think we should postpone this thing. I mean, all we are saying is that it has been 30 years since the first good PRA.

MEMBER POWERS: That has to be the most ingenuous complaint that I can think of, because I know what the PRAs were like 30 years ago, and I don't think they were ready for prime time or any kind of time.

And it took us 20 years to get PRAs that had a reasonable amount of confidence, and now we are raising ancillary issues that really have not been wrestled with. And to argue that we have PRAs now for fire that are comparable to those that we have in internal events, is difficult to do.

To argue that we have shut down risk analyses that are acceptable to Dr. Kress is impossible to do. So I don't think it is fair to say to say, look, it has been 30 years, and this is like wine. It has aged enough.

CHAIRMAN APOSTOLAKIS: No, but on the other hand, it is a technology that came out five years ago. I mean, I can appreciate the argument of the 30 years, but I think there is some point there.

And look at the last thing.

We have been doing this risk-informed regulatory thing for 5 or 6 years now. I mean, there has to be some knowledge that has been gained, and what is important, and what is not important.

MEMBER POWERS: And I think your discussion is appropriate for later this afternoon.

CHAIRMAN APOSTOLAKIS: Yes, when we get into that.

MEMBER POWERS: I think this lady and gentleman are doing just a workmanlike job on making a correction, and we ought to let them get on with it so that they can then devote their time to carrying out the implementation plan.

CHAIRMAN APOSTOLAKIS: Let me repeat the argument. I would be happy to let them go ahead and publish this, but they are publishing a document that nobody really cares about, and I am undermining my point.

I think that people are paying attention when you say no to something, okay? Otherwise, it is another advice from the ACRS and we will think about it. Anyway, anything else? This afternoon we will have to discuss this as to what the letter will be. But is there anything else that anybody else wants to

ask? Mary and John? Okay. Thank you very much. And we will recess for eight minutes.

(Whereupon, at 11:15 a.m., the meeting was recessed.)

A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

(4:12 a.m.)

CHAIRMAN APOSTOLAKIS: We are back in session. The next item is Risk-Informed Regulation Implementation Plan, and the cognizant member is me, and so let's go ahead. Who will start? Okay. Mr. Cunningham, would you care to introduce your colleagues there for the record.

MR. CUNNINGHAM: I would be happy to. At the table with me today are Chris Grimes, Chief of the something branch in NRR.

MR. GRIMES: I am the program director for Policy and Rule Making in NRR.

CHAIRMAN APOSTOLAKIS: Okay.

MR. CUNNINGHAM: Next to him is William Beckner, Chief of the Technical Specification Branch.

MR. BECKNER: Again, Mark is not with me, and we have had programs put in place, and I am now the Chief of the Operating and Reactor Improvements Program, which includes the technical specifications section now.

MR. CUNNINGHAM: And then Mark Cunningham and Mike Johnson.

MR. JOHNSON: Mark Johnson, Chief of the Probablistic Safety Assessment Branch since April.

MEMBER WALLIS: Mark, do you know what your job is?

MR. CUNNINGHAM: I am the Chief of the PRA Branch nominally in the Office of Research. Okay. This is an information briefing for the Committee, and we would like to tell you something about what is in the current version of the risk-informed regulation implementation plan, and give you some ideas on what we think are some of the more interesting topics there.

And to use this as an opportunity to define what might be of interest to the committee in hearing about over the next six months or so. Each of us will do some of it as we go on here.

We provided a draft copy of the implementation plan to you, and a somewhat modified version is with EDO now. It has not been signed out to the Commission as of this morning anyway.

I have a couple of slides that provide you a summary of what is in the implementation plan, the June 2002 version. There is 3 or 4 major elements in the mission paper itself.

One is a summary of upcoming activities, and one is a description of new activities in the implementation plan, there is a description of

accomplishments over the last six months; and then there is an attachment, which is the implementation plan itself, which is a more detailed description, a kind of a two-page description of all of the activities that we have underway and that fall under the purview of risk-informed regulation.

The plan itself covers both reactor safety issues and nuclear materials, and safety and nuclear waste issues. And most of what we are going to talk about today is reactor oriented, and we will hit on some of the issues that are coming up in the waste area as well or in the materials area.

CHAIRMAN APOSTOLAKIS: Now, I read the draft document to the Commission, I guess, and it lists the areas that you have there. How come there is nothing on PRA methodology improvements and on safety cautious work environment.

MR. CUNNINGHAM: I will do the second one first, safety functions work environment is not something that is the subject of research in the agency. A few years ago there was a discussion up through and including the commission of whether or not that was an appropriate thing for us to study, and the commission said it was not an appropriate thing for us to study.

CHAIRMAN APOSTOLAKIS: But in light of what happened recently, should we -- I mean, we keep talking about learning from experience.

MR. CUNNINGHAM: And some of our recent experience may cause us to rethink that, but at least the --

CHAIRMAN APOSTOLAKIS: But you would wait until you received high level guidance on this. You are still under the old Commission decision?

MR. CUNNINGHAM: Correct. Correct.

CHAIRMAN APOSTOLAKIS: Okay. How about general improvements of PRA methodology?

MR. CUNNINGHAM: General improvements are in the implementation plan. There is a description of work we are doing in human reliability analysis, fire risk analysis, and that sort of thing.

It probably didn't show up in the upcoming activities, because there were not major milestones to be accomplished over the next six months. The plan is updated every six months. So this list of upcoming activities tends to focus on that six month time frame.

There are a number of I think interesting issues going on in fire and human reliability, and aging, and that sort of thing if the committee wanted

to hear about, and we could --

CHAIRMAN APOSTOLAKIS: And you would talk about each one of these items there?

MR. CUNNINGHAM: Today, we will talk about a few of these items.

CHAIRMAN APOSTOLAKIS: Does that include the coherence among risk-informed activities?

MR. CUNNINGHAM: Yes, sir.

CHAIRMAN APOSTOLAKIS: Good.

MR. CUNNINGHAM: And as we talked about, the paper talks about a number of upcoming activities in the reactor arena. We will talk today about some changes in 50-69. We will talk a little bit about risk-informing 50-46.

But in other things that are going on, there is a rule of vision for the fire protection rule, and we will talk about coherence here in more detail, and talk some more about risk management tech specs.

And you have heard a little bit already about the new regulatory guide or our P Chapter that we are writing on to address the issue of the needed PRA quality or adequacy to support decision making, and that you heard this morning in one of a series of discussions on pressurized thermal shock.

CHAIRMAN APOSTOLAKIS: Right.

MR. CUNNINGHAM: Next slide. In the waste and materials safety areas, there is some other upcoming activities. They are looking at you know in that arena the number of licensees, and the type of licensees is much more diverse than in the reactor arena.

So they are looking at amending regulations related to medical uses, and they are looking at issues related to Yucca Mountain, and they are looking at how to risk-inform the materials inspection manual, and looking at ways to improve the decommissioning policy and make it more risk-informed.

CHAIRMAN APOSTOLAKIS: Now, the document says that NMSS anticipates the issuance of a final rule to amend the regulations governing the disposal of high level radioactive waste at Yucca Mountain, and to define the term unlikely in quantitative terms.

Now, that is kind of interesting. They are using the term unlikely in places, and they have not defined it?

MR. CUNNINGHAM: That is my understanding. We have got somebody that who will talk to us a little bit about that.

MR. LESLIE: Bret Leslie from NMSS, Risk

Task Group, but previously from High Level Waste. When Part 63 was finalized, the EPA in their 197 standards had used the term unlikely and left it up to the NRC to decide what was an appropriate range for features, events, and processes to be screened out associated with the human intrusion and the ground water protection standards.

The staff made a decision to go out with Part 63 with unlikely not defined, and the Commission had guided or told the staff to come back with a quantitative number for unlikely specifically for this rule making.

The public comment period closed on April 12th, and they are in the process of putting that up to the Commission right now.

CHAIRMAN APOSTOLAKIS: That's interesting. Thank you. We don't use that term in reactors.

MR. CUNNINGHAM: We haven't.

CHAIRMAN APOSTOLAKIS: I don't remember.

MEMBER POWERS: No, we like to use highly unlikely, very unlikely.

MR. GRIMES: The legal standards from previous precedent is remote and speculative, and are the terms that were used to establish those things that should go or were beyond regulatory need.

CHAIRMAN APOSTOLAKIS: You know, a famous mathematician, Amir Burrell, years ago said if you witness the occurrence of an event which probability is less than 10 percent, you have witnessed a miracle.

The probability and not the frequency. But he never heard of a nuclear reactor though. But it is interesting though. It is interesting to --

MEMBER POWERS: And he did all of that without EBAs, too.

CHAIRMAN APOSTOLAKIS: So, 10 percent. Okay. Mr. Cunningham, let's go on.

MR. CUNNINGHAM: We will go to the next slide, please. There are about seven new activities that are described and that are new to this version of the implementation plan. Two of them are in the reactor arena; the coherence issue that we will talk about later, and the new reg guide on PRA adequacy.

For your information, in the waste and materials arenas, there are several of them. They are developing guidance on how they should be performing risk analyses throughout the spectrum of regulated activities that they have.

They are developing -- and we are working with them on research to develop safety goals for the different types of licensees that they have. They are

looking at risks associated with low level source material, and we are talking about amending Part 63.

And then looking at a set of what they call cost-cutting issues related to risk of spent fuel management. Again, the paper continues, and there is an Attachment 1 to the paper, which is a set of accomplishments over the last six months.

And again Attachment 2 is the more detailed implementation plan that gives you a kind of two page summary of each of the activities in the implementation plan.

With that general overview, I am going to spend a couple of minutes talking about one particular topic in that reactor arena, which is the possible changes to 50.46.

We have under way now a study of looking at several changes to 50.46 to make it more risk-informed, and we are talking about replacing the current requirements with more performance-based requirements.

We are looking at a possible change to the evaluation model to allow for more realistic analyses, and we are looking at developing or changing the way that the reliability requirements are implemented for ECCS.

CHAIRMAN APOSTOLAKIS: The title of this is risk-informed regulation and implementation plan. What is a plan? I mean, these are activities that you are already doing.

MR. CUNNINGHAM: Yes.

CHAIRMAN APOSTOLAKIS: Is there a plan of getting somewhere?

MR. CUNNINGHAM: Yes, there will be. Let's go back to that when we get into the coherence, because that is exactly the issue that has come up in several different ways.

CHAIRMAN APOSTOLAKIS: So we know where we want to go, and we have a plan to get there?

MR. CUNNINGHAM: That is the coherence issue, and we will come back to that in a minute.

CHAIRMAN APOSTOLAKIS: Okay.

MR. CUNNINGHAM: So 50.46, and we have had a number of things under way. Next slide. We have completed an evaluation of the technical feasibility of plant specific reliability of evaluations for ECCS equipment, and that was completed in April.

We have completed the technical evaluation of changes to the acceptance criteria and the evaluation model and that was just provided to NRR in June. And we will complete the evaluation of a

generic approach for assessing reliability requirements for ECCS equipment at the end of this month.

Basically, this is a set of technical work to look at the feasibility of possible changes to the rules, and starting in April through this month, we are making a transition from technical assessment to looking at potential rule changes.

So the focus and the lead for the work moves from research to Chris' people and the NRR folks to look at the possible ways to implement rules to make these types of changes.

MEMBER WALLIS: I thought we already had allowance for realistic analyses in the ECCS evaluation model. What is it that is becoming more realistic?

MR. GRIMES: The proposal that has been submitted to the NRR is a recognition that there are certain features of the analytical techniques that could be improved by using more current --

MEMBER WALLIS: Well, you can do that now.

MR. GRIMES: You can do that, and in fact, the research information letter that was sent to us makes some specific recommendations about undertaking rule making. You are correct that 50-46 and Appendix

K currently provide for a realistic model.

And, in fact, I think you have heard some of the industry feedback on the proposed rule making changes, and a question of whether or not the cost of making the model improvements will be offset by benefits.

MEMBER WALLIS: Industry is backing off?

MR. GRIMES: We are still trying to gather information from the industry and in fact this is the point where I should interject that we are reviewing the recommendations in the research information letter, and we are also going to look at the July generic findings, in order to determine whether or not we are ready to start developing draft rule language, or whether or not in the context of future planning whether we will postpone any rule making activity in this area to put more effort into looking at the cost benefit aspects, and do some preliminary regulatory analysis work in order to determine how to proceed.

MEMBER WALLIS: But my question though was about the more realistic analyses. I thought we had the ability to put in more realistic analyses, and I wondered what new greater realism you were looking for.

MR. CUNNINGHAM: One particular piece is

that we have changed to use the newer standard for decayed heat, the new 1994 or something ANS standard on decayed heat. There is a few things like that which would be implemented.

MEMBER WALLIS: And that have not been flexible in the past?

MR. CUNNINGHAM: Correct.

MR. GRIMES: That's correct.

MR. CUNNINGHAM: The regulation states specifically that you have to use --

MEMBER WALLIS: I think in the thermal hydraulics that you can use better methods all the time, and just bring them in.

MR. CUNNINGHAM: That's right. It is implementing those in a fairly prescriptive set of requirements. So you have to be fairly formal about making these --

MR. GRIMES: That is one of the reasons why we would like to also consider the specific recommendations that research sent in their research information letter.

In the context of what the most effective way to proceed with rule making might be, because obviously anything we can do in the rule making area that establishes more generic requirements, as opposed

to simply setting forth a set of requirements that have to be implemented on a plant specific basis, or with topical report methods be reviewed on a case by case basis, we could be more efficient if we could do this on a generic basis.

MEMBER SHACK: I mean, particular research information that you are talking about really relates to reliability requirements rather than best estimate thermal hydraulic codes.

MR. CUNNINGHAM: The June research information letter that we talked about, talks about changes to the acceptance criteria, and the evaluation model. And that is separate from the April and July deliverables related to the reliability requirements. And there is three distinct products.

MR. GRIMES: It also offers up the prospect of performance-based criteria for fuels that is going to take some more work and requires some implementing guidelines that are still being worked on.

MR. CUNNINGHAM: We will turn at this point then to talk more about the plan for improving coherence among reactor-risk informed activities.

MR. JOHNSON: Thanks, Mark. Let me just point out that I am joined at the side table by Stu

Magruder and Mary Druin, and they are actually going to do the bulk of the presentation on coherence. I just want to say a few words about coherence, and where I think we are headed.

We believe that we have witnessed considerable progress in terms of risk informing our regulatory activities. And, in fact, examples like the reactor oversight process, and many of the things that have been captured in the current implementation plan, some of which are well underway, and many of which are still ongoing, sort of demonstrate that we are continuing to make progress on risk-informing our activities.

But we believe, and in fact we have -- the Commission has pointed out to us, and others have pointed out, that if we are going to continue to make progress and get to the next level that we are going to need to be clearer about what we desire, in terms of an End State if you will, and what approaches we see in terms of trying to reach that End State.

And we are going to need to be more integrative between the various activities, some of which we sort of did in isolation so that we can inconsistencies and overlaps, and address those overlaps, and in addition to that, look for holes and

address those holes.

And as a sort of relatively new initiative, we are going to need to manage the internal environment to make sure that that environment -- and I am talking now about the staff and the staff's understanding of, and ability to be able to implement our activities because they are trained in the area to communicate and the processes that support them.

And we need to manage the environment, and so all of those things are wrapped up into this notion about working towards improving the coherence among our risk-informed activities.

So let me just say that in terms of an introduction, and turn it over to Stu to talk through the slides.

MR. MAGRUDER: Thanks, Mike. Can I have the next slide, please. Actually, Mike went through some of this, but I just would remind you that we do have an SRM directing us particularly to move forward with this, and the result of I think a reactor safety arena briefing for the Commission in January.

So that is one of the inputs that we have, although I should say that we started this process well before the SRM as a result of our own internal

discussions, and external input from GAO and others in the ACRS area.

Obviously, stakeholders believe that we are inconsistent in our approaches, and as Mike said, the NRC staff itself is often frustrated in trying to implement some of the se activities. Next slide, please.

So the goal of this effort, at least at a high level, is to develop a common understanding of the objectives. And it sounds simple, but we found that if you asked 10 people, you would get at least 10 different answers about what the goals should be.

Everybody understands the highest level of goals of protecting public health and safety, and most people agree on the quantitative health objectives, but not everybody agrees that those are appropriate for all types of reactors.

So our goal is to reach a common understanding, a unified goal, or unified understanding and then obviously get the staff and the stakeholder buy in that we are headed in the right direction.

CHAIRMAN APOSTOLAKIS: But what would that common understanding be? I mean, I don't understand this. I think what we discussed with the

Commissioners earlier today, this afternoon, is probably an element of this, and that the agency has developed a regulatory structure that has a number of objectives.

And everything that is risk-informed seems to have as objectives the controlling of the frequency of core damage in larger releases. Isn't that an obvious place to start?

That is creates a gap between risk informed activities and traditional regulatory activities? And I think we had a good start with the reactor oversight process when we asked you guys to develop the hierarchy and you did.

And you identified the cornerstones and you said, look, we really worry about initiating events, and we worry about this and that. Is that a common understanding that we are going to develop?

MR. GRIMES: Dr. Apostolakis, if I may, yes, to all of the above. As the project manager for all of the rule making activities and guidance development work that needs to be processed as part of this program, what I look to this effort to do is to basically define the performance measures that I can use in order to determine whether or not all of these various activities are working to a common set of

performance standards.

How will I know when the rules are going to achieve the desired outcome? And as you described to the Commission, there may be some fundamental policy issues associated with the regulatory structure, and how we implement the regulations, and how we establish the threshold for regulatory analysis, and that is the degree of regulatory involvement.

And so this very high level statement actually should read the development of a common understanding of risk-informed performance, and based risk management regulatory program planned activities.

MEMBER POWERS: You will get chastised to no end by Commissioner Diez if you come on to him with those words.

MR. GRIMES: I understand.

CHAIRMAN APOSTOLAKIS: So this is really your goal with this?

MR. GRIMES: That's correct.

CHAIRMAN APOSTOLAKIS: Well, that's great.

MR. GRIMES: And I would also point out that Stu didn't put enough emphasis on that stakeholder buy-in aspect, because besides the description of what the ACRS views about what is right

and wrong that you just described to the Commission, as well as your own individual views about what is right and wrong, we also have a large number of other stakeholders.

And as you correctly pointed out to the Commission, ultimately the program is going to succeed or fail based on whether or not it is credible to the majority of the people who ultimately are going to implement it.

And so if we don't have credibility that we know that we are doing, and that we have some idea about the outcome of these efforts are going to be, then we are just going to make a bunch of rules and people are going to ignore them, especially if those rules continue to be constructed as voluntary alternatives to traditional design basis requirements.

MEMBER SIEBER: I agree.

MEMBER WALLIS: This is very strange. I mean, you are here to tell us why you are doing something, and you do something because you have objective and that's why you do things. And so what you are telling me is that the agency has decided to performance base its regulations without knowing why?

MR. GRIMES: No, we know why, because the performance goals in the strategic plan that give us

the high level outcomes are, and the reactor oversight process translated those into cornerstones.

And at the risk of defining yet another term, I would say that we would use the cornerstone concept now and extent that to all of our other regulatory features.

MEMBER WALLIS: So now you are going to be more specific or more detailed about the objectives, but the major objectives you understand?

MR. GRIMES: Yes, sir.

MEMBER WALLIS: Okay. I think we need to know that, because I think the impression has been given here that you didn't know what the objectives were.

MR. GRIMES: No, we know what he very high level objectives are. The purpose here is to translate those into detailed objectives.

MEMBER WALLIS: And it is very simple to deduce the details from the high level?

MR. GRIMES: I would suggest, and I will ask Mike to add to that; that the work that went into developing the cornerstones for the oversight process was not a trivial matter.

MR. JOHNSON: This is really just a fundamental step that we are taking, and it is just

trying to be clear about where we want to be at some time in the future with respect to risk-informing the regulations and all of these activities that we have ongoing.

It is trying to crystalize that and you don't have to look very far into the staff internally or even with external stakeholders to figure out that while it may be clear to some of us, it is not clear to everybody about where we are trying to go.

And the approaches that we are using to get there, and so that is sort of a fundamental step, but this is sort of a fundamental step, but it is not a trivial step actually.

CHAIRMAN APOSTOLAKIS: So this is what you mean on page 6 by articulate and propose clear and consistent statements of the vision for risk-informed regulation? This is it? This is the most important bullet in this document?

MEMBER ROSEN: Let me talk about the staff and stakeholder buy-in for a minute, because I have been through an analogous process at a utility, where developing risk-informed objectives, and techniques, and processes, was -- we clearly understood, we and the management, clearly understood what it was that we were trying to do.

But we couldn't get it done until we got staff and stakeholder buy-in. Well, it turns out that no amount of talking worked. No amount of discussion worked. Pretty soon you have to realize that the people that have to do the job want to know what is in it for me.

And so one of the pieces of this that my experience teaches me and that you need to include is a clear discussion of how it will affect to the better hopefully the lives of the people whose buy-in you want or that you are seeking.

MR. JOHNSON: And if I could just add to that. The other thing that we are finding, I believe, is that risk informing is not a spectator sport if you will. You don't get it until you do it.

So, that is a part of that statement that I made at the very end about having to manage the environment internally, but also having to work with stakeholders to make sure that they understand, and that they are participating in the process as well.

MEMBER ROSEN: I am thrilled with what you said about it not being a spectator sport, and that you absolutely have to have and to create an environment where people want this to go forward, because my experience tells me that is what you need

to make it work.

And where we have made it work at one utility. Now, the question that I am going to be thinking about as you go forward is what is it in there that -- what is in it for them, and can you focus a little bit of your discussion on how, if that is what you are intending, which I hope it is, how are you going to get there.

MEMBER WALLIS: And what is in it for the public.

MR. GRIMES: All of the stakeholders, and in fact that is the point; that we need to get all of the stakeholders, including the utilities that are looking for reduced and unnecessary burden, the public advocates who are looking for public confidence, and the practitioners who are looking to better safety.

We tie all of the special interests back to performance goals, and then get the spectators involved in developing the tools and the regulatory structure so that they feel that they have some ownership of it.

CHAIRMAN APOSTOLAKIS: And how are you going to do this? Are you going to have workshops and all that stuff?

MR. GRIMES: We are planning on a workshop

in the late summer or early fall, as soon as we can without interfering with progress, near-term progress, and then start the dialogue process.

CHAIRMAN APOSTOLAKIS: I suggest that you come to us as soon as you have some half-baked ideas.

MR. GRIMES: Well, at the end of this presentation, we are going to talk about where we are going from here, and next steps, and --

CHAIRMAN APOSTOLAKIS: Because we are very much interested in this subject, and we will be happy to brainstorm with you in fact. I mean, this is the way that we did 1.174.

MR. GRIMES: And my attitude has always been that since I don't have to go get technical assistance contracts to get your assistance, you are a freebie resource that we would like to take advantage of as frequently as possible.

CHAIRMAN APOSTOLAKIS: And that is not the only reason. Come on now.

MR. GRIMES: I didn't say the only reason. I just said I am motivated.

MEMBER POWERS: I want to remind you, Chris, that you get what you pay for.

CHAIRMAN APOSTOLAKIS: Okay. So where are we now, Slide 11. Are we already to move on to 12?

MR. MAGRUDER: Yes, let's move on to 12. Let me go back quickly to Dr. Wallace's point about taking the high level goals and going down to a more detailed level.

Some of the issues that we are struggling with, and that we have done a lot of reading of ACRS reports and letters, are issues such as the balance between prevention and mitigation, defense in depth and what that means, and things like that.

So as Chris said, the more input that we get from you and other stakeholders, the better on that. On Slide 12 here, as Mike has already said, we are going to utilize existing efforts, or ongoing efforts, including the oversight program, the framework that has already been developed for risk-informing Part 50.

And as we talked about, make sure that we need to identify what the goals are and the products that we want to come up with. The approach for achieving the goals is going to be consistent obviously with the Commission's papers on risk-informed and performance-based regulations, and the SECY-98-0300 on laying out the approaches here.

Things that we will be looking for obviously are inefficiencies in the process, and

unnecessary regulatory burden, and safety concerns and where they come up. The advantage of obviously doing this approach is to give a holistic view of the regulations, or at least that is what we are going to attempt to do.

And if we uncover some areas that we need to tighten up on, we will do that obviously.

MEMBER ROSEN: I would have been happier if your inefficiencies said something like inefficiencies and unnecessary workload for NRC staff, because of this business of getting staff buy-in.

I know that the staff feels it is overburdened and overworked, and they are. So this approach would identify something that they really don't need to do.

CHAIRMAN APOSTOLAKIS: And that is an unnecessary burden on the NRC staff.

MEMBER ROSEN: Yeah.

MEMBER WALLIS: I think you would be better off if you said that the approach to identify opportunities for better efficiency rather than putting it in a negative way like this.

MR. GRIMES: That's a good point. And we continue to try to stress the positive, and we sometimes fall into these habits of using outdated,

half-empty class language.

And in fact I think that this would be an appropriate point to mention that I think the first step in this activity is my desire to organize a public meeting to settle language use, and to pick out terminology and say there is a common set of terminology that we are going to use to communicate these activities.

And what does risk-informed mean, and what does performance-based mean, and what is risk management, and how does it relate to the tech spec activities that Bill is going to describe, because a lot of the frustration that we have is simply our inability to communicate with each other about what it is that we really are trying to accomplish.

MR. MAGRUDER: Real quickly, the last bullet down there, the interface with advanced reactors has been talked about, and I know that you talked about it on Monday, and I am sure that you will talk about it tomorrow also.

But we just wanted to point out that we are looking at this, and that we are starting with the approach that there should be one regulatory framework that covers all reactor designs, and that we will diverge when we have to.

And rather than starting out with a different structure for gas reactors, or other advanced designs, we are going to try to start and proceed down the path that way, and we will see where it takes us.

MEMBER WALLIS: This is the technology neutral part that we heard about the other day?

MR. MAGRUDER: Yes.

CHAIRMAN APOSTOLAKIS: But you will not be so ambitious as to go to frequency consequence curves and drop CDF are you?

MR. GRIMES: Not immediately. The idea here is that we look at -- we want to look at the vision of the future, which is technology independent, but we emphasize that we are not going to stop what we are doing now, or try to make changes too fast and confuse ourselves.

CHAIRMAN APOSTOLAKIS: Well, if you develop some sort of frequency consequence curve for some other type of reactor, then the CDF that we are using now should be consistent with that.

MR. GRIMES: Right.

MEMBER ROSEN: You just introduced another key point in terms of stakeholder buy-in, that my experience teaches me, and I will share it with you.

That early on when we decided to go forward, we determined to control the pace and quality of what we were doing in a pro-active way.

Because to get buy-in, which is crucial, one must not swamp the stakeholders with change. It takes time to get used to change. So you need to control the pace, and how well you do things.

Not everything has to be done perfectly, but you need to know how well certain things need to be done. If you feel that establishing control of the language, for instance, your last point is a crucial matter, and then you need to say we are turning the dial way, way down in terms of speed as part of this process so that we can spend more time, and give people a chance to adopt to the language consciously as part of the management control

So that was another thing that we found necessary to implement change in a culture, because that is what you are doing. You are trying to affect a culture change. So you control the pace and quality, and you tell the people what is in it for them.

MR. GRIMES: Correct. And in fact this is not only relevant to this specific compliment of programs, but it is part of our efforts to instill

planning, budgeting, and performance monitoring, and management techniques within our organizational improvements.

So we have cross-cutting interests here, in terms of -- and as the now popular textbook says, we are practicing moving the cheese, and the textbook is called, "Who Moved My Cheese."

It is one of a series of change management technique texts that is used for retreading some of us old managers.

CHAIRMAN APOSTOLAKIS: Is this a good time to also make a few comments on Part One, Risk Informed Regulation that is part of the document?

MR. CUNNINGHAM: It might be better to wait a minute or two, and let's finish with the coherent part, and then move on.

MR. JOHNSON: Right. Stu has one more slide to finish up on.

CHAIRMAN APOSTOLAKIS: I thought he was done.

MR. MAGRUDER: Let's go to the last slide here read quick We have already talked about many of these, and obviously there is an outline of these activities in the RIRIP, and the version that you have is a little bit dated.

The version has marks in it, and the latest version is with the EDO, and it should be forwarded to the Commission any day. The Commission TAs have expressed interest in this process also, and so after they have read the RIRIP paper, we are going to set up a briefing for them.

And as we have talked about a lot, we want to have many interactions with stakeholders. We tentatively have planned to try to get ont he ACRS calendar for September, along with a discussion of 50.69.

And as is obvious, we don't have a detailed plan yet, but we are hoping to put one together. Obviously, we want to set the goals and objectives first before we write out plan, and to get agreement on the language and everything.

MR. GRIMES: This is a more detailed plan. We don't want to diminish the fact that we are continuing with this RIRIP, which is a series of planned activities. And those are reflected in our budget assumptions.

This is a more detailed plan that looks more like a 5 year plan, and that is going to lay out a series of activities that are logically leading from one stage to the next stage.

CHAIRMAN APOSTOLAKIS: Now, okay, I read what is called Part Roman One, Risk Informed Regulation, and I think it has the same tone that was adopted back in 1997 when we were thinking about writing 1.174. It assumes to a large extent that everybody knows what a risk-informed regulation is, and just real quick on the things that you really have to worry about; defense in depth, safety margins, and so on.

I think it is too negative that way, and then there is a whole section on defense in depth, and safety margins, performance-based and so on. I think the time has come to have a section up front that actually describes what a risk-informed approach is, and what it is that it brings to the table that is not already there.

And I think that Stu in his presentation actually alluded to that. You know, you have a holistic view of the thing, and the classic words are socio-technical system. You find this and you find that. You know, that kind of stuff, and to say why are we trying to do this.

You know, in '97, we really didn't want to rush into it, and we put all sorts of constraints, and this and that, and there is no reason for us to do

that any more.

And then after you do that, praise it a little bit since you are planning to work on it for 5 years, but then you say, but look, there are certain shortcomings, and we still don't want to abandon the defense-in-depth, and so on. So the tone is kind of negative. That's what I am saying. It could be more positive.

There I have a minor comment on defense in depth. The defense in depth philosophy ensures that safety will not be wholly dependent on any single element of the design for structural maintenance or operation. Does that include the reactor vessel?

MR. GRIMES: It is one of the core areas.

CHAIRMAN APOSTOLAKIS: So then I guess I stick to my earlier comment that we really have to change the attitude. And then at the end, you know, you can have a treatise on uncertainty, and then say that an traditional way of handling it was defense in depth and safety margins, and as I said to the Commission earlier, the PRAs right now largely quantify the in-part of defense in depth because it is the easiest thing to do.

If I have three trains, two trains, two pumps, it is easier. But I think that would place

things in perspective and in fact I think we wrote a letter back in '97 that has a long discussion of that.

And I asked the staff to prepare a copy of that. I think it would be worthwhile for you guys to go look at it. By the way, when we write letters, they are valid 5 or 6 years later. This is from '97.

MR. GRIMES: I think Stu pointed out that they did a very thorough search, and obviously didn't uncover all the nuggets in that search.

MEMBER ROSEN: They are rather more like wine actually.

MEMBER SIEBER: Or kernels of corn.

CHAIRMAN APOSTOLAKIS: No, because the issue of uncertainty, I think that in a document like this, like we did in that letter, start out by saying, look, from day one of this industry uncertainty has been a major issue.

Before the PRA was unquantified, they were handling it with defense in depth, and this and that, and now we can quantify part of it. How do we bring all these things together. I think that is the real issue, and what are the benefits of a risk-informed approach, rather than always saying, oh, but we have to do this and do that, and make sure that it is not risk-based, but heaven forbid. Okay. Now we can go

on.

MEMBER WALLIS: Well, when you interact with your stakeholders, you may find that some of them are less favorably inclined to this objective than they were before. The objective has been around for quite a while, and some people's experience with it has not been as positive as maybe it could have been.

CHAIRMAN APOSTOLAKIS: Now, as part of the package that I received, there was an NEI 02-02, a risk-informed, performance based regulatory framework for power reactors. Is that for our information or --

MR. GRIMES: Yes. As a matter of fact, it was originally envisioned that NEI had intended that that white paper was going to establish their vision of the regulatory framework for advanced reactors, but there are so many commonalities that they took the advanced reactor title off, and they presented it as a means of starting dialogue.

MEMBER ROSEN: Well, the members will know all the letters by heart.

MR. GRIMES: In answer to your question, 02-02 is essentially an NEI vision of what regulatory framework could aspire to, and we are going to use that as one of the inputs, as one of the stakeholder inputs, to things that we should consider for this

coherence plan.

It also I think nicely lays out and organizes what the industry views as the issues that need to be overcome.

MEMBER ROSEN: You will of course understand that any NEI viewpoint will be -- there will be members of NEI, utilities specific, that don't agree a hundred percent with that. That is ont a homogenous view out there, and so you always need to be alert to the outliers, who if you can get them to tell you what they are thinking, may offer you a more diverse viewpoint.

MR. GRIMES: That's true, and that is a very important point of our communication plan, is making sure that we get as homogenous group as possible, and that the same is true of the public advocates.

There are extremes and middle of the road views, in terms of what the public interest groups think are the advantages and disadvantages.

MEMBER ROSEN: I think you misunderstood my point. My point was that you need to understand the homogenous view if there is one.

MR. GRIMES: Yes.

MEMBER ROSEN: But you also need to listen

to the non-homogenous, the heterogenous viewpoints, because there may be some wisdom in the heterogenous viewpoints as well.

MR. GRIMES: Yes, I understand. Are right.

MR. CUNNINGHAM: Are we ready to talk about tech specs?

MR. BECKNER: All right. Yesterday, we were trying to figure out just why I was going to talk, and I think that the approved answer here is that as a number of people alluded to, we are developing an overall plant while there are a number of ongoing activities in progress, and I think we need to strike a balance between continuing progress, and at the same time not getting ahead of ourselves.

I think that was the reason that I wanted to talk about one of many programs that has made some progress and give you a status report. I may change my remarks just briefly, because some of the experiences that we have had do relate to some of the comments that have been made here.

And so I will try to tailor them a little bit. If you want to go to the first slide, Slide 15, we have talked to the ACRS before, but it has been quite some time, and so I think it is probably

appropriate that we give you a brief, and let me emphasize very brief, update, and wet your appetite, and if you want to hear more, we will be glad to come back.

There have been 7 or 8 initiatives around for a very long time. The eighth one is in effect the Option 3 rule making and do we need a tech spec rule or not.

But there have been 7 or 8 initiatives that have been evolving over the years, but they are very, very similar, at least in terms of title, and I have a slide in there that lists what those eight are. I am not going to specifically go over those.

What I will do is go over the first four, primarily from a status and experience standpoint of where we stand. One thing I want to point out is the objective of what we are trying to do, and in what we are not calling risk management tech specs.

And if you want to know where we got that, that is really in 1.174 and in integrated decision making, and there is a small paragraph there that describes it very well. But what we are trying to do is that we are trying to make tech specs and the maintenance rule work together.

And that idea actually emerged long before

the maintenance rule had the shall and it used to have a should. We have a configuration of a risk management program that was in 1.177 and that later the Commission asked us to replace the maintenance rule.

But our objective remains the same, is trying to make these two activities, tech specs and the maintenance rule activities, work together in a synergistic manner, and that remains, and I think we are getting there to various degrees.

So with that, if we can go to Slide 16. I am going to list the first four initiatives, but in order of chronological order. We have completed one of the initiatives on missed surveillances.

And rather than talking about what it is, I may talk about some of our experience because some comments were made here about stakeholder buy-in, and also what is in it for me. I think we learned a lot with this one. We viewed this as a relatively small and straight-forward change to tech specs.

And boy did we learn different. We have some stakeholder interaction to learn about, and we had some issues about what is in it for me, relative to the maintenance rule was one of the areas, and I will talk about that briefly.

But the bottom line is this is one of the first risk-informed initiatives and it basically gets surveillances that are missed off the table, in terms of potentially shutting down a plant in most cases, because they are not risk-significant.

We are going to treat them in a manner, and make sure that they don't happen very often, but basically manage any risk if there is one from this surveillance. That has been offered, and we came up with a model safety evaluation that we put out for public comment under our consolidated line under item improvement process.

And we offered it back in September for plant specific adoption, and about half the plants now have come in and requested that, and I don't have the numbers as far as how many we have approved, but under the consolidated line item process, that is simply turning the crank with a relatively straightforward process.

So that is a success, and which I would call is a small initiative in terms of changing the text specs, but it is a big step in terms of what we are learning, and I will talk more about that when I get to Initiative 4.

Initiative 3. Again, this is an

initiative that is fairly well along. We have completed the safety evaluation and we expect to be putting that out for public comment very soon under the consolidated line item improvement process.

We will provide that to the ACRS and other stakeholders, and we won't make you look in the Federal Register, and we will make sure that you see it coming so that you will be able to look at it.

This is what I would call just a simple tech spec change for consistency. Right now tech specs allow plants to stay at power for some period of time with equipment out of service, but it won't let the plant go up to power with that same equipment out of service.

There is an inconsistency, and as long as there is nothing special about the mode change, or a licensee trying to go up knowing that they can't get it fixed, there is an inconsistency there.

This attempts to make that more consistent, and there are some notable exceptions that prevent licensees from going up to power with risk significant power, such as diesels.

And I view this more as a consistency within tech spec changes and making it make sense, and if there is any safety improvement here, it is

primarily that regulations make sense, and they work better when they make sense.

The third initiative, an chronologically was what we called our first initiative, is right behind it. We are working on a safety evaluation and again our goal would be to put this safety evaluation out for public comment, and hopefully this month.

This is End States. Right now most tech specs and the standard tech specs drive you to cold shutdown eventually with equipment out of service. Obviously cold shutdown may or may not be any safer than hot shutdown, depending on the particular equipment.

In fact, in some cases, depending on the equipment out of service, hot shutdown may actually be the preferred state.

MEMBER POWERS: Do you have a quantification for the risk in cold and hot shutdown?

MR. BECKNER: This has been done generically, I believe so, but I think if Bob Dennig wants to help me, but I think I am looking at what equipment is available and what function is needed. Do you want to add to that, Bob?

MR. DENNIG: Yes. The risk analysis has been reviewed by Mike Johnson's outfit, and the

analyses are being provided by owners' groups. I do not believe that they are quantitative. They are primarily qualitative with regard to what assets are available for accident mitigation in different modes given the loss of equipment that is meant to be repaired.

MEMBER POWERS: Well, when I have seen these analyses of a qualitative nature, I find that, for instance, as an example, at Brown's Ferry, they showed me an example, and they were quite proud of having made a decision to avoid a situation in which all of the metrics that they used were green, except for one that was red, and replaced it with one where they were all green and two were orange.

Okay. And they said this is much safer, and for the life of me, I could not understand how one decided that two oranges was safer than one red. Is this the kind of qualitative analyses that you are getting?

MR. DENNIG: Actually, I don't think this relies on anything that is even that subtle. These are fairly straightforward understandings of I've got steam, and I've got pressure, and I can run a steam driven off-speed pump in hot shutdown, and I can't do that in cold shutdown.

Or that I have impaired my RHR and why am I going to cold shutdown. These are not really subtle points. But --

MEMBER POWERS: These are a presumption of what your initiating events are going to be.

MEMBER SIEBER: Yes.

MR. DENNIG: Yes.

MR. BECKNER: Again, it is primarily looking at the --

MEMBER POWERS: I think this kind of risk analysis is not good.

CHAIRMAN APOSTOLAKIS: Is not god you said?

MEMBER POWERS: Not good.

MR. BECKNER: We would be interested in any comments you might have then. The fourth one I think is where the rubber meets the road, and this is one where I think both stakeholder input and also what is in it for me, we learned some very good lessons under the initiative, too.

This is one where basically the maintenance rule and tech specs would start becoming highly integrated and would be a significant change. This is where your completion times, which currently in tech specs are fixed now, would become variable

under an (a)(4) type process.

And where you would look at basically what the overall plant status is, and you would look at your cumulative impacts and so forth, and the tech specs would rely heavily on a (a)(4) like process for this.

The concerns that we immediately had was that the maintenance rule is not up to that, and concerns about what the maintenance rule requires and so forth.

And we spent a lot of time very concerned about that, and then we realized that we had a solution to it in the fact that through the tech specs we can bolster the maintenance rule.

MEMBER ROSEN: Through the tech specs you can what?

MR. BECKNER: We can bolster the maintenance rule to in effect say maintenance rule plus. And what we did after we saw the licensees were doing a lot of very, very good things relative to the maintenance rule, but the question was, yes, but they are not required to do that. They are just doing good things.

And so we said, okay, and again this isn't what is in it for me. And then suddenly the

maintenance rule people were very happy, because some of the things that they saw was going on was good, and in terms where licensees were getting this type of thing, and certain tech spec requirements, as far as criteria capability, PRA, and so forth could in effect be part of a tech spec program.

So the bottom line is that this initiative is really the big one. Where we are in status is that we have agreed with NEI on an initial concept, and we have also talked to a number of licensees who are interested in piloting this and that is where we stand.

We have also looked at -- and I think you made the point that there is a variety of capability out there. We don't want to pilot something that one licensee can make use of, but the other one can't.

We want to cater to a spectrum of capabilities potentially, and that is one of the things that we want to pilot.

MEMBER LEITCH: Do I understand correctly here that you are allowing or the proposal is to allow various out of service times, depending upon --

MR. BECKNER: Yes. Getting into some details, basically the current concept is front stops and back stops. The front stops would probably be the

existing completion times, and licensees and operators have comfort in a fixed set of rules, and they would be deviating from the fixed set of rules on an infrequent basis.

But, yes, they could extend then a completion time beyond the current time and up to some back stop, which might be 30 days or some number; and based on an (a)(4) like assessment. But that would be what I would call (a)(4) plus.

MEMBER LEITCH: But conceptually you might have a normal out of service time with a diesel of seven days, and that would still be expected under normal situations.

MR. BECKNER: Right.

MEMBER LEITCH: And you may have an unusual failure or tear down, and you would analyze that from a risk perspective.

MR. BECKNER: Well, it could be emergent or it could also be planned. Either way, (a)(4) basically requires you to look at the overall plant activities and take appropriate action to basically minimize the risk.

MEMBER POWERS: I would like to pose a question to Dr. Apostolakis. Earlier today, you hypothesized a reason for the slow pace of risk-

informing the regulatory process as arising because of a lack of confidence, and the rigor with which risk assessments were being done.

And where we have a variety of activities moving along in which I would characterize as ersatz risk assessments are being done. Do you think that contributes to the lack of confidence in the risk assessment?

CHAIRMAN APOSTOLAKIS: These activities?

MEMBER POWERS: Yes.

MEMBER ROSEN: Well, before you answer that, I think you should understand that Dana has posited that these are ersatz and I am not sure that he is correct.

MR. GRIMES: Actually, I wanted to add to that. I would characterize the End States activity as not being risk informed, but avoiding being risk stupid. Regulation 50-36 requires that if you don't satisfy your license requirements that you shut down the plant, even if all your RHR is out.

And so the End State concept was one of not so much an ersatz risk analysis, but simply a logic diagram that says if you are in this condition, what is the most sane thing you can do that is not risk stupid.

MR. BECKNER: Yeah, I think we would characterize them as two categories. One is the pre-analyzer of the fixed condition that you typically have in tech specs, where the specific action relative to condition is fixed.

All of the initiatives are along that line, except for 2 and 4, which we call process-based actions; the action is not fixed, but is based on a pre-defined process.

MEMBER ROSEN: Could you go back to that last one? I want to address Dr. Power's comment about ersatz, and to indicate just how far it is from ersatz, this Initiative 4, and where ersatz I understand to mean wrong, false, improper, in those kinds of words.

50.65 (a)(4) control of completion times at a plant that I am familiar with is based on a set of analyses that are each individually based on a full PRA quantification, based on a PRA that has been declared state-of-the-art by the staff after many years of review.

It is as far from ersatz as you can be, and it is based upon real quantification of risk, and it is a method to manage risk rather than to stumble along without knowing what the risk is.

MEMBER POWERS: I have no doubt that you can do these analyses with a great deal of rigor and a licensee might well choose to do them with a great deal of rigor. What he is being required to do, however, does not demand that level of rigor.

MR. BECKNER: It sounds like to me that we should come back and talk to the subcommittee in detail. It might be useful.

CHAIRMAN APOSTOLAKIS: That's a good idea.

MEMBER ROSEN: You say Initiative 4 is one of the key initiatives, and I think just so we all get on the same page here, as obviously I feel strongly about it.

MR. DENNIG: Just a basis for four, and we have made clear -- and this is what Bill talked about that the maintenance rule folks are pleased with, is that the (a)(4) as it stands, you use qualitative, quantitative, or blended approaches.

In Initiative 4, we have made it clear that this is a quantitatively based approach. It requires an automated PRA with real time risk analysis capability, and meeting some quality standard for that PRA and update frequencies, and so on and so forth.

And we have gotten a very positive and very supportive response from the industry working on

this proposal with us to put that on the table as a pre-condition for anyone being able to do this.

MEMBER ROSEN: I'm glad you said that, Bob, because earlier today, Mr. Chairman, you made some point about it not moving fast enough and not going ahead with these kinds of things.

If the Staff is telling licensees that if you do this well with a good PRA, kind of like what Bob just talked about, you can get major advantages in tech spec flexibility. The effect of that is to have more people who do the job well.

CHAIRMAN APOSTOLAKIS: There is no question about that. The problem is that there are many, many other instances where they get benefits with less than adequate PRAs.

MEMBER ROSEN: And this is a good case, and so I think we --

CHAIRMAN APOSTOLAKIS: We are running out of time and I think we should --

MR. BECKNER: That's my presentation

CHAIRMAN APOSTOLAKIS: Okay.

MEMBER ROSEN: I heard a promise that you would come back and talk in more detail.

CHAIRMAN APOSTOLAKIS: Yes.

MR. BECKNER: Well, I get an offer and I

heard it was a good idea.

MEMBER ROSEN: Which subcommittee, the PRA subcommittee?

CHAIRMAN APOSTOLAKIS: Usually that is the one.

MEMBER ROSEN: Operations and PRA.

CHAIRMAN APOSTOLAKIS: Chris, are you going to wrap it up?

MR. GRIMES: Yes, sir. Could I have Slide 20, please. I do want to point out that the success of any program plan consists of both having a long term vision, but also having some short term deliverables.

So our immediate interest is that we are working feverishly. As a matter of fact, earlier today there was a meeting with NEI to discuss their proposed guidance for categorization.

We are going to complete a proposed rule for 50.69, the treatment rule, and whether it is the treatment rule or the categorization rule, it is one of those linguistic exercises that I would like to sort out very quickly.

But that is a near term success, and getting the 50.69 rule and associated regulatory guidance, there are a lot of associated PRA

application issues, and risk-informed issues, and performance issues, and so that will be something that we can chew on together with you and our other stakeholders.

So we are on the agenda for the September meeting and we will deliver a product to you in August so that you will have sufficient time to prepare for that meeting.

Mark had previously described the activities that are going to lead to a regulatory guide on the quality standards for the tools. And Prasad Kadambi has a draft, NUREG BR, which is a high level guidance on performance-based regulations.

Both NRR and MNSS basically have regulatory analysis guidelines that encourage performance-based regulations. But the guidance that Prasad is going to present is a deliverable from research that we have agreed -- and when I say we, this collection constitutes the smallest number of first-line SESers that I felt could work together to improve coordination.

And I refer to us as the risk management team, and we meet every week to --

MEMBER POWERS: You mean the smallest or the largest?

MR. GRIMES: The smallest, because the largest is all of the first-line SES supervisors in the NRC who have a piece of this, and we needed to start with a core group and work out, as opposed to try and take everybody at once.

MEMBER POWERS: Well, you said the smallest group that could work together effectively. Don't you mean the largest group that could work together effectively?

MR. GRIMES: We have already added one to our number, Gene Imbro, who is the Chief of the Mechanical Engineering Branch, who has the biggest investment in the treatment issues. We have designated him to lead the staff activity and the dialogue on what are the appropriate treatment requirements associated with categorization.

And I am working with Trish Holahan to see whether or not we can bring the two rule making programs and the implementation of the performance guidance which exists in different forms in both offices, and try and bring some coherence to those activities as well.

And Mark can have the last word, but the other piece of this is trying to figure out how to bring Mr. Lyons' organization into alignment with this

effort.

MEMBER ROSEN: What is his organization?

MR. GRIMES: New Reactor Licensing Project Office, LRLPO.

MR. CUNNINGHAM: But again in the context of advanced reactors, you have heard something from Mary on Monday, and you will hear some more tomorrow about an advanced reactor framework, and that work is very much related to the coherence issues that we have been talking about earlier.

Mary is involved with both activities, and so we can help ensure that whatever issues come up with for the licensing of new reactor designs in a framework standpoint are different only by design if you will from the current reactor core.

MEMBER POWERS: And we can have great confidence that it will be done in a superior fashion.

CHAIRMAN APOSTOLAKIS: Any further comments or questions? Well, thank you very much, Gentlemen. We are in recess.

(Whereupon, the meeting was recessed at 5:23 p.m.)