Official Transcript of Proceedings

ACRST-3163

NUCLEAR REGULATORY COMMISSION

Original

Title: ADVISORY COMMITTEE ON REACTOR SAFEGUARDS ~~JOINT MEETING~~
Materials & Metallurgy / Thermal-Hydraulic
Reliability & Probabilistic Risk Assessment

Docket Number: (NOT APPLICABLE)

PROCESS USING ADAMS
TEMPLATE: ACRS/ACNW-005

Location: ROCKVILLE, MARYLAND

Date: MONDAY, JULY 9, 2001

Work Order No.: NRC-310 Pages 1-158

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

JOINT MEETING OF THE ACRS SUBCOMMITTEES ON MATERIALS AND METALLURGY, THERMAL-HYDRAULIC PHENOMENA, AND RELIABILITY AND PROBABILISTIC RISK ASSESSMENT

Monday,

July 9, 2001

Rockville, Maryland

The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pile, at 1:30 p.m., William J. Shack, Joint Meeting Chairman, presiding.

COMMITTEE MEMBERS:

WILLIAM J. SHACK	Subcommittee Chairman
GEORGE APOSTOLAKIS	ACRS Chairman
MARIO V. BONACA	
F. PETER FORD	
THOMAS S. KRESS	
GRAHAM M. LEITCH	
STEPHEN ROSEN	
JOHN D. SIEBER	
ROBERT E. UHRIG	
GRAHAM B. WALLIS	

A-G-E-N-D-A

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

1:33 p.m.

DR. SHACK: This is the Advisor Committee, an ACRS Joint Committee on the ACRS Subcommittees on Materials and Metallurgy, Thermal-Hydraulic Phenomena, and Reliability and Probabilistic Risk Assessment.

The meeting will now to come order. I am William Shack, Chairman of the Subcommittee on Materials and Metallurgy. Graham Wallis is Chairman of the Subcommittee on Thermal-Hydraulic Phenomena, and George Apostolakis is Chairman of the Subcommittee on Reliability and PRA.

Subcommittee members in attendance are Mario Bonaca, Peter Ford, Thomas Kress, Graham Leitch, Steve Rosen, Jack Sieber and Bob Uhrig.

The purpose of this meeting is to discuss the status of risk-informed revisions to the technical requirements of 10 CFR 50.46 for emergency core cooling systems. The Subcommittees will gather information, analyze relevant issues and facts, and formulate proposed positions and actions, as appropriate, for deliberation by the full Committee. Michael T. Markley is the Cognizant ACRS Staff Engineer for this meeting.

The rules for participation in today's

meeting have been announced as part of the notice of this meeting previously published in the *Federal Register* on June 27, 2001.

A transcript of the meeting is being kept and will be made available as stated in the *Federal Register* notice.

It is requested that speakers first identify themselves and speak with sufficient clarity and volume so that they may be readily heard.

We have received no written comments from members of the public regarding today's meeting.

I don't really have any comments. We've sort of discussed some proposed revised of 50.46 before, and I think we'll be going into a little more detail on some of these options today. And I assume that Mark or Mary will do the honors.

So now we'll proceed with the meeting, and I'd like to introduce Mike Johnson of NRR who'll introduce the topic and the presenters.

MS. DROUIN: My name is Mary Drouin with Office of Research, the probabilistic risk analysis branch. At the table also with me is Alan Kuritsky, also from Office of Research, and the PI branch.

Today we're here to give you a status of where we are in 50.46, and we're going to concentrate

primarily on the paper that is on its way to the Commission. I will remind the committee the paper has not been signed out at this point, so it's still sensitive. Hopefully, it will be to the Commission within the week.

For today's briefing, we are going to concentrate on 50.46. We'll quickly go over, you know, the purpose and what we would like to see out of today's discussion, the feedback we'd like from ACRS.

Quickly to remind a little bit about option 3 in the background and what we're supposed to be accomplishing. And then hone in on the particular activities that are associated with 50.46.

There are three primary things that we're going to touch on: The feasibility of changing the actual 50.46, going in and tentatively we have some considerations to change the actual rule; also looking at additional changes to 50.46, things that are more in the long term; other Option 3 activities. And then wrap up with what our tentative recommendations and our schedule is for 50.46.

In regard to today's meeting, again, we're focus in on 50.46 and the paper that is making its way up to the Commission. And for today, as we go through the different options that we're considering, we would

like to get feedback from the ACRS on these options, any implementation issues that you feel that we may overlooked or not addressed adequately enough and whether or not was really have come to the conclusion that this is feasible or not feasible. And, of course, at this point we are looking for a letter from the ACRS to accompany our paper to the Commission.

Just briefly on the background, we go back to SECY-264, which was the original plan for the Option 3 work. And we also had a framework. And the two important things to remember was a big lesson on 50.44 is that part of Option 3 has two phases to it. And this first phase is strictly a feasibility study. Is it feasible to do the things that we would ultimately recommend to the Commission. That does mean that we have done all the technical work that would be needed to support a rulemaking, because that technical work is part of Phase 2 when we get into the implementation once we have received approval from the Commission to proceed forward. And there seems to have been some confusion there. So, I just wanted to quickly highlight that again that the Phase I when we complete it and we make our recommendation to the Commission, that does mean that all the technical work is done.

We've done enough work to have a good comfortable feeling that this is feasible, that it will work out, but there's no guarantee that it would.

DR. WALLIS: Besides feasibility, are you looking at desirability as some sort of criterion for--

MS. DROUIN: To me desirability is part of feasibility.

DR. WALLIS: You can do all kinds of feasible things, but they may not be desirable.

MS. DROUIN: That's right. So part of that feasibility is that it's desirable.

DR. WALLIS: Okay.

MS. DROUIN: I mean, you might be able to do something, but if nobody wants it --

DR. WALLIS: That's right.

MS. DROUIN: Right. So absolutely, that's part of the feasibility.

DR. SHACK: Well, that was in your prioritized bullet, right, that you've already decided this particular one is a high priority candidate for Option 3?

MS. DROUIN: Yes. Yes. And that looks at the resources and the cost, and the benefits. I wasn't going to spend time going through each of

these, I just wanted to really focus on the difference between Phase I and Phase II. Okay.

Now, getting into 50.46. We talk about 50.46 and, and they used that number 50.46 rather loosely. But when you go and you look at Part 50 and you talk about the ECCS performance, which is really more what we're talking about, then you're really talking about 50.46, you're talking about Appendix K and you're talking about GDC 35. These you have to handle together. You can't just deal with 50.46 and exclude Appendix K and GDC 35. They work together as one entity.

And when you look at these and what are the ECCS requirement, they break down into these four what I would call topical areas in terms of what the requirements are trying to achieve.

One is the ECCS reliability. The acceptance criteria for the ECCS, it's evaluation model and then ultimately the LOCA size definition.

And as you come out of these boxes to the right, then you start seeing -- and we tried to mimic the words right from the regulation so what exactly what is the technical requirement.

When you look at the ECCS reliability, and this is where I come back to, it's not just 50.46,

because that reliability, this row here is showing up in GDC 35. And that ultimately gets to the single failure criteria and the requirement for your simultaneous LOCA and LOOP requirement.

We come down into the next one, which is the ECCS acceptance criteria and you ultimately get to -- this one is in 50.46, the five criteria that they have to meet from their performance. And you hear about, you know, your peak cladding temperature, 2200 degrees, your long term cooling, your coolable core geometry, etcetera.

Your next one, your evaluation model, now this is a coupling here of both 50.46 and Appendix K, which gets into what the analysis you have to do and what model that you're going to have to use.

And then your last topic then gets into the LOCA size definition, and this is showing up in several places. It does show up exactly in 50.46. It shows up in Appendix K, which actually defines, and you'll see these same words in those three places of what is defined as a loss of cooling accident in terms of the pipe break size and location.

So in risk-informing this, these are the things that we're dealing with, trying to look the reliability, looking at the acceptance criteria or get

the evaluation model and look at the LOCA size. So those are going to be the four things that we're going to touch on.

So, at this point, I'm going to turn it over to Alan, and he will start walking us through each of these four areas.

MR. KURITSKY: Okay. As Mary said, I'm Alan Kuritsky, I'm in the PI Branch in the Office of Research.

Based on the staff's feasibility assessment of 50.46 and GDC 35 and Appendix K we feel that changes to the reliability and acceptable criteria and evaluation models may be justified.

More specifically what we're looking at is ECCS reliabilities resulting from the technical requirements may not always be commensurate with the risk significance of the various LOCA sizes.

DR. WALLIS: How do you make a measure of this commensurate? What do you balance against what to decide whether its commensurate or not?

MR. KURITSKY: Right now we've been using as our metric core damage frequency.

DR. WALLIS: Balance versus?

MR. KURITSKY: In other words --

DR. WALLIS: When it gets below a certain

amount, it's not worth bothering, its a go/no go kind of thing?

MR. KURITSKY: Yes. For instance, if you had a 10^{-5} frequency of initiating event and you had 10^{-3} ECCS reliability and it required some additional failures in your calculation that would make it even lower, you may say okay that's not commensurate. It's either CDF or just a total frequency of the sequence of events you consider.

DR. APOSTOLAKIS: I don't understand the second bullet anyway. Can you explain it?

MR. KURITSKY: The one that we're just discussing?

DR. APOSTOLAKIS: Yes. What does it mean?

MR. KURITSKY: Well, just pretty much what I was just saying. If you have a frequency of, let's say, a class of LOCA that may be 10^{-5}, okay. And then the technical requirements may require -- let me use this example first.

Technical requirements may require you also consider for that class of LOCAs a simultaneous loss of off-site power and a single worst additional failure. If you have a 10^{-5} frequency of this initiator and it's another 10^{-4} or 10^{-2} for something as loss of off-site power, an additional maybe 10^{-2}

for another single worst additional failure and you end up with a frequency of that series of -- you know, sequence of events which is already down to the $10^{-8/9}$ level and you're having that in the core damage, it's just that sequence, that's the events. So to us that means that, you know, you rely on what you require of these, yes. You would not need to have as high reliability.

When I go to the loss of off-site power assumption and that single failure, that all feeds into the ECCS reliability. In other words, when you're assuming that it has to operate with off-site power failure, you're assuming it has to operate given the failure of some piece of equipment, final has to go to how reliability that system has to be. In that case you may be requiring a greater reliability than is really called for by the frequency of that initiator.

DR. APOSTOLAKIS: Now, if I look at the first bullet and what you just said, and compare it with the -- what is left out is the LOCA size definition.

MR. KURITSKY: Yes, and that's going to show up when we discuss the longer term, the additional --

DR. APOSTOLAKIS: So the message you're sending with this is that change as to the LOCA definition model may not be just --

MR. KURITSKY: Right now we don't -- we haven't established the feasibility level right now.

DR. APOSTOLAKIS: Okay.

MR. KURITSKY: And some we're still going to look into.

DR. WALLIS: This is really focused on the LOCA LOOP simultaneous requirement, isn't it?

DR. BONACA: One of those.

DR. SHACK: Mary, you wanted to say something.

MS. DROUIN: Also the thing that I wanted to add is that we say it may be justified. The words that are missing here are "in the short term." These are things that can be done immediately.

DR. APOSTOLAKIS: Okay.

DR. SHACK: We're going to discuss the solution of the large break LOCA in more detail, right?

MS. DROUIN: We're going to get into that also here.

In answer to Dr. Wallis, if we go back and we look at, you know, the flow chart. Remember the

liability, that's being set. So when we talk about reliability, we're talking about the single failure criteria, we're talking about the simultaneous LOCA LOOP assumptions.

DR. SHACK: Although in your second bullet you certainly are leaning on the frequency of the breaks as a function of break size as far as the ECCS reliability?

MS. DROUIN: Yes, that comes into play.

DR. SHACK: You're certainly arguing that certain frequencies are much more likely than others.

MS. DROUIN: Correct.

MR. KURITSKY: Okay. And then the last bullet there also is that based on feasibility study we recognize that there may be some unnecessary conservatisms in the existing requirements we want to address.

DR. APOSTOLAKIS: Maybe you said?

DR. WALLIS: Are these just conservative?

MR. KURITSKY: Well, we say maybe because EDO hasn't signed off on those yet.

DR. BONACA: Well, isn't bullet 2 and 3 the same? I mean, really what you're saying there is excessive conservatism --

MR. KURITSKY: Yes, it is --

DR. BONACA: -- being imposed right now because of the requirements?

MR. KURITSKY: Right. The third bullet also is trying to capture things that aren't -- just dealing with ECCS reliability. As Mary showed you in that previous slide there's some other things.

DR. BONACA: I understand.

MS. DROUIN: And when you get into the acceptance criteria, you know, that's separate from the reliability that there's conservatisms in the evaluation model.

DR. WALLIS: It's only unnecessary conservatisms, and when NEI were here they were saying that the accuracy on some of these -- the focus on some of these very unlikely events was diverting the design into channels which were actually harmful when it came to dealing with likely events. It's not just conservative, it's that you're doing the wrong thing.

MR. KURITSKY: Yes, there are a couple of examples that indicate --

DR. WALLIS: So you're going to bring that sort of thing up, too. It's not just conservatism that's the problem, it's doing the wrong thing because you're responding to the wrong kind of -- the less likely one and then you're impairing your ability to

deal the more likely.

MR. KURITSKY: There may be a more optimum way.

DR. WALLIS: Right. That's right.

MR. KURITSKY: It doesn't mean that the current way is a safety concern, but there may be a more optimum way.

DR. WALLIS: The optimum, and that's a very good one if that can be made. The optimization is a very clear one to me if you can make it.

MR. KURITSKY: Okay. Some of the technical observations and conclusions that we've arrived at during the feasibility study conducted by the staff is that, as we've been mentioning, current evaluation models of ECCS performance may be overly conservative for large-break LOCAs. And that goes right back to what we just discussed. That could be because of the additional assumptions that you put on in the models. And it also could be due to specific features of Appendix K which we may feel a little overly conservative.

Current estimates of the frequency of large-break LOCAs are uncertain and are not low enough, at least the current estimates that we have are not low enough to eliminate all large-break LOCAs

as design based accidents.

DR. APOSTOLAKIS: How long should they be?

MR. KURITSKY: Well, we haven't put our finger on the exact number. Certainly it'd be below 10^{-6} confidently.

DR. APOSTOLAKIS: Mean value?

MR. KURITSKY: I say confidently, so I'll leave that up to whether we see it as a percentile or whether we would be comfortable with a mean. But if we could be comfortable with them being below 10^{-6}, that may be somewhere in that ball park. But we're not anywhere near that right now, so we don't really have to establish that threshold because we just know we're not actually there.

DR. SHACK: Well, you know, when you said that the current estimates are not low enough to allow elimination, that's the current estimates based on data and observations which will, in fact, will be limited by the fact that you just -- you know, to get those kind of times, you need a lot of observations and a lot of hours.

MR. KURITSKY: Exactly.

DR. SHACK: Certainly the estimates from probabilistic fracture mechanisms would certainly suggest that they're low enough to meet your 10^{-6}

requirements.

MR. KURITSKY: Right, except that again -- I don't want to tread to that area because I'm not an expert. That's your expertise. But our fracture mechanics experts actually have some -- are not necessarily as comfortable with the operational data, the numbers coming from the operational data because they don't necessarily address certain failure mechanisms like primary wire first corrosion cracking which has been showing up recently, and so there's some concern on their part that the operational, the numbers coming up from operational data are not, say, maybe not conservative or they're not properly --

DR. SHACK: They haven't been updated sufficiently to take into account new phenomena.

MR. KURITSKY: Right. Exactly.

DR. APOSTOLAKIS: Has probabilistic fracture mechanics ever produced numbers that are 10^{-3} or ^{5} for anything? It's always 10^{-x}, and X goes -- is that an inherent property --

DR. SHACK: Well if you look at a 2 inch pipe and a 28 inch pipe, you get very different numbers.

DR. APOSTOLAKIS: But never high numbers?

DR. SHACK: Well, the ones for the 2 inch

pipe would be high.

DR. APOSTOLAKIS: They would be?

DR. SHACK: Yes.

DR. APOSTOLAKIS: Then we would believe them.

DR. WALLIS: Can I go back to the first bullet, I'm sorry.

When you say evaluation model, do you mean the criteria in Appendix K or do you mean something in the codes, which is what I think of as an evaluation model?

MR. KURITSKY: Well, I guess what I'm thinking of is two things. One may be the assumptions used in the model, which goes back to the single failure criteria --

DR. WALLIS: Those are sort of criteria, they're not technical assumptions in the code of some sort?

MR. KURITSKY: Right. That's just --

DR. WALLIS: So regulatory assumptions?

MR. KURITSKY: Right. Right.

DR. BONACA: I understood, for example, that your multiplier under the code, it's one of those things, is it?

MR. KURITSKY: Okay. What I just

mentioned was the first type. And the second time is what Mario just mentioned; it's multiple -- you know, anything in Appendix K, some of the actual features, required features in Appendix K we may feel are actually conservative. Like, for instance, 1.2 multiplier on decay heat or, as we're going to mention later, the few that we're going to look at.

DR. WALLIS: This might even get down into the actual calculation model for a large break. I mean, requiring something like a Moody model in Appendix K may not be appropriate if you know how to do something better.

MR. KURITSKY: Yes.

DR. WALLIS: Well, you seem to be thinking more in terms of regulatory part rather than the technical --

MR. KURITSKY: Right.

DR. WALLIS: -- code modeling part.

MR. KURITSKY: Right.

DR. WALLIS: Okay.

DR. KRESS: Those models and those conservatisms were put there on purpose --

MR. KURITSKY: Right.

DR. KRESS: -- because of the uncertainties, probably.

MR. KURITSKY: And the idea being that more recent information may allow us to be in a better position to --

DR. KRESS: If you think you know better what the large-break LOCA frequency might be, so that you --

MR. KURITSKY: Well, that's a whole another issue. In the Appendix K part we may know more about, you know, heat transfer or we may know more about downcomer boiling or something. There's different things that we know more about now then we did back in, say, 1974 time frame.

DR. KRESS: So that's sort of somewhat separate from actually making a risk-based move. It's just the fine tuning Appendix K as it is now.

MR. KURITSKY: Right. And, in fact, we're going to actually mention when we get a little further along how we are actually kind of separating off our purposed changes in two groups. One, which we're really changing the Appendix K or 50.46, which would then apply to everybody and then the other would be, you know, coming from a risk-informed alternative to Appendix K or a 50.46 and then that would be something that would be voluntary.

So you're right, some of these things are

just fine tuning what's there already.

DR. SHACK: Where did we leave off?

MR. KURITSKY: Okay. The third bullet just kind of follows on from the second bullet. The current estimates of the LOCA frequencies aren't sufficiently low that we can rule them out from the design bases, but they are low enough that when we combine them with the reliability of the ECCS we don't see them as being risk significant.

DR. WALLIS: But if you made the large-break LOCA no longer a part of this rule, then the reliability might get lost because it no longer has to confront the break. So these aren't independent variables.

MR. KURITSKY: Right. That's right. That's right. Okay.

And lastly, we note from our plant equipment that has been there and designed for the LOCA design or large LOCA and LOCA design-basis accidents. However, it actually gets a lot of use in the defense against a spectrum of beyond-design-basis accidents. So we have to be very conscious that if we do make some changes to what's covered in the design basis, that we don't allow for something to be -- change, removed that we are currently taking credit

for that has good significance.

DR. APOSTOLAKIS: Can you give an example?

MR. KURITSKY: Well, I'm just trying to think. Almost any equipment that's used in design of a large-break LOCA, whether it be a low pressure injection pump or whatever that's used to meet the success criteria, the current ECCS acceptance criteria for large-break LOCA and, you know, that's also used for, let's say, in a seismic event beyond design basis seismic event that could result in a loss of coolant greater than a small LOCA, so therefore you would need to have low pressure injection --

DR. APOSTOLAKIS: Well, then you're back to a large LOCA, just that the cause changed.

MR. KURITSKY: Right. The idea being that it was in the design basis because of a large-break LOCA, but yet it's used for a response to something that may be beyond the design basis, in an issue that's not considered within the design basis.

DR. BONACA: But actually the report identifies the view on design basis, but also in transients, for example, certain transients that will lead you to the need for some injection, right? You mean, your knowledge, at least in the report, shows pretty big spectrum of applications of ECCS injection

for some issues.

MR. KURITSKY: Right. Right. Yes, to require further initiation.

DR. BONACA: I mean ultimately they end up in a LOCA of some type, or maybe, you know, examples of station blackout issues and things that drive need for -- any requirements for ECCS.

MR. KURITSKY: Right.

DR. SHACK: I mean this notion that the large-break LOCA is also the surrogate for all the other LOCAs, whether it's man ways or seismically induced equipment failures and supports and things is, again, even if you could show that the large pipe break was infrequent, you'd also have to show that all other sources of large LOCAs would be equivalently infrequent?

MR. KURITSKY: Actually, that's very good. The -- that's one of the one main things he's getting at too, things like that.

DR. SHACK: Well, I think -- and, again, you know, we're talking about ancient history here. But I mean the Livermore studies had the indirect failures essentially as contributing more to the large-break LOCA, you know, back when the did those things in the '80s than the pipe failures themselves.

MR. KURITSKY: Right.

DR. WALLIS: Back to number three, not only is the large-break LOCA less likely, but it may be easier to handle than small-break LOCAs. This is one reason that the AP600 opens up a valve, because you depressurize and it's easier then to refill. It may well be that, although it appears in the big pipe break is a worse thing to happen, in fact it's easier to handle with your ECCS. Is that a true statement?

MR. KURITSKY: And that's also why you've seen a lot of PRAs, you see the contribution to core -- in small breaks is greater than for large breaks.

DR. WALLIS: Not just because they're less likely?

MR. KURITSKY: They're more likely, in fact.

DR. WALLIS: They're more likely and they're more difficult to handle.

MR. KURITSKY: And they can be, because you have to depressurize, right.

DR. WALLIS: Right.

DR. KRESS: And that's why I think the rule calls for looking at a spectrum of breaks, too, because it doesn't limit it to the large.

DR. APOSTOLAKIS: Again, going to the last

bullet, are we regulating now beyond design basis accidents?

MR. KURITSKY: No, we're not regulating beyond there, but it just --

DR. APOSTOLAKIS: Then where do we go?

MR. KURITSKY: Because this equipment helps reduce the --

MS. DROUIN: This is more of a cautionary type statement in consideration of our defensive tab, which is going to come out on the next slide.

DR. APOSTOLAKIS: Okay.

DR. KRESS: Well, but we've always regulated beyond design basis.

DR. APOSTOLAKIS: We have?

DR. KRESS: We always have.

DR. APOSTOLAKIS: Like when?

DR. KRESS: The design basis regulates beyond design basis.

DR. APOSTOLAKIS: It's meant to be a surrogate --

DR. BONACA: I think for the regulation the ELPs are very much beyond design basis, too. I mean, they have considerations and multiple -- sort of support where directions are given to the operator on what he has to put up and how -- and so there is a use

for whatever equipment you have.

DR. APOSTOLAKIS: Yes, but you're not asking for new equipment or new design.

DR. BONACA: No.

DR. APOSTOLAKIS: Yes, that's my point.

DR. BONACA: But you're asking for mitigation on whatever you got. I mean, we've been banking on this system for what it is. And so by the time --

DR. APOSTOLAKIS: Is an earthquake part of the design basis? But the stuff you're talking about is really beyond the -- earthquake right?

MR. KURITSKY: Yes, and PRAs, yes.

DR. APOSTOLAKIS: Well, not in PRAs. I mean reality. You're not going to have a large-break LOCA with an earthquake that's safe shutdown.

MR. KURITSKY: Right. Right.

DR. APOSTOLAKIS: And so that's something legitimate to worry about what's going to happen beyond the SSE?

DR. KRESS: You always worry about that.

DR. APOSTOLAKIS: Well, we should worry about it. We make it part of the regulations. I thought the whole idea of the design basis accidents was we defined an envelop beyond which we don't go.

DR. KRESS: That's exactly right.

DR. BONACA: Yes, but after TMI, we discovered that we needed some -- I think many of the things right now we have really conquered whatever we got, and I think the U.S. regulatory system has not imposed additional requirements, in other countries they have.

DR. APOSTOLAKIS: I think what Mary said makes more sense to me, that this is a cautionary. Yes. But strictly speaking if I start worrying about beyond design basis accidents, I would deny 99 percent of the industry. It's like defense-in-depth and risk-informed regulation. In the name of defense-in-depth, no. In the name of protecting me from accidents that go beyond design basis, I deny. Because I'll find some weird occurrence --

DR. KRESS: It depends on your criteria for what you mean by protection.

DR. APOSTOLAKIS: We don't have criteria how to handle these, do we?

DR. KRESS: No, that's the problem.

DR. SHACK: But if they contribute enough to CDF you certainly --

DR. KRESS: Yes, I understand, George, but CDF itself is beyond design basis. Core damage is

beyond design basis.

DR. APOSTOLAKIS: And we are not regulating on the basis of CDF. We are not.

DR. BONACA: And the program, severe accident management guidelines are based on utilizing whatever we got for events that go beyond design basis. And, so, I mean there has been a commitment of the industry to use, the OPs use it and in some cases PWRs, APGs are intertwined between design basis and none.

DR. KRESS: The whole idea, though, is to see if we can change the regulation.

DR. APOSTOLAKIS: Sure.

DR. KRESS: And in a risk-informed manner, and then you're automatically going beyond design basis whether you like it or not. You're not regulating to it, you're using it as a tool to see how to change the regulation. The regulation is always addressed beyond design basis.

The way it does it, is like you said, they generally use the frequency of the currents and the cut off for the design basis. So if you dream up a design basis accident which has a frequency of the currents less than 10^{-6} per year, you usually don't worry about it. That wasn't a strict rule. Some of

them do go beyond 10^{-6}, but for example, the design basis that includes a LOOP for the large-break LOCA.

DR. APOSTOLAKIS: I think the 10^{-6} applies to the initiator, not the sequence.

DR. KRESS: No, it's the initiator, but you know, you can forget about it at that point.

DR. APOSTOLAKIS: Not the sequence.

DR. KRESS: Well, no, I think it applies to the whole sequence when it comes to design basis.

DR. BONACA: I would agree that the statement that Mary made is the correct one, because--

DR. APOSTOLAKIS: But Alan said their view that it's not low enough. The frequency of the large-break LOCA is not low enough to forget about it, not the sequence.

DR. KRESS: Maybe not low enough.

DR. APOSTOLAKIS: Maybe.

DR. KRESS: Your assessment might not be.

DR. APOSTOLAKIS: Well, I'm just trying to understand the rules of the game. Are we really regulating -- I mean, we're attempting to regulate using risk information, are we attempting to do things in a traditional --

DR. WALLIS: That's the whole idea. It's the whole idea.

DR. KRESS: Yes, that's the whole idea.

DR. APOSTOLAKIS: Yes.

DR. BONACA: But, for example, if they go into the notice that has been used for a certain scenario beyond design basis and the probability of that scenario combined with blah, blah, blah is extremely low, then surely you would exclude the importance of the ECCS for that scenario.

DR. APOSTOLAKIS: Okay.

DR. BONACA: And you may just consider the point.

MS. DROUIN: Correct.

DR. BONACA: So you're just looking at one--

DR. APOSTOLAKIS: Again, okay, this is Option 3 risk-informed. So why then do we care about the frequency of the initiator itself? Shouldn't the frequency of sequences --

DR. WALLIS: But if the initiator is small enough, you don't care about the sequence, do you?

DR. APOSTOLAKIS: But not the other way.

DR. WALLIS: Because the sequence isn't going to be large.

DR. APOSTOLAKIS: But it can be large, large and they're small enough, and I would still not

care on the basis of other things.

DR. WALLIS: That's why you look at --

DR. KRESS: You could go that step, too.

DR. APOSTOLAKIS: Yes. But we're not going that way?

DR. KRESS: Well, I think the first step is to --

DR. WALLIS: We're doing both.

DR. KRESS: Yes, we're doing both. I think if we listen to them, they'll tell us they're doing --

MS. DROUIN: If you go back to -- I didn't bring a copy of it with us, but if you go back to our framework document --

DR. KRESS: Yes, it's in there.

MS. DROUIN: It's in there. And, I mean, I'm going to just bring it down for a second because our second bullet on the next slide says it follows the guidelines and the framework. And so if you go back to the framework to that figure that shows the quantitative guidelines, we deal with initiated frequency, we deal with the CDF.

DR. KRESS: We had three ranges of frequencies.

MS. DROUIN: That's right.

DR. KRESS: And they had to -

DR. APOSTOLAKIS: All right. I remember that.

DR. KRESS: Yes. Okay. And then they had the CDF, and then they had the LERP.

DR. APOSTOLAKIS: Okay.

MS. DROUIN: So we deal with all of those.

MR. KURITSKY: Okay. Now we're on this slide.

DR. APOSTOLAKIS: And we're done with it.

MS. DROUIN: Want me to go back to the other.

DR. KRESS: No, please don't.

MR. KURITSKY: Okay. And we mentioned in the previous discussions -- we're looking at two different types of changes to make. The first set of changes --

MS. DROUIN: In the near term. These are the near term ones.

MR. KURITSKY: The near term. Near term.

DR. APOSTOLAKIS: Within a year, or something like that? Right now?

MS. DROUIN: We're going to get to the schedule. Bear with us.

MR. KURITSKY: That's the last side, so it

keeps your attention.

In any case, we're looking at two types of changes. The first set of changes would be to the actual technical requirements of the current 50.46 and Appendix K. Again, like Mary said, we use 50.46 very loosely but it can mean that 50.46 and one or more of these accompanying regulations. And particularly terms of the acceptance criteria and the evaluation model, we'd be looking to make changes to the existing requirements.

And then a second set of changes would be part of a voluntary risk-informed alternative to 50.46 and GDE 35 and/or GDE 35, and that would deal with the reliability requirements. That goes to the assumption about the simultaneous loss of off-site power and the single failure criteria.

DR. KRESS: Can we view what's going under A as allowing utilization of what margins already exist? Cutting down on those margins?

MR. KURITSKY: Using new information to help us, you know. Going back to what you had said before about how new information -- back then there was, say, certain margins --

DR. KRESS: Yes, but regardless of what information you use, you're cutting down the margins.

Because you maybe have a better appreciation of what the margins are. You can ease up on them, because you have a better idea of what the margins are?

MR. KURITSKY: Right. Where there were margins that were applied on the past based on not knowing certain things.

DR. KRESS: Yes.

MR. KURITSKY: Now we have the knowledge, we don't need as much --

DR. KRESS: Yes, you have a better idea of what the margins are, you can ease up on them a little.

DR. WALLIS: But the result will be that the reactors are less safe?

MR. KURITSKY: No, I wouldn't say that. That's a requirement.

DR. WALLIS: If they make changes in their operating procedures or design as a result of regulations, it will be in the direction of cutting down on safety margin? It may be to establish a safety margin which was reasonable all the time, because it was too conservative before.

MR. KURITSKY: Right.

DR. WALLIS: But the effect will be to reduce safety margin.

MR. KURITSKY: Except that where margin was applied based on not understanding a certain process, and now better understanding that process tells us that we can now model that process better.

DR. WALLIS: It means that you were too conservative before?

MR. KURITSKY: Right.

DR. KRESS: That they were unsure about what the uncertainty was.

DR. WALLIS: That's right.

DR. KRESS: Now they have a better idea, they say well we were too conservative. We can use some of that.

DR. SHACK: But, again, it's not simply a matter of conservatism. You know, your steam generators -- I mean, your diesel generators may work ore reliability now for small breaks --

DR. WALLIS: Then something has changed which is better.

DR. SHACK: I think that you actually can argue that there is a safety benefit to changing this rule as well as a --

DR. WALLIS: It would help if we could do that. It really would help.

DR. BONACA: No, the question is how do

you do that. I mean --

DR. WALLIS: Now, B you start with a fresh sheet of paper?

MR. KURITSKY: Well, not really. B is the more risk-informed piece. We're actually using risk--

DR. WALLIS: B sounds very interesting.

MR. KURITSKY: B is using the risk -- A really isn't, as I think Dr. Kress pointed out, isn't really looking at risk-information. It's just kind of cleaning up what's there.

DR. WALLIS: A you can see achieving. A is something achievable. How much is doubt, but A is achievable.

B is much more iffy and much more interesting.

MR. KURITSKY: What have a schedule for this, which if you believe it is 12 months.

DR. WALLIS: You're just looking at the record then, so maybe I went too far. There is no C, which is development of a fully risk-informed --

MR. KURITSKY: No. We're just focusing in the near term.

DR. WALLIS: Okay. I understand.

DR. APOSTOLAKIS: But he's talking only about the reliability requirement.

DR. WALLIS: That's right.

MS. DROUIN: We talk about the reliability again --

MR. KURITSKY: Any rule change in 12 months.

MS. DROUIN: When we talk about reliability requirements, again we're talking about the single failure criteria and the LOCA LOOP.

DR. BONACA: Right. And I think your report already makes a convincing case that for a large-break LOCA you assume also a LOOP. It's an overkill.

MS. DROUIN: Yes.

DR. BONACA: And so, I mean, that's a pretty clear cut.

DR. APOSTOLAKIS: Now I'm confused myself. So A deals with acceptance criteria in the evaluation model?

MR. KURITSKY: Yes.

DR. APOSTOLAKIS: But if you develop a risk-informed alternative, you're not going to deal with acceptance criteria and evaluation.

DR. KRESS: Well, you might.

MR. KURITSKY: In the long term you may. right now in the short term we don't have a change

proposed dealing with the evaluation model. We had thought about some of them, but we couldn't establish their feasibility in the short term.

DR. APOSTOLAKIS: And why can't you change the reliability requirements in the short term for the current 50.46?

MR. KURITSKY: Well, we are going -- you mean, as opposed to making a risk-informed alternative?

DR. APOSTOLAKIS: Yes. I mean, you mention explicitly acceptance criteria and evaluation. Why don't you say and the reliability requirements? I mean, they're very explicitly stated on slide 5: "On site power operation and assuming a single failure," and so on. I mean these would easily change in the current rule, right?

MR. KURITSKY: Right. But we want to allow people, the licensees, to choose to keep the current requirements if they want to. If they want to do their analysis assuming a lost of off-site power, simultaneous loss of off-site power and a single worse failure, they may do so. This is going to be an alternative if they want to use either of the two methods that we're going to discuss shortly.

DR. APOSTOLAKIS: The question is in A.

MS. DROUIN: It wouldn't be mandatory.

DR. APOSTOLAKIS: Huh?

MS. DROUIN: It wouldn't be mandatory. B is not a mandatory. It's a voluntary.

DR. APOSTOLAKIS: No, but in A you're explicitly talking about acceptance criteria and evaluation. And I'm wondering why you don't also mention reliability requirements. They're very explicit. I mean, you can say don't do this anymore. You don't have to have a risk-informed alternative to do that. You can easily say as part of the current 50.46 we're changing this. No?

DR. BONACA: Well, they have to have a basis determinable to that, that's what they're trying to do now. They're trying to develop the basis for which they can tell them as part of 50.46 don't do that. Don't take --

DR. APOSTOLAKIS: Why are two of the four mentioned and not a third one?

DR. SHACK: Well, hold on, maybe they'll get to that. I'm interested, too.

DR. KRESS: The current regulation addresses reliability very, very indirectly. In fact, by using the single failure criteria --

DR. APOSTOLAKIS: Yes, and off-site power.

DR. KRESS: Right.

DR. APOSTOLAKIS: Right.

DR. KRESS: It doesn't specify what the reliability has to be.

DR. APOSTOLAKIS: No.

DR. KRESS: And if you're going to change that, I don't now what you do. You have to have a basis for saying what the actual reliability is and from erring it and determining. I mean, I don't think they ought to get into that with A. I sort of think that's something that leads to D.

DR. BONACA: A is more like, you know, they're saying for example 2100°F. Okay. It may be inappropriate to measure the real objective, which is the coolability of the core; that's what they're talking about.

DR. KRESS: Yes.

DR. BONACA: And you may show that you can have higher temperature than that and still meet those requirements. So within the models existing right now they find there are ways to meet the same objectives with less -- so that's really much more into the evaluation model and 2100, which is one of the accepted criteria.

The other one, it's more of this

reliability requirements which are really right now there isn't a solid basis for understanding why you're imposing LOOP in addition to single failure, in addition to the blended -- that's -- okay. And if you kind of develop an understanding of extremely low probability, then you can eliminate that. But you don't want to eliminate that blended break, so then you can eliminate a LOOP.

DR. WALLIS: It's interesting, but we're still trying to infer why they might have divided it into classes A and B. Maybe we should ask them why.

MS. DROUIN: Going back, A is we're going to the acceptance criteria in the evaluation model and the current 50.46. And with current knowledge we're doing some clean up work in the current rule. That's all it is. It's really that simple.

Now we get more into of what Option 3 is about and bringing risk-information and coming with our risk-informed alternative, which is supposed to be voluntary. So this would be creating a separate regulation that a licensee could choose to implement or not. It'd be like -- I mean, in 50.46 where we came up with a alternative, here's our risk-informed alternative.

DR. APOSTOLAKIS: So the second bullet

then really refers to B only?

MS. DROUIN: In B you don't need A, because you've already done it. It will be there.

DR. APOSTOLAKIS: But A will not be done following the guidelines in Option 3

MS. DROUIN: I'm sorry?

DR. APOSTOLAKIS: A will not be done following the guidelines in Option 3?

MS. DROUIN: It certainly won't contradict them.

DR. APOSTOLAKIS: It's just in there?

MS. DROUIN: As I said, it's not really risk.

DR. APOSTOLAKIS: Okay.

MS. DROUIN: It's more just clean up stuff.

DR. WALLIS: Well, are you going to look at something like 2100°?

MS. DROUIN: Yes.

DR. WALLIS: Are you going to say what risk benefit is there from that and suppose it were 2250 or 2300, what would be the additional risk? And then you're going to make choice based on risk? Is that the kind of thing you're going to do?

MR. KURITSKY: Well, I think --

MS. DROUIN: Well, we're going to get into it, so why don't we move on to the next slide.

DR. KRESS: But before you leave, are we going to talk about in this meeting about this framework document and all?

MS. DROUIN: No, we hadn't --

DR. KRESS: Could I ask one question about it?

MS. DROUIN: No.

DR. KRESS: Why? In your table of framework where you have three ranges of initiating event frequencies and then you have the conditional probabilities.

MS. DROUIN: Yes.

DR. KRESS: It wasn't quite clear to me whether those ranges of initiating event frequencies referred to just one initiator or the summation of a set of initiators.

MR. KURITSKY: The summation of the set? You mean --

DR. KRESS: So you're going to take all initiators and group them into these three sets, in some there are frequencies and that's the range you're talking about in that range of frequencies?

MS. DROUIN: Yes.

DR. KRESS: Okay. I just wanted to get clarification of that. Because it's something that bothered me when I looked at it.

MS. DROUIN: We are planning on reissuing an updated version because we did receive comments from the ACRS. We did get some public comments. And we've gone through and we're trying to clarify all this, and we hope we have a new version out in August. It doesn't change any of the technical basis or concepts, just better --

DR. KRESS: Just clarifies it?

MS. DROUIN: Better explanations of the numbers and how they're used.

The next set of slides that Alan's going to get into is going to go into detail of what we're doing in A and what we're doing in B.

MR. KURITSKY: Okay. First in A, which is the possible changes to the existing 50.46 and Appendix K. One of the first things we're looking at is replacing the current prescriptive ECCS acceptance criteria with a performance-based requirement. And the performance-based requirement would be that you would have to demonstrate adequate post-quench cladding ductility and adequate core-coolant flow area to ensure that the core remains amendable to cooling.

DR. KRESS: Well, let me ask you a question about that. The current version is based on failure to develop for zircaloy clad, I presume. And it has to do with how much oxidation you had as far as clad embrittlement and how much bowing and swelling you might have as with respect to the temperature.

Well, if you were to write a general rule that says you demonstrate the coolability, well won't whoever makes that demonstration have to go through the same -- if they're using, say, a different kind of clad, it's got to go through the same experimental program and same database? I mean, develop it all over again for their new clad?

MR. KURITSKY: In fact, that's exactly -- you see the last bullet. The whole purpose -- the main purpose of this change to these acceptance requirements is to allow uses of other cladding materials.

DR. KRESS: Yes.

MR. KURITSKY: What currently they have to do is if they want to use a different material, is they have to apply for a license exemption, okay. And what we want to do is have that changed so that the rule will be more general, you know, it would be more performance-based nonprescriptive. And in the rack

out we would specify some conditions they'd have to meet, and one of them would be what they would have to go through in order to demonstrate that adequate post-quench ductility, which would be that criteria.

DR. KRESS: Okay. So you'd spell that out in a reg guide?

MR. KURITSKY: Right. Right.

DR. KRESS: Okay.

MR. KURITSKY: And as a matter of fact was the main purpose of this change, this clean up, so to speak. So it's not limited just to zircaloy and ZIRLO.

DR. WALLIS: I like this. I think, though, that you have to think very carefully about what the performance is to be.

MS. DROUIN: Yes.

DR. WALLIS: The performance-based requirement. And amenable to cooling, I challenged last time because you can always cool some things some how eventually.

And then your thing about a core temperature and acceptably low value, well there's nothing magically about temperature. It's got to be something other than temperature. It's got to be some consequence to safety.

DR. KRESS: What the temperature does to the geometry, yes.

DR. WALLIS: To geometry or the coolability, or to eventually release of fission products. There's got to be something here about that.

MR. KURITSKY: Right now this is just taking this thing --

DR. WALLIS: You've got to think very carefully about what these performance measures are to be.

MR. KURITSKY: Right. Right. Right now we're working on it. That's taking an existing -- the five criteria that are there right now, this is the long term cooling criteria --

DR. WALLIS: But you see hydrogen release isn't covered by any of this, is it?

MR. KURITSKY: Right. And the idea being that hydrogen is not really controlling and it's going to be adequately taken care of with the 50.44.

DR. WALLIS: So they can release as much hydrogen as they like?

MR. KURITSKY: Well, no. But the control of hydrogen is going to be covered under 50.44.

DR. KRESS: Well, they have an oxidation

limit in this rule which could be converted into hydrogen, but it doesn't produce much hydrogen because what it has to do is embrittle of the clad. So that will actually control the amount of hydrogen. It'll be a lot less.

DR. WALLIS: But you know we can't produce a great deal of hydrogen.

DR. KRESS: Not with that level, no.

DR. WALLIS: Not with that level. So something else happens first.

MR. LEITCH: You overly embrittle the clad before you get much hydrogen.

DR. WALLIS: At least with the cladding we know today, right?

DR. KRESS: Yes, that's true. Good point.

DR. SHACK: But it would still be covered elsewhere.

DR. KRESS: Yes, the hydrogen part will be covered under 50.44.

MR. KURITSKY: Okay. I think the major area of change under A, which is the changes to the existing criteria or existing 50.46 is changes with regards to the evaluation -- the test evaluation model. And that's to make them use more realistic analysis.

And in the near term what we're specifically looking at would be changes to Appendix K to use more, as we mentioned before, more current, more realistic information. And specifically this could involve taking the main pieces -- what's currently for the -- the '71 ANS decayed standard using a multiplier of 1.2 to account for uncertainty. And we'd be looking to use instead something like the '94 ANS standard and then coming up with an NRC-prescribed uncertainty treatment because the '94 standard has a lot more options and perimeter and uncertainty treatments. It's a little more complicated than just applying factor, which is done for the '71 standard. So that's one of the main pieces that we're looking at under changes to Appendix K.

But we also wanted to take a look at these other few things that are on the list. There's a couple of items that we're looking. We want to look at more recent data to see whether or not they want to delete the limitation on the PWR reflood steam cooling for small reflood rates. And then also the possibility of deleting the prohibition on the return to nucleate boiling during blowdown.

And lastly, we're also looking at the

Baker-Just -- what currently is used at the Baker-Just zirconium steam model and we'd be looking at possibly using the Cathcart-Pawel zirconium steam oxidation model just for heat generation. Replacing that plan for fuel embrittlement, that would be covered on the other. And we're looking at demonstrating adequate ductility, but for the heat generation part, we would be looking at replacing Baker-Just with the Cathcart-Pawel.

So those are some of the clean up items that we're looking under at under Appendix K.

And then the important thing to note at the bottom is that as part of this update we'd also be looking at recognized nonconservatisms and model limitations that exist right now and to make sure that those are accounted for and that the safety focus is still, you know, maintained such that the impact of these nonconservatisms, recognized nonconservatisms and model limitations wouldn't -- what's that phrase-- significantly erode the conservatism remaining in the Appendix K model.

DR. KRESS: Well, when you start getting rid of only conservatisms, replacing them with more realistic best estimate type, should one start thinking about these best estimate calculations need

to be accompanied by uncertainties so we really know how close we are to limits?

MS. DROUIN: Yes.

DR. KRESS: Would that part of this change maybe then?

MS. DROUIN: You're not going to be able to do that without thinking of the uncertainties associated with them.

MR. KURITSKY: Okay. As part of these changes that we -- these proposed changes that we're considering, there'd be additional technical work that would have to be done. As Mary mentioned, right now this Phase 1 work is a feasibility study and there is additional work that would have to be done under Phase 2 in order to support rulemaking.

And the main thing that would need to be done under Phase 2 for these A changes would be work to support the removal of the unnecessary conservatisms from Appendix K, which means for each of those items that we just listed as possible changes on the previous slide, we'd have to go through and look at data or look at different calculations and sensitivity analysis and uncertainty consideration to determine what we feel comfortable -- what changes we'd feel comfortable making.

Also as part of the ECCS acceptance criteria changes we discussed a couple of slides ago, and I think we mentioned, too, we'd have to go through and identify what would be necessary for -- what guidance would be necessary for demonstrating adequate post-quench ductility.

DR. WALLIS: Again, that's a funny criterion. I mean, ductility is a means to an end, not an end in itself.

MR. KURITSKY: And this, again, not my area, but my understanding is that we're saying as long as we can hold the core in its shape --

DR. WALLIS: But how much is it allowed to distort, and what does this do to the cooling capabilities and such? It's not a simple question. It can stretch into all kinds of shapes and still be okay, but then someone has to analyze to see what the consequences are of those events and so on.

MR. KURITSKY: Right. And I think that's what the other -- I mean, that's -- the adequate post-quench ductility is one of the two pieces. The other piece was adequate core-coolant flow area.

DR. WALLIS: You're saying the same as nonreleasing fission product, isn't it?

DR. KRESS: But that's part of the post-

quench ductility.

MR. KURITSKY: That's the ultimate, right.

DR. WALLIS: Well then why don't you put that in as a criterion instead of these means to an end?

MR. KURITSKY: Well, I guess, again this is not my area of --

DR. WALLIS: But if you can't cool it, it gets hot and then eventually releases product. It is ductile, it splits and it releases fission products. The end is releasing fission products, isn't it?

MR. KURITSKY: Yes.

DR. WALLIS: So why don't you put that in as a criteria, otherwise you get into something which is too wishy-washy.

MR. KURITSKY: Well, I think -- and again this --

DR. WALLIS: It'll blow out like a great big balloon, and that doesn't make it okay.

DR. KRESS: It's because you can't -- because if you had limits on fission products --

DR. WALLIS: Yes.

DR. KRESS: -- you couldn't quantify very well, and you have to back off to the next level. Say, well let's put the limit on ductility and if we

got a certain level of ductility, we know we're not going to release fission products. So it's one of those things were you back off to where you can deal with something you can deal with. Because you're not going to be able to calculate the amount of fission products you get out a given ductility level.

DR. WALLIS: Right. But then if you can't, you get conservative about your ductility then?

DR. KRESS: You get more conservative about your ductility, yes. You back off to where you can -- to something you can deal with.

DR. WALLIS: Well, I'm just saying don't back off until you have to.

DR. KRESS: Yes, well I think it's a good premise.

DR. WALLIS: Because if you're doing something which is a much better measure of performance than --

DR. KRESS: You should always turn to high level and see where you can deal with it, yes.

DR. WALLIS: Right.

DR. BONACA: But I thought that's why you need the time, right, to develop so this criteria --

DR. WALLIS: Yes, that's why Bill Shack's right about the one year.

DR. SHACK: No, no. The one year is after they finish the technical work.

DR. KRESS: To write the rule? To change the rule? Well, they could probably do that.

MR. KURITSKY: Actually, the work for this actually is currently ongoing at Argonne National Lab. And so we'll be able to borrow off that and use it for this.

DR. KRESS: Well, that adds a couple of years to it.

MR. KURITSKY: I was told it would be done by December.

DR. APOSTOLAKIS: December 2003.

MR. KURITSKY: They may have left that part out.

MR. LEITCH: On your previous slide one of the bullets said deleting the prohibition on return to nucleate boiling during blowdown. Why can we eliminate that prohibition?

MR. KURITSKY: Well, we don't know if we can. What we're saying is --

MR. LEITCH: Well, why do you suspect you can?

MR. KURITSKY: It's just we want to look at more recent data on heat transfer during blowdown

and on minimum film boiling temperature. Actually, the expert is here.

MS. DROUIN: Norm's going to --

MR. KURITSKY: Norm is here.

MR. LAUBEN: I think that there's certainly a lot of question as to whether you really could eliminate that, because minimum film boiling temperature of the data is quite large, although you could choose a low enough one and be -- might be okay.

But this request was made by one of the industry representatives, and if they have some interesting science to provide us, we'll be willing to look at it. But the people I've talked to thus far, I would have to say there's not a lot of optimism in this particular one. That's why the word "could" is up there. But we don't want to exclude from making a case for that, that's all.

Oh, excuse me. I guess I'm supposed to say I'm Norm Lauben from the Office of Research.

MR. KURITSKY: Okay. If there are no other questions on this slide, we can go to the next one.

MS. DROUIN: Just I want to add, going back again, all we've done now is determine it's feasible. Over the next year as we do the technical

work, we'll be coming to the ACRS, I'm sure, on numerous occasions as we get into the details of this and, hopefully, during that time period, you know, a lot of these questions that you're raising are very good and, hopefully, we're start beginning having answers to them.

DR. KRESS: One with respect to this Part A, it would be interesting to know if you made these changes what would be the resulting changes that the licensees would make in the way they operate their plant or even plant hardware. And then how would one look at those changes and perhaps give it the 1.174 treatment that would say these changes are acceptable to us from a delta risk standpoint? Is that part of this A activity or is it a thinking part of it?

MS. DROUIN: I'm sorry, I didn't follow your question.

DR. KRESS: Well, if you make these changes in the regulations, Part A, then the plants are going to do something. They're going to up the power, they're going to maybe even relax some of the ACC requirements; I don't know what they're going to do, but they're going to do some things. You have a made a list of what these possible changes might be, and then looked at that list of changes and give it

the reg guide 1.174 treatment to say that list of changes would likely result in a delta risk of so much, and therefore maybe we'd better think about it again or something?

MS. DROUIN: If you go back to the earlier slide where we said we're going to follow our guidelines, our framework guidelines, which are widening.

DR. KRESS: Yes, but for A --

MS. DROUIN: Yes.

DR. KRESS: For A you're going to follow the guidelines?

MS. DROUIN: Oh, absolutely, yes.

DR. KRESS: Oh, okay.

MS. DROUIN: Yes.

DR. KRESS: And they're sort of consistent with 1.174?

MS. DROUIN: They're totally consistent with 1.174, yes.

DR. KRESS: Okay. I didn't realize you were going to the guidelines for the A part.

MR. ROSEN: Mary, as long as we're on A and B, could you go back to that slide for a minute and let me ask you a question? Slide 9, I think it is.

From a licensee's perspective -- no, I'm sorry. It's slide 8 that I want to look at. Okay.

From a licensee's perspective what you've described now seems to be we've put them in a position that once they did the changes to their modeling and processes that A would allow, they would get some improvement, some value from that which would then be the baseline for whether they would go ahead with the risk-informed alternative. In other words, they might get so much value out of A, that going ahead with the risk-informed alternative might even not be necessary or even desirable. Could you comment on that?

MS. DROUIN: I think that --

MR. KURITSKY: That possibility exists. I mean, I --

MS. DROUIN: Yes, but I don't think it's very probable. Because I think these are two very separate distinct entities when you look at the acceptance criteria and the evaluation model versus what gets imposed because of GDC 35. I mean, I think they're two separate benefits.

A licensee could certainly come along and say "You know, I've gotten these benefits from A and I don't care for anymore benefits." But I think both of them offer independent benefits.

MR. ROSEN: Okay. Thank you.

MS. DROUIN: Were we on 12.

MR. KURITSKY: I think we're on 12, yes. Okay.

The type B changes that we're considering, which are the ones that involve developing a voluntary risk-informed alternative to 50.46 and/or GDC 35 would involve -- the technical requirements that are used to ensure or that -- well, the changes that we would be recommending would include technical requirements to ensure an ECCS reliability that's commensurate with the frequency of the challenge. And that goes back to the discussion we had early on in the presentation where we would be trying to match up the ECCS reliability with the frequency of the LOCA initiators or whatever.

DR. WALLIS: Now reliability includes functionality? I mean reliability per se to me just means does the pump work or not. But, I mean, does it perform? Does the whole thing work, it's functionality. That's got to work. That's got to be there, too. It's got be functional and reliable.

MR. KURITSKY: Yes, again --

DR. WALLIS: Conceivably if you said don't worry about this size break and that size break,

people would change the size of the accumulator or the size of the pumps or something, so they couldn't handle a big break. It wouldn't even function.

MR. KURITSKY: Right. In my mind reliability means it has to be reliable to accomplish its function. So to me I see functionality being part of it. But I'm sure that, you know, people are going to have to defend wording interpreting, so that point is definitely true, I mean that has to be accounted for.

DR. KRESS: When you say commensurate with the frequency of challenge, the only reason that seems to me like it's a useable concept is because you somehow know the next step, and that's the conditional core damage frequency. So you could back off from some criteria like 10^{-4} to take conditional and then say now what is the frequency that I can live with.

MR. KURITSKY: That's exactly right. Based on the options in the framework guidelines we come up with some, say, GDF limit and then we can back off of that. Looking at different -- the frequency of different groups of initiators, whether it be a spectrum of LOCA sizes or whatever, and then come up with what should be the commensurate reliability that we're looking for.

you factor success criteria into that some way? Because, you know, they may discover they can do away with one of the trains, but success criteria has that built into it sometimes, how many trains are operational of ECCS.

MR. KURITSKY: Well, in fact, the way this will work, let me just jump to the second book, because we're looking at two different options.

MS. DROUIN: Why don't we just get right into them.

MR. KURITSKY: Okay. We're looking at two different options for how we would accomplish this ECCS system liability requirement. And the first option, and it says a deterministic system reliability requirement based on risk information. And as an example we put up there an ECCS requirement that only one train of ECCS would be required for some set of --

DR. KRESS: That is a success criteria.

MR. KURITSKY: Right, sum set of LOCAs. And that actually is what you'll be using to establish maybe a less stringent reliability requirement for initiators that are much lower frequency. And those various LOCA frequency intervals and the associated ECCS reliability requirements would be something that the NRC would be establish based on generic

information. And so once we would come out and specify what you would need. For this LOCA interval you would need to have this reliability requirement, you know, one train or two trains. Well, you need to consider loss of power, you would not.

DR. KRESS: But would you specify that in terms of some confidence level in order to factor a defense-in-depth concept in?

MR. KURITSKY: Well, certainly -- I'd certainly --

DR. KRESS: I mean you're not going to stick to means, are you?

MR. KURITSKY: The framework you definitely need to consider uncertainty. To get a mean you, obviously, have to consider uncertainty.

DR. KRESS: Yes. You have to have the uncertainty to get to mean.

MR. KURITSKY: And the framework document does talk of means. I mean, the values that are provided in the framework document are based on mean values.

DR. KRESS: See, that bothers me because you could have a given mean, large uncertainty or small uncertainty, you ought to treat the two differently.

MR. KURITSKY: Right. But that's why this is something the staff has to -- on this particular one it will not be up to the licensee to come up with that value. We'll be doing that evaluation ourselves. So if we run into a situation where you can have a very wide uncertainty that could give you a -- mean or whatever, and we are well aware of that.

DR. APOSTOLAKIS: Or they could specify an appropriate threshold.

DR. KRESS: Or a confidence level.

DR. APOSTOLAKIS: Yes. They say they're going to specify a threshold. So, the earlier comment that it's going to be based on 10^{-4} is not really valid. I mean, it's got to be the location issue. It has to be a large LOCA contribution of some kind, and they will specify that. And, presumably, they work with mean values. The value that they will choose will allow for the uncertainty also. It'll be low enough to allow for the uncertainty.

And you want it more explicit, that is what you're saying?

DR. KRESS: Yes.

DR. APOSTOLAKIS: They might give you reason why --

DR. KRESS: Because I think people would

treat it differently if --

DR. APOSTOLAKIS: They might then give you a reason why they selected this mean value and do some sensitivity studies to show what the 96 percentile does, for example. Because in these cases it's the high tail that drive the mean, really.

DR. KRESS: Yes.

DR. APOSTOLAKIS: So it's -- but I think the appropriate NRC specified threshold should address this question. That's going to be a challenge to do that.

DR. KRESS: Yes.

MR. KURITSKY: Okay. And just to jump down. So for number 1, the NRC would establish those requirements and they would be, I guess, maybe in a reg guide or whatever, but once we establish then --

DR. APOSTOLAKIS: Now, all this is with the current definition of large-break LOCA, right?

MR. KURITSKY: Well, right now we're not--

DR. APOSTOLAKIS: You're not touching that?

MR. KURITSKY: Yes. And this is not just relegated to large-break LOCA.

DR. APOSTOLAKIS: All LOCAs?

MR. KURITSKY: This would be all LOCAs.

DR. APOSTOLAKIS: Well, the interest is really in the large-break, isn't it?

MR. KURITSKY: Right, that's obviously where you would find --

DR. APOSTOLAKIS: So this is the current--

MR. KURITSKY: It's the current definition.

DR. APOSTOLAKIS: The current definition, current frequencies?

MR. KURITSKY: Yes.

Okay. And so, like I said, in the first case --

DR. APOSTOLAKIS: And now you don't expect -- I mean, you said there earlier that the issue of the frequency or the size will be visited later?

MR. KURITSKY: Yes.

DR. APOSTOLAKIS: And if you reach certain conclusions, then you don't expect these things to change much?

MR. KURITSKY: No. As you'll see when we discuss that later, that of course --

DR. APOSTOLAKIS: But it's frequency, though.

MR. KURITSKY: -- had a large synergistic beneficial impact with these.

DR. APOSTOLAKIS: Yes. Yes.

DR. WALLIS: I don't quite understand why. If you've got two trains of ECCS for LOCAs of a smaller size, you don't know what kind of LOCA you're going to get anyway, so saying you're only going to have one for a large LOCA, I don't quite know what you mean, unless you mean in a probabilistic sense, in which case you're putting in an improbable LOCA with a improbability of failure of a train, say you're going to sort of beating a dead horse, really. I mean, you're putting in a weaker requirement for a LOCA which isn't required anyway. I don't think you gain anything for that.

If you have to have two trains for some other kind of LOCA, you need the two trains.

MR. KURITSKY: Right. Like, as an example, look at accumulators. You only need them for large LOCAs. So if you could show that for large LOCAs you only need one train step, then you would only need to have one accumulator, let's say, or you know, something along those lines.

So, you're right. If it's a high pressure injection pump that's used for small LOCAs and large LOCAs and transients, just the fact that you only need one for this case but you need two or more for other

cases, you're right. It doesn't buy anything. But if there's specific equipment that is associated with us a particular subset of LOCAs or subset of initiators that you can then demonstrate --

DR. WALLIS: You might get rid of those altogether?

MR. KURITSKY: Well, what we're saying is that you would say, for instance, especially you only need to have one train for LOCAs above size X and if accumulators are only needed in your plant for LOCAs above size X, you would only need to have one train of accumulators.

DR. WALLIS: Why?

MR. KURITSKY: If you only had one accumulator, and now whether or not --

DR. WALLIS: Because one accumulator is able to handle the large LOCA and the second one's just a backup?

MR. KURITSKY: Right.

DR. WALLIS: Okay.

MR. KURITSKY: And if there's four, you need two then it means that, you know, two need two, you wouldn't need the other two.

DR. APOSTOLAKIS: How would you accommodate in this risk-informed approach or allow

for the statement you made earlier the plant equipment that is designed to the requirements of design basis LOCA also provide defense-in-depth against a spectrum of beyond design-basis accidents? It seems that this is strictly based on LOCA.

MR. KURITSKY: Well, actually, it's not here on the slide, but in the description on attachment 2 we mention that -- and it applies both to 1 and 2 here -- is that changes that are made at the plant based on these things need to consider the impact not just on LOCAs but on all initiators because ECCS, of course, is used for a wide swath of initiators, it's not just LOCAs. So, obviously, no change is going to be made without considering the risk impact and the risk significance of those changes across all initiators.

So, it can impact what you have to assume for your thermal-hydraulic ECCS performance calculations. It may -- if you can find things like an accumulator only applies to a subset of LOCAs, you can change those requirements, then you can get some benefit from that. But you need to consider the impact across all initiators.

MR. ROSEN: But it might also impact allowed outage times?

MR. KURITSKY: Well, that's what one of the benefits may be. In other words, I wouldn't say necessarily that if you had three accumulators in your plant and now this thing says you only one, you may not take get rid of one, but you could certainly have the case for a greatly relaxed allowed outage time on one accumulator.

DR. WALLIS: You wouldn't go from green to white --

MR. KURITSKY: Yes. I don't exact with that oversight program what's what, but -- okay.

So anyway, so getting back, under option 1 it's something the NRC will specify. We'll establish it and it will be specified. And so a licensee who chooses this option will go ahead, they will not require any NRC review and approval, because it would already be there, they can pick it.

And I make that point because in under option 2 what you're doing is actually allowing the plant to use plant specific LOCA frequency information and plant specific ECCS reliability information to come up with -- you know, to do the same type of thing but do it on a plant specific basis. So they'll come up with commensurate ECCS reliabilities based on the frequency of LOCAs or challenges that they have at

their plant, and that can allow them more relaxation than what would be obtained through the generic application the NRC would do.

DR. WALLIS: So people are going to be exercising these thermal-hydraulic codes a lot to look and see if they can gain anything by saying well, you know, if we didn't have this functional, then this would happen and maybe we could tolerate that, and maybe something else could happen. There's be a lot of exploring to see what would happen if you backed off on all sorts of requirements.

MR. KURITSKY: Right. But I think for the most part the way it would probably work out is you're talking about relaxation of allowed outage times. And you already know from your calculations that you need this one train or this two trains. And so anything more than that --

DR. WALLIS: But that you need a train, who is going to decide whether you need the train? Is that the calculation of the licensee or the NRC? The NRC is going to run in some codes to decide that one train's okay.

MR. KURITSKY: No. I think that the ECCS performance calculations that are already done determine how many trains you need.

DR. WALLIS: Oh, they've already been done?

MR. KURITSKY: I think everybody has to have those done.

DR. WALLIS: And they have explored all these --

MR. KURITSKY: Well, they know what the minimum -- they know the minimum number of trains that they need or the amount of equipment they need.

DR. WALLIS: Okay. So much of the technical work has already been done?

MR. KURITSKY: In that regard, yes.

DR. WALLIS: Okay.

DR. KRESS: Based on the current Appendix K?

MR. ROSEN: Or best estimate.

DR. KRESS: Best estimate.

DR. WALLIS: When you start changing some of these things, you may need to run those again, though, when you change these --

MR. KURITSKY: That's right.

MR. LAUBEN: This is Norm Lauben again.

I think in general because of the single failure requirement currently, and it's the state of the single active failure, usually it turns out that

the whole thing is designed so one train will do the trick in terms of pump ECCS. But I think in terms of accumulator outage times, there may be a dearth of information about how many accumulators you'd need under various circumstances. Because you do require some accumulators even for large small breaks or certain evaluation models show that.

DR. WALLIS: Small large breaks, too.

MR. LAUBEN: Excuse me?

DR. WALLIS: And small large breaks.

MR. LAUBEN: And small large breaks, right.

So I think there might be studies that the vendors would -- and utilities would need to do also with respect to their accumulator outage.

DR. WALLIS: And the, of course, when you've changed the decay heat curve and the decay heat multiplier and all these other things, you have to run them again and again.

MR. ROSEN: Well, where the margins would show up, would be in the margin to the peak clad temperature requirements that utilities have to keep track of all the time anyway. And with these changes, my first take on it is that they'd show up with much larger margins than they now show. Is that correct?

MR. KURITSKY: I think with the A changes, yes. That's basically would be in, you know, getting increased peak clad temperature.

MR. ROSEN: And some plants are now quite restricted --

MR. KURITSKY: Yes.

MR. ROSEN: -- by the conservatisms in the existing model requirements.

DR. WALLIS: It's going to be very interesting for the codes. Because up to now, the codes have been accepted based on the way things have always been done. When we start changing these decay heats and these zirconium steam models, and all those things, it's going to change everything, isn't it? So, there's got to be then a careful evaluation of whether the codes are now adequate for this new environment and what the uncertainties are and so.

DR. SHACK: Now, bullet 2 would let me get rid of the simultaneous LOOP and large-break?

MR. KURITSKY: You mean the second option?

DR. SHACK: Yes.

MR. KURITSKY: Yes. It's essentially the same thing, only it's more of a plant specific type of calculation. So the NRC would establish some CDF threshold and they would do their calculation

underneath that threshold.

The first one is meant to do something where we wouldn't require any reviews. We'd go through and establish it ahead of time and licensees who wanted to choose it could just go do it without having to get review and approval. One allows them to do that in order to be comfortable, we can do that across the board, we have to be more conservative. The second one allows them to be a little more plant specific if they want to sharpen their pencil and use their PRA models or do reliability analyses. And, again, that goes to -- coming with the LOCA frequencies, it goes to the issue we mentioned before where it may be some kind of updating of operational data to come up with the new LOCA frequencies, or it may involve some PFM analysis and more detailed things along the lines of large-break LOCA redefinition. So that would be something they could consider. Maybe it would take a little longer, but that's something that they could use their --

DR. WALLIS: And that would be consistent with the loss of their performance-based regulation would you just had some -- at a high level a requirement and then it has to be met somehow.

MR. ROSEN: The first one's more

prescriptive and the second one will be more performance based.

MR. ROSEN: Plants with more robust designs, like three safety trains, would particular be able to take good advantage of that second bullet.

MR. KURITSKY: And the first bullet, too, for that matter. Because they may show that maybe two of their trains can have relaxed aspects or something.

MR. ROSEN: Conversely, plants with less robust designs might not get any improvement out of this because they're bumping up against the limits now and even with the changes, they might not get more margin, much more margin?

MR. KURITSKY: And the same thing with the A changes. I know it's very plant specific. Some plants, you know, may get a lot of benefits, some may not get that much benefit depending on how close you are to bumping up to the margins right now.

DR. WALLIS: Well, 2 ought to be more acceptable to the public if you could say that these plants -- we are now assuring that these plants have a certain NRC specified CDF threshold.

MR. KURITSKY: The first one --

DR. WALLIS: That's much more direct than saying that it's got to have all these prescriptive

requirements, but we don't know what the consequences are.

MR. KURITSKY: Right. Only -- yes. Maybe as far as when the public sees it. But for us to go ahead and come up with those prescriptive requirements under 1, we're going to be using a CDF threshold as our metric, too. You're right, it's not as much in the public in that sense, but it's the same thought process, the same procedures can be used in 1.

DR. WALLIS: Well, at least it's clear what your measure of safety is. Your measure of safety now is analysis specified CDF threshold. It's not some statement that if they follow our requirements, that's adequate for the safety. I mean, this is a definite statement that you have an NRC specified threshold.

DR. SHACK: Progress, right?

DR. WALLIS: That's progress.

MR. ROSEN: Okay. And, again, going back to the fact that this is a feasibility study right now, page 1, you know we got to work on feasibility, establish the feasibility, now under Phase 2 we will continue with additional technical work to support the rulemaking. And just as under the A changes, under the B changes we have a number of items that we have

to pursue.

Specifically, as we've all been discussing, when it comes to this risk-informed alternative, we need to determine acceptable methods and assumptions for performing those LOCA CDF and system reliability analyses. And that does mean that we have to take a lot of consideration of uncertainties, because that becomes a very big part of determining how we're going to come up with threshold and what types of analyses will be acceptable for meeting those thresholds.

Again, the --

DR. APOSTOLAKIS: Excuse me. Option 3 is separate from 1.174?

MS. DROUIN: Yes.

DR. APOSTOLAKIS: So there in Option 3 you can actually increase the CDF more than what the regulatory guide says? Because I mean if you establish a threshold value that's high enough, then for a particular plant the result may be a change in CDF that's more than regulatory guideline 1.174.

MR. KURITSKY: The Option 3 doesn't specify a limit on like reg guide 1.174 is on increase. Just like you say, if there's a threshold, theoretically someone may move up more than what would

be in reg guide 1.174 theoretically. But we do, I believe, and the framework does say that any changes that would tend to increase risk would have to be limited. It's qualitative wording, but I think there is some wording in the framework that limits -- says that increased numbers have to be limited and they must still remain below the framework guideline values and also may have to be limited. But it's not as clearly specified as reg guide 1.174, which has actual quantitative limits.

MS. DROUIN: I mean, our goal is to stay consistent with reg guide 1.174. The difference is that between them is you have to remember is that reg guide 1.174 is applied on a plant specific basis. Our framework is applied on a generic basis.

Now, if because of some circumstance the numbers are going to have to differ, then there will have to be a real good basis for it. Because our goal is to stay consistent. It doesn't mean that we can't deviate, but there'd have to be a good technical basis for it.

MR. ROSEN: But, Mary, after you're done with this, 1.174 still stays in play, right?

MS. DROUIN: Absolutely.

MR. ROSEN: So then a utility could then

still make small changes to that based on 1.174?

MS. DROUIN: Absolutely. Absolutely true.

DR. WALLIS: I think you're going to have to face the question of the risk that ECCS wouldn't work based on uncertainties in the codes. Fit that somehow into your risk analysis and in a formal way as soon as you move away from conservatism.

DR. APOSTOLAKIS: It seems to me when you talk about codes here, the issue of model uncertainty would be that important, would it not, Graham?

DR. WALLIS: That's the issue, yes.

DR. APOSTOLAKIS: That's the issue.

Now, are you guys having an approach? I mean we keep hearing now for two years at least that the University of Maryland is developing something on model uncertainties. Is that done? Now you have an approach to this? How are you going to handle it.

MR. CUNNINGHAM: There's, I guess, two issues of this.

This is Mark Cunningham from the staff.

DR. APOSTOLAKIS: That's one issue.

MR. CUNNINGHAM: That's one issue, who I am, yes, sir.

And the second issue is where I'd rather be, but that's -- the University of Maryland work on

model uncertainty is being feed into the PTS work that we've talked to the Committee about on several occasions.

DR. APOSTOLAKIS: Yes.

MR. CUNNINGHAM: And how you deal with model uncertainty there. Probably some of that same thinking will go into play as we do the greater -- the next phase of the technical work for the ECCS modeling as well. So I think it's going to spell over into that.

What we've learned so far, if you will, the PTS work we'll feed into this work the next time around or over the next year or so.

DR. APOSTOLAKIS: But we haven't seen any report, have we? Have we seen anything yet?

MR. CUNNINGHAM: I think that's right, yes. It'll come in at least in the context of the PTS documentation that you see.

MR. KURITSKY: Okay. As you mentioned, there's a lot of work to be done in Phase 2 for determining the methods to use between the LOCA CDF and ECCS system reliability. We have to determine the appropriate thresholds concerning many of the things and the comments that the ACRS has just brought out, and also the items that we already have considered.

Another thing that we have to do is identify features that tend to decrease the likelihood of loss of off-site power after a LOCA and determine acceptable methods and assumptions for estimating the plant-specific probability of loss of off-site power given a LOCA. And the reason we have those two kind of separate, because the first one really kind of applies to Option 1 from the previous slide where we're going to specify some generic requirements and it may be that in order for a plant to take advantage of certain requirement where they do not have to consider loss of off-site power for a certain set of LOCAs, they have to meet features.

Like, for instance, they'd have to have the capability -- or they may have to have the capability for communication with -- you know, communication with the transmission system operator or something like that. There may be some features that plants would have to meet, and if they meet those, then they can have the relaxation on the LOOP assumption.

And the second --

DR. WALLIS: Does the LOOP always follow a LOCA and not precede it?

MR. KURITSKY: It can go either way.

Preceding the LOCA, there isn't as much -- at least to date there hasn't been shown to be as much of a tie. There's been shown more of a tie where when you have a LOCA, you have a big inrush of loads when big pumps start and so you can precipitate a LOCA.

Q So it's of common cause then?

MR. KURITSKY: Yes, right. And the other way around, you don't tend to really have that much of a --

DR. WALLIS: So the loss of off-site power doesn't set off a transient which lead to a LOCA?

MR. KURITSKY: Right. I mean, is there a possibility they could have a greater chance of popping open a valve or leaving it open or something? I mean, there is some connection-- there's some connection, but it's not as strong, nearly as strong as -- at least to date from --

DR. WALLIS: Not perhaps the broken pipe, but the stuck open valve or something might be more likely if you lost off-site power?

MR. ROSEN: Right. Right.

MR. ROSEN: But what you're talking about are all hypotheticals. I mean, we're not talking about experience of losses of off-site power causing LOCAs or LOCAs -- or LOCAs causing losses of off-site

power. You don't have much data on that.

MR. ROSEN: Yes, we don't. There's very little data.

MS. DROUIN: That's correct.

DR. APOSTOLAKIS: You don't have much data on LOCAs, period.

MR. ROSEN: That's right. I mean, we're talking about this hypothetical space and trying to think about -- what you were talking about here is trying to think about mechanisms where losses of off-site power, for example, can cause a LOCA. And you have to go pretty far to figure that -- to think about that. And there's no operating experience that shows it.

There's been lots of losses of off-site power and no LOCA's as a result of it, or very few.

MR. KURITSKY: Right.

MR. ROSEN: I mean these are not causally linked subjects in my mind. We can think about possible ways to link them causally, but in fact experience says they're not.

MR. KURITSKY: And going from LOCA -- going from LOOP to LOCA we don't have anything. Going from LOCA to LOOP we don't have -- we don't have data to show it because we don't have that many, because as

we said we don't have many LOCAs. We have some ECCS actuations.

DR. BONACA: Yes, because then it would be ECCS acutations and sequencing that --

MR. ROSEN: You have lots of scrams, right?

MR. KURITSKY: Right.

MR. ROSEN: And how many LOOPs are caused by a scram?

MR. KURITSKY: Right.

MR. ROSEN: When the plants scrams, how many times has the LOOP gone done? And the answer is very, very infrequently.

MR. KURITSKY: Right. But the issue is not from just a regular scram, but from an ECCS actuation. The drawdown on the voltage from all of the safety injection pumps coming on line. There is limited data as far as ECCS actuations, but again -- I don't say it's conjecture, but I mean --

DR. BONACA: The numbers they use here, you know, are pretty low in frequencies.

MR. KURITSKY: Right.

DR. BONACA: I mean projected frequencies. So it's not that it's very high.

MR. KURITSKY: Right.

DR. BONACA: But it justifies the thought that for certain break sizes, you know, those estimates tell you you don't overkill to assume loss of of-site power. And an interesting thing is that, of course, as you go to a smaller size break size, then LOOP seems to be less of a necessity because the loading is differently, probably you're not going to have as much demand on the electrical system as you will have in a large-break LOCA.

So, for both of them really it seems to me when I read the report, it becomes questionable whether we're using a loss of power assumption, except it's a conservative assumption.

MR. ROSEN: One of the other features of using a loss of off-site power assumption is a regulatory principle. It neglects the fact that a off-site power systems at all the different sites are different, some more robust than others.

MR. ROSEN: Yes, that's very true. And that's why we talk about in this last bullet determinable acceptable methods for us being plant specific for us being plant specific probability of loss of off-site power because it can be very plant specific.

MR. LEITCH: I thought some of the work

related to this had to do with the elimination of single failure criteria. In other words, what we're talking about here is simultaneous LOCA LOOP and be able to do this with a single failure. And I thought in some of the reading it was thought that perhaps the single failure could be eliminated.

MR. KURITSKY: Well, in this -- what we're doing with these reliability thresholds or CDF thresholds is accounting for simultaneous LOOP -- LOCA LOOP assumption and single failures, kind of all round up into one.

MR. LEITCH: Yes.

MR. KURITSKY: So if you can demonstrate that, you know, you're below some threshold and only let's say, for instance, with just one train of equipment --

MR. LEITCH: Right.

MR. KURITSKY: You know, that you're below this threshold, then you don't need to have like a second train. So in other words, you don't have to have to have that single failure criteria, you don't have to have that extra redundancy built in. So it's addressing that single failure criterion through reliability framework.

MR. LEITCH: Liability, yes. Okay.

MR. ROSEN: And that's perfectly appropriate, because the single failure criterion was a surrogate for a real reliability framework when we weren't able to put one together and analyze it because we didn't have the PRAs and because we didn't have the data to support the reliability analysis that we now have based on real experience at operating plants.

DR. KRESS: And this is where I keep harping on uncertainties. You've got two trains that have a mean reliability of this level for that, and then you are going to replace it with one train that has reliability down here. Then you have to worry more about the uncertainties in this train down here because as the reliability gets lower and the uncertainties does get bigger. So you can't just swap out means.

MS. DROUIN: I mean, one of the biggest challenges, you know, over the next year we're going to be faced with is how to deal with the uncertainties.

DR. APOSTOLAKIS: Absolutely.

MS. DROUIN: And how to incorporate that in, without a doubt.

DR. KRESS: And I know I keep harping on

that, and you keep giving me the same answer. So, I appreciate it.

MS. DROUIN: I may not have the answer to you today, but we don't. We have lots of ideas, but--

DR. WALLIS: Well, I think it would be good to try to implement some of those ideas in a preliminary way to see if they work.

MS. DROUIN: Yes.

MR. KURITSKY: That's kind of what Phase 2 does.

DR. WALLIS: Rather than sort of promising to do it. I mean, I think you need to start trying some of them out and seeing if they work or not, since not too much of this is work to be done, but some of it gets done and then you can say "Yes, we know. We know we can do that."

MR. KURITSKY: And that's exactly what the Phase 2 work is going to do.

DR. WALLIS: I was looking at this slide here. I was wondering if eventually we're going to see, or you're going to have to develop a work scope for all this stuff.

MR. KURITSKY: Yes.

MS. DROUIN: Yes.

DR. WALLIS: It'll be interesting to see

how comprehensive and long it is.

MR. KURITSKY: We have a little bit in attachment 2, the paper, there's a little more detail on it.

MS. DROUIN: But that's still a high level document.

MR. KURITSKY: Yes, it's still high level.

MS. DROUIN: No, you're right. We're going to have to sit down and work out all the things that are going to be needed to be done. And once we get the go ahead, yes. Okay.

DR. WALLIS: Consequently it becomes a real thing and not a dream.

MS. DROUIN: That's right.

Now the long term changes. You heard about the short term and now we will get into the long term.

MR. KURITSKY: Right. Based on our feasibility study we also feel that additional changes to 50.46 may also have merit, particularly possibly in the definition of the spectrum of breaks and locations.

The extent of potential change to 50.46 --

DR. KRESS: What do you mean by definition?

MR. KURITSKY: The specificity of the

size.

DR. KRESS: The speculation, rather.

MR. KURITSKY: The spectrum, specified rate spectrum.

The extent of potential change to 50.46 is dependent on our state of knowledge regarding the LOCA frequencies for different break sizes. And as an example, you know, if we could confidently demonstrate that a set of LOCAs has a collective mean frequency, again that means, of course, we take into account uncertainties, but --

DR. KRESS: But you're adding them up? That's what collective means.

MR. KURITSKY: Right, collectively means, right. In other words, all breaks above 16 inches.

DR. KRESS: Well, let me ask you a question about that. I would have thought that the conditional core damage frequency would be a function of the LOCA frequency, they're not independent.

For example, small-breaks have higher frequency and small-breaks have a different conditional core damage frequency. Therefore, there's a link between CDF and frequency, but the numbers you have, 10^{-4}, 10^{-5}, 10^{-6}, seems to me to assume a constant conditional core damage frequency.

DR. WALLIS: This is just initiation frequency shown here.

DR. KRESS: Yes, but in order to arrive at those numbers, you've assumed the constant core damage, conditional core damage frequency, I think. And it seemed to me like a little bit a issue that you ought to think about.

MR. KURITSKY: Right. Well, I think -- the way something like this would work, and this is just an example to illustrate how we would --

DR. KRESS: Yes.

MR. KURITSKY: If we had such data, what we could work with. If, for instance, we could that a set of LOCAs had a collective frequency of 10^{-4}, you know, lower than 10^{-4}, then we may say that some regulatory relief is appropriate. It may be reducing it to one train of ECCS. Now, regardless of whether that's a small or large-break, what we're saying is if you had one train, you're going to get, let's say, another 10^{-2}, but your 10^{-4}, so that may be sufficient.

DR. KRESS: Yes. I would prefer it, I think, more high level specification. Say, if a set of frequencies can be determined such that the convoluted frequency and the conditional core damage

frequency is less than 1/10th of the core damage frequency, then you could do some of these things.

Let's ignore high level. You know, you may be able to plant specifically back it off to some numbers like this, but I think for that particular one I would look for more of that kind of statement.

DR. BONACA: Yes. He had already give you some kind of blanket credit to your ECCS system.

DR. KRESS: Yes. Right.

DR. WALLIS: Yes, sort of in the low requirement.

DR. KRESS: Yes. Yes.

DR. WALLIS: And so --

DR. KRESS: This is too -- I'm looking for more of a performance one rather than a prescriptive one idea.

DR. WALLIS: But 10^{-6} you might go for anyway no matter what the conditional core damage frequency.

DR. KRESS: Yes, 10^{-6}. You might get the one level like that or you just forget it.

DR. BONACA: Well, then I think the implication there is that, you know -- I mean, even if you just give 10^{-1} as credit for the ECCS system, you would -- your sequence would be successful enough. I

mean, a likelihood, I mean it's so low, I guess. But that makes it more clear, you're right.

MR. ROSEN: Yes. The point is we've already done that. The NRC has already done that for vessels. The vessel failure is so low we don't consider it.

DR. WALLIS: Or our estimate with current knowledge is so low, yes.

DR. BONACA: On the other hand, I mean if you take that last case, 10^{-6}, I assume that these would be double and can break. And you're saying that -- if -- in the case there will be no credit or very little credit given for the ECCS effectiveness because if you step down the capability, not to be designed to meet this kind of criteria for the LOCA, then you're really hanging your hat on 10^{-6} for reactor here, right? Assume that you said I don't need an ECCS system for a large-break LOCA because the frequency of that is so low, so therefore I step down --

DR. KRESS: Therefore it doesn't contribute to CDF anyway?

DR. BONACA: That's right.

DR. KRESS: Because it's more than a certain percent to --

DR. BONACA: So for that particular case

you're taking no credit for the ECCS system at all. You're saying 10^{-6} is good enough and then live with that.

MR. KURITSKY: Don't need it.

DR. BONACA: That's right.

DR. WALLIS: This is long term work anyway, isn't it?

MR. KURITSKY: Yes. Yes.

DR. WALLIS: So I think you understand what we're saying how can it do it tomorrow.

MR. KURITSKY: Yes.

DR. BONACA: In other words, how can you get that kind of constant.

MR. KURITSKY: Assuming we have a schedule, that's longer term.

DR. KRESS: Yes, but my problem is how are you going to demonstrate these set of LOCAs, how they collective mean frequency? That seems like a pretty tough problem.

MR. KURITSKY: That is --

DR. KRESS: I guess we'll leave that to Bill Shack.

DR. BONACA: And to Peter.

DR. SHACK: Without Mayfield here to argue this out, I mean you know we calculate these things

all the time for leak before break, for pipe wipe restraints, we deal with environmental fatigue by calculating things. And now all of a sudden it's --

DR. BONACA: Too hard.

DR. SHACK: -- too hard to do, you know.

I think to my mind somehow I just sort of get the feeling that we're making this more difficult than it has to be. You know, I look through some of this work and, you know, you're not trying to calculate the leak rate through every crack and every pipe. You're trying to sort of block off the feasibility of a very large pipe break, a double under guillotine pipe break. And we've done an awful lot of leak before break and pipe probabilistic fracture mechanics. You know, we've studied in connection with PTS initial flaw sizes.

I get a little worried, you know, you're going to get bogged down on your short term, which will turn out to be longer term than you think it is and more difficult than you think it is and the pay off there is really a whole lot less than it is here. And to just go for it and concentrate the resources on the thing that has the pay off.

DR. BONACA: Yes, I totally agree with that that there's a great pay off. To some degree

it's a little bit like, you know, a little bit different but like, say, okay we're going to remove a container. What I'm trying to say is that ECCS when it comes down to makeup water and so, you know, everything you think about --

DR. SHACK: Not a safer cow, right?

DR. BONACA: And you want to have water. And to step it back, it's a little bit of a holy grail.

DR. SHACK: Well, yes. And I suppose it comes down to how feasible you really think the first set of changes are. You know, if they could be implemented quickly.

DR. WALLIS: Speaking of pay off, the pay off is mostly to industry, isn't it, rather than to NRC. So then maybe industry should be the ones to demonstrate all these things with an optimism that they can succeed.

DR. SHACK: Well, I think industry is sort of they think they can do this. The NRC has to do enough work to be able to judge what the industry does.

DR. BONACA: That's right. No, they don't have to lead the way. They only have to sort of drag industry into it by showing it can be done.

DR. SHACK: Right. But they certainly have their own set of work to do in order to be able to evaluate and to assess what industry proposes.

MR. ROSEN: Let me give the other side of the argument, Bill, to your statement about jumping to Part B forgetting about Part A.

I think what you need to do is demonstrate some early success. And so that's what Part A is for.

DR. SHACK: Yes, we've been picking low hanging fruit here for the 8 years I've been on the ACRS.

DR. KRESS: The higher up the tree, the sweeter grows the lemon, right?

DR. BONACA: Out of a lot of low hanging fruit?

DR. SHACK: Yes, a lot of low hanging fruit.

DR. WALLIS: When I pick the apples, I usually forget the low hanging ones because they're not worth eating. You go for the ones that are really good at the top, right.

DR. KRESS: The ones at the top are better, yes.

DR. BONACA: Still there is the holy grail thing. I mean, once you say that I don't have to

design any more of my system. Because somewhere you're going to capture the benefit of that for a double ended break. You're making a trust issue. I mean, and the consequences in case you could have a low ended double ended break and not a capability to deal with it, would be very significant. It would be so -- I mean there is a -- you know, there is a real issue of public acceptance in stepping back on that kind of commitment. It has to be really looked hard and tough, and you have to have a very high confidence in the fact that you won't have that break.

Again, we depend on our colleagues with the metallurgical background to give us that confidence.

DR. KRESS: Well, I think you can have probably a large confidence on a break -- the largest pack with the double ended guillotine. My problem is you're going to back off to something else.

DR. BONACA: Absolutely.

DR. KRESS: And somewhere down there you don't have that confidence, and I don't know where that level is.

DR. SHACK: I see what you mean, yes. Yes, and you know I think getting to industry 6 inch break might be difficult, but I think you could

certainly back off from the double ended guillotine break of the largest pipe down quite a ways with a reasonable degree of confidence.

MR. ROSEN: And certainly back off from a double ended guillotine break at the same time that you get a LOOP and take a single failure rate.

DR. SHACK: That's easy.

MR. KURITSKY: But I mean they're going to deal with that one, absolutely, because that's in the sort term. And there you can do very conservative estimates of those large break frequencies and still get a lot of benefit.

MS. DROUIN: I believe so. Shall we go to the --

MR. KURITSKY: Okay. Just to -- off this conversation that we were just having, the staff is going to continue to meet with industry, representatives of the industry in public meetings to discuss the set of issues to resolve or a set of issues that would be necessary to be able to come up or satisfy the NRC they could come up with pipe frequencies for different sizes.

Like was mentioned, yes, we know that the double ended guillotine break of the largest pipe is a low frequency event and we shouldn't not to drive

for it, but you can't take that away until you set what's the limit you're going to stick with. And that one, it takes a little more work, and that's the one that both the staff and industry I think are going to have to pursue.

As I think Dr. Shack may have mentioned that industry will have to go ahead and do a lot of work, but the NRC has to do enough work to satisfy ourselves that what they're doing is reasonable and it's possible.

DR. WALLIS: Do you resolve anything in a public meeting?

MR. KURITSKY: Excuse me?

DR. WALLIS: Do you resolve anything in a public meeting?

MR. KURITSKY: Well, the --

DR. WALLIS: You bring up subjects and you state what your positions are, but I think you resolve things in a different way than in a public meeting.

MS. DROUIN: This is not meant to say we're going to resolve these in public meetings.

DR. WALLIS: That's what it says. We'll meet "to address and resolve the technical issues" in public meetings.

MR. KURITSKY: Right. Yes, that may be in

this thing. But also the fact what this is is it's going to be, hopefully, a working level meeting. It's going to involve -- the next one we have planned that we're trying to set up right now, in fact, is going to involve, hopefully --

DR. WALLIS: It may spell out what has to be done to resolve the issue?

MR. KURITSKY: Right. Right. And it's going to, hopefully, get the experts from industry and NRC in this field to really hammer out what needs to be done.

DR. WALLIS: Right.

MR. KURITSKY: And some of the example issues are listed right here, the initial flaw distributions, crack propagation, material response and metallurgical properties, that kind of stuff. And, of course, uncertainly analysis are things that have to be dealt with.

And if this large-break LOCA redefinition is found feasible, then the staff would recommend additional changes to 50.46 including possibly wording changes to Part 50 to reestablish what the limiting break size is --

DR. WALLIS: Are there no thermal-hydraulic issues that are for example in the second

bullet? It's all materials problems?

MR. KURITSKY: No, they're not only material problems. But this -- at least the means that we've talking issue set up is to address the materials, metallurgical ones. It's not to say that the other issues don't also have to be addressed, but the first stepping stone that we're trying to get a handle on is the materials.

MR. LEITCH: It seems to me that there's a number of issues where double ended guillotine breaks are as a bounding thing for all sorts of things. I mean, just all kinds of analysis and so forth have been done. I'm not sure that I can come up with any real specific --

DR. BONACA: The containment ropes.

MR. LEITCH: We read on our reading for tomorrow's meeting about the CRDM failure. Well, it doesn't matter because it's bounded by doubled end guillotine break.

Is there a way to -- I mean, it seemed to me you'd have to go back and replow those fields every place where that was used as a --

MR. KURITSKY: Surrogate.

MR. LEITCH: -- surrogate for some other event or issue that is, perhaps, even totally

unrelated to it but it turned to be a bounding situation. I mean, that seemed to me would be a major piece of work to go back and try to assure ourself that we hadn't missed anything along the way.

MR. KURITSKY: That point's well taken, it is something we have to do. I think in the big attachment, attachment 1, we have somewhere in there a list, a table of a whole bunch of LOCA initiators that we feel -- you know, the large-break LOCA may bound or be a surrogate for. You have to go through them one by one to assure ourselves that either because of the frequency of these other events or the consequence of them that we're still bounding and that we feel as important, and that's a very important piece.

MR. ROSEN: I think that addresses Dr. Wallis' point earlier. When we do that, pay some real particular attention to what pops up when we take the double ended guillotine break away, that we may find the things that are really important that have fairly significant consequences and relatively higher frequencies and be able to address those as a regulatory and the industry. And so that seems to me to begins to get to the question of how do we -- what are the --

MR. LEITCH: What is in it for NRC?

MR. ROSEN: What are the regulatory benefits of this? And the answer is a sharpened focus on the accidents and the consequences that are more likely to happen in a double ended guillotine break.

DR. KRESS: And maybe deal with them in a better way than just a double ended surrogate or something else.

MR. ROSEN: Exactly.

DR. WALLIS: So it's better defense of public safety because the folks doing the right things.

MR. ROSEN: That's exactly right.

DR. WALLIS: So there's actually a positive side. It's not just backing off on a conservative requirements. We're actually doing a better job of preserving public safety. If you can make that case, I think you've got a very good one.

DR. APOSTOLAKIS: Well, I think that's the general theme of initially reforming the regulations. We're focusing on what's appropriate --

DR. WALLIS: But it's always sort of at a philosophical level. If you can show you've actually done it, you have improved safety because of being risk-informed, then you become much more credible.

It's not just a promise that it ought to happen.

DR. APOSTOLAKIS: You are opening up a whole new subject now. That's what we've been doing for the last 20 years; adding things.

DR. SHACK: Right.

DR. WALLIS: Mr. Chairman, is this the presentation or is there another one? I notice there's a break. Is there another presentation after the break or is this one?

DR. SHACK: Are we going to have a discussion of the attachment 2, the technical work?

MS. DROUIN: That's what we've been going through.

DR. WALLIS: Yes, and so there's no second presentation?

DR. APOSTOLAKIS: So what's going on now? Where are we?

MS. DROUIN: We only have three more viewgraphs to our presentation. We're almost done.

DR. SHACK: Then we can break and come back and we have some -- I assume you'll have something to say.

DR. WALLIS: We might just have some comments. This is the first time we're hearing it.

DR. APOSTOLAKIS: Never stopped you

before.

DR. SHACK: Okay. Why don't we finish your presentation and then we'll take a break. You'll have 15 minutes to think about it.

MS. DROUIN: Before we move on to the other Option 3 activities, just to wrap up on this long term one, different than the short term. And the short term, again, we want to move forward immediately with the technical work because we feel it's feasible. Here we're trying to establish the feasibility. But once we feel that it's feasible, then we would go in and, as it shows here, potentially go through a rulemaking to change the wording to allow a licensee to come in and offer up a different pipe size break over the large double ended guillotine.

DR. APOSTOLAKIS: That's just for Appendix K?

MS. DROUIN: Yes.

DR. APOSTOLAKIS: Because if you're going to be risk-informed, you really ought to look at all possible break sizes and evaluate the risk.

MR. KURITSKY: But let me just say, just for the break size change would be -- Appendix K are for all of them.

MS. DROUIN: Well, it goes with the 50.46

and Appendix K.

MR. KURITSKY: Right, 50.46 and Appendix K.

MS. DROUIN: Okay. I'll just quickly try and go through the next two slides just to give you a brief idea of where we are on the other Option 3 activities.

We talked about the single failure criterion. The option that we're going forward in the short term on the single failure only relates to ECCS. But if you go into Appendix A, the single failure is broader than ECCS. You'll see there I have listed on the third bullet there's GDC 17, 34, 38 -- I can't remember which all of these are. I know one of them is containment heat removal, one's electric power --

MR. KURITSKY: Electric power, residual heat removal, cooling systems.

MS. DROUIN: But the single failure applies beyond ECCS, so one of the things that we were planning hopefully to continue doing is looking at a generic change to the single failure criterion that would apply across the board and not just to ECCS.

DR. BONACA: Outside the LOCA analysis? I mean --

MS. DROUIN: Correct.

DR. BONACA: -- for every accident that is written there.

DR. APOSTOLAKIS: I think that's a big change, is it not?

MR. KURITSKY: Yes, that is a big change. That would be a big change.

DR. APOSTOLAKIS: A huge change.

DR. BONACA: But wouldn't you use then PRA to identify the most likely failure that you should design for? I mean, wouldn't you exchange it for a criteria on that is based on PRA insights?

MS. DROUIN: We would still bring risk information into the formulation of it.

DR. BONACA: Yes, because I know the single thing about a single failure already you have to take the most penalizing single failure that you can find, so you have to do it -- irrespective of high likely is the failure. It may be impossible to have it, but you have to assume it. Not that far, but close.

MS. DROUIN: Not again, this would be --

DR. BONACA: But still you would have --

MS. DROUIN: -- to establish the feasibility of doing this. We had not gone beyond just thinking -- we do it's feasible to do it for

ECCS. Now we want to look at a whole global generic change to see if that's feasible. And so that would be the next --

MR. ROSEN: And here again, Graham's already said it, but this question of desirability comes back onto the table. Would you really want to do it for all of the application of single failure criterion across the whole plant safety systems? You've got to think about the desirability as well.

MS. DROUIN: That's part of the feasibility. Absolutely.

DR. KRESS: The problem I see you're going to have is whether or not you can make this go away with this single failure criteria, you'll have to ask yourself if we did away with it for these GDCs that are listed up there, what changes will take place in the way the plant's operating or the way it's built and then what effect will those changes have on risk in a generic basis? That's the kind of questions you're going to have to ask.

MR. ROSEN: Yes.

DR. KRESS: And I think that's a tough job.

MS. DROUIN: Absolutely.

DR. KRESS: Especially the first part;

what changes are going to result.

MS. DROUIN: But it's not doing away with it, it would be replacing it.

DR. KRESS: With the reliability statement.

MS. DROUIN: Yes.

MR. ROSEN: Yes, but which is in effect a multiple failure criteria. But the failures will be at the probabilities or the reliabilities encountered at the plant, which is much more realistic. Yes.

DR. WALLIS: But you'd replaced it with a performance based criterion, wouldn't you?

DR. BONACA: Remember, however, there is another --

MS. DROUIN: Perhaps.

DR. BONACA: All the analysis that you have with single failures, particularly what you have on analysis on a single failure, your reality behind that you have tons of analysis assuming the worst single -- well, until you find the single failure. And those analysis had also as significant deterministic design value in that you understood the behavior of the plant; if you assumed this failure versus this failure, versus failure and then finally you found the bounding one, you put in the ECCS, or behind that you

have all the design basis of the plant.

So, this is a significant change. I mean, clearly it would go in the direction of being more risk-informed. You would identify a combination of probable and combination of consequences, etcetera, but you have to think about what you're going to lose, and maybe you don't lose anything. You have to perform -- you know, but it's a complex change.

DR. APOSTOLAKIS: I just don't know how you can attack just a single failure criteria in isolation. That is part of a bigger --

DR. BONACA: It's a big -- a big change.

DR. APOSTOLAKIS: That's fine. You can go ahead and we'll see what comes out of it. Because I don't -- I mean, a first reaction is that you can't just do it to the single failure criterion. You are really talking about risk-informing the whole thing. So you have to look at the -- you have to look at a lot of things.

DR. BONACA: Very ambitious. Yes, it's a very big change.

MS. DROUIN: The other thing is that, you know, we have started to look at the special treatment requirement under Option 3. Now, under both of these looking at the single failure criterion and the

broader aspect, the special treatment requirements, both of these have right now been deferred because right now over the next couple of years we're going to focus our resources in supporting 50.44 and 50.46.

DR. APOSTOLAKIS: Oh so -- oh. So that, what is it, Appendix D, was it?

MS. DROUIN: Yes.

DR. APOSTOLAKIS: 50.69?

MR. CUNNINGHAM: No, that's not being deferred. That's the Option 2 or --

MS. DROUIN: Option 3 aspect.

DR. APOSTOLAKIS: I don't know what the difference is.

MR. CUNNINGHAM: The work that Mary is talking about would be a step beyond what's in Option 2 today. It would be to change the -- Option 2 looks at what's the scope of equipment that has to be subject to --

DR. APOSTOLAKIS: Right.

MR. CUNNINGHAM: -- EQ and that sort of thing. This would be what should the EQ be that would go with it. What would be the environmental qualification standards and that sort of thing. So it's revisiting that aspect of it, not the scope.

DR. APOSTOLAKIS: And that's it?

MS. DROUIN: Okay. Schedule.

So in terms of the schedule those two things have been deferred because we're going to focus our resources into supporting. You know, right now we're doing the technical work to support 50.44. We're starting on the technical work to support 50.46 and completing the feasibility on the definition.

So in looking at the change which is was our A -- I think it was our A. Now I'm getting all this confused. But where we're going to go in and modify the existing regulation.

In developing the proposed rule, the schedule that we have tentatively set is 12 months from the date of the SRM or two months after the completion of the technical work. And that's the development of the proposed rule.

DR. APOSTOLAKIS: Is that a magic number or did someone look at all the things you have to do and the people available and figure out how long it would take to do the job?

MS. DROUIN: Yes.

DR. APOSTOLAKIS: Someone didn't just say let's do it in a year. What's the magic about July 2, 2002 since everything is --

DR. WALLIS: No. By saying they can do

the job in 12 months, it looks like somebody's guess, you know.

MS. DROUIN: We are continuing to do the technical work. We are not waiting on the -- it was -- we are not waiting on the SRM to start our technical work. We're going to continue to do the technical work.

We feel that in terms of the changes to the acceptance criteria and the evaluation model we can have that work done by July 2002.

DR. KRESS: Twelve months is a lot more believable to me than 13.62 months. Because 12 months is one of those round numbers --

DR. WALLIS: What's the uncertainty on the 12 months.

DR. KRESS: You can do it one year rather than --

DR. APOSTOLAKIS: What's the risk of not completing the job? You don't like the 12 months?

DR. SHACK: No, I don't mind 12 months. It's just, you know, trying to think of other rule changes that we've done in 12 months.

DR. APOSTOLAKIS: And you fail.

DR. WALLIS: By the time you have public meetings and responses to comments and all that kind

of stuff --

DR. SHACK: And you have to come to the ACRS and which we talk about -- and that'll last for--

MS. DROUIN: No, no. This is development of proposed rule.

DR. BONACA: They don't say complete. Yes, they don't say complete.

DR. WALLIS: So you would be ready for public comment by then?

DR. BONACA: Development.

DR. WALLIS: Right.

MS. DROUIN: The development. A significant subtly there.

DR. WALLIS: Well, we should cheer and say "go for it," isn't that what we should do?

MS. DROUIN: Absolutely.

DR. WALLIS: Okay.

DR. BONACA: You agree we should cheer and tell you "go for it?"

DR. SHACK: Short letter.

MS. DROUIN: In terms of the development of the voluntary risk-informed alternative, and that's where we're coming in and changing -- it's really changing GDC 35, that's going in and attacking the single failure criterion as it applies to ECCS, it was

those two options. The generic and more plant specific one.

Again, we're going to continue, we aren't going to stop our technical work. We're going to continue on that and we feel that can be done by April 2002. And the development of the proposed, again, 12 months from the SRM or two months after the completion of the technical work.

DR. BONACA: Yes, that second bullet seems to be pretty optimistic to me. Because that change in the GDC 35 is a very -- not GDC 35, all the other places where you have single failure criteria --

MS. DROUIN: No, no, no. Only for GDC 35.

DR. BONACA: I understand. Okay.

MS. DROUIN: This does not include the others. Just for GDC 35.

And, again, we aren't going to stop, we're going to continue with the feasibility in looking at the redefinition of the large-break LOCA and the completing of the feasibility. There's a lot of complexities and we feel that could go up to three years to complete feasibility.

DR. APOSTOLAKIS: Now I thought we said at one point that maybe being a risk-informed regulatory system you will not need GDCs. Didn't we say that

once? GDCs are remanents of the old system, so that a possibility that you don't need at all a GDC.

MR. KURITSKY: So those would be interim changes.

DR. APOSTOLAKIS: Huh?

MR. KURITSKY: These will be interim changes.

MS. DROUIN: You know, when you look at this what form it takes, your alternative risk-informed regulation, whether you characterize it as a GDC or as a -- I mean --

DR. APOSTOLAKIS: Or something else?

MS. DROUIN: It's premature to say. But you are not getting rid of the current GDCs that are on the books. Those are there.

DR. APOSTOLAKIS: Yes. They are, yes.

MS. DROUIN: Now, whether you have a risk-informed alternative to it or you characterize it some other way, those are decisions to be made.

MR. KURITSKY: And just for this specific point, the changes to the reliability requirements, even though the GDC 35 is where they're specified, depending on how we ultimately decide it should be applied, it may actually be a change in 50.46 that tells you whether or not you have to meet the

requirements in GDC 35. So that way whether or not the actual wording change occurs in GDC 35 or in 50.46, we haven't decided that yet.

DR. WALLIS: I don't know if we're going to cheer or not, but it seems to me you're much more positive and optimistic about the chances of success than you were last time we met. Maybe that's because you've had the time to figure out what you need to do to do the job. And it turns out that it looks feasible.

MS. DROUIN: Well, I'd say that's true, yes. You know, whether we come up against something that throws off track, but know at this point we've given it a lot more thought, we've done more work and we do feel for these first two bullets that that's feasible.

DR. WALLIS: And you're going to have enough support from management to get this done?

MS. DROUIN: Mark?

MR. CUNNINGHAM: Well, of course. Mary said something a little bit ago that plays into this. In the context of Option 3 the focus over the next couple of years is going to be changes to 50.44 and 50.46. That was to make sure that the resources we've got available here are focused where we want them to

be. And, you know, these other things could devote resources away. So from that standpoint that commitment is there.

From a budgetary standpoint the commitment is there, too. We've got money today where we can start each of these three efforts in parallel. And as we've got money in the fiscal '02 and '03 budget to support these, so we've anticipated that in our budget preparations and we think it's there.

DR. WALLIS: Now this is an RES activity?

MR. CUNNINGHAM: No, it's a staff activity. The technical work that you would talk about here, perform the technical work, that will be done principally in RES. The rulemaking will be done in NRR.

DR. WALLIS: Yes. Is there a good tie in with the people who are actually going to use this product in the regulatory world?

MR. CUNNINGHAM: Yes. Yes. They're the ones that are going to be writing the rule itself and the reg guides and that sort of thing.

DR. WALLIS: Are we going to hear from them, too?

MR. CUNNINGHAM: You will hear from them, you know, at some point we'll talk about when the next

meeting on this subject would be.

DR. WALLIS: Good to hear on that, too, to know that they're fully behind you and they really appreciate the product.

MR. ROSEN: It's not going to change what they want --

MR. CUNNINGHAM: So it's just in the next -- in Phase 2 Research will be behind it and all are supporting them. It becomes their lead to do it.

And, yes, I expect that sometime in a few months from now the committee would want to hear from the staff again in terms of now -- given -- presumably this paper goes forward, now what's happening.

MR. ROSEN: Is the risk-informed licensing panel in this process?

MS. DROUIN: Yes.

MR. CUNNINGHAM: Yes. They basically concurred in these recommendations.

Just to be clear, some people understand how it works. This is -- Mary and Alan said, this paper is with EDO. NRR has concurred in this as well as Research. So this is not just Research's opinion on this. NRR has concurred in the paper.

DR. WALLIS: Well, looking at this from a personal perspective at what might have been achieved

by the time I leave the ACRS, if I can go back to talk to my friend and they say "Well, what have you been doing in Washington that made any sense that actually achieved something." I can say "Well, those guys managed to risk-inform 50.46."

MR. CUNNINGHAM: 50.46, yes.

DR. WALLIS: And maybe we had something to do with it. That would be something that I'd like to be able to say.

MR. CUNNINGHAM: Okay. I think we'd like you to be able to say it, too.

MS. DROUIN: Any other questions?

DR. SHACK: No more questions?

I think maybe it's time for a break and we can come back at 4:00 or a few minutes after and hear from NEI.

(Whereupon, at 3:44 p.m. off the record until 4:05 p.m.)

DR. SHACK: Well, now that Adrian's had 15 minutes to think about, I think we can get his comments.

DR. APOSTOLAKIS: Maybe you can start by telling us what's new in what you heard that we didn't know before. I mean, I -- we -- I didn't know, at least.

MR. HEYMER: Good afternoon. My name is Adrian Heymer. I'm a project manager with NEI on risk-informed regulation.

I have with me today Bob Osterieder from Westinghouse Group and Terry Reick from the BWR Group, Terry Reick's from Exelon in their Chicago offices. And Bob's a project manager for Westinghouse looking after risk-informed activities for the Westinghouse Owners Group.

We are just going to give you some initial feedback on what we heard. What was new, I think, was someone's suggestion, and it was mentioned earlier about climbing apple trees and picking the fruit. And as we've told you before, we really think there is significant benefit in taking a look at redefining the large-break LOCA.

We recognize there is a significant amount of work to be done, and we're willing to work with the NRC staff in trying to develop some of that work and being that work to the staff. And so, we're looking forward to working with them. We've been trying to arrange some dates where we can start sitting down and get a better understanding of what we would have to develop or the level to which material that we would to develop. And we can move forward with that.

We did find a little confusing in some of the material, and I think that was clarified briefly in a discussion. But if you're going to impose new requirements, I think you got to be careful about how you word such requirements. Because in some cases not everybody might want to pick up on those new requirements. I'm talking about the A(1) I think it was of the slide. Some people might like to stick with the criteria that have already been established and not make any changes.

As regards the A(1) I think it's clear that we can move forward. There is an existing standard on the books from 1994 on decayed heat and we think we can move forward with a rulemaking very expeditiously in that area.

There are some other things that are linked into that part associated with ECCS acceptance criteria. And that's where, I know it's been mentioned before, but we were a little surprised that that should be blended together along with the same time frame as the ECCS rulemaking.

Terry, did you want to comment?

MR. REICK: Yes, on the Option A I had a couple of questions that came up when I listened to the presentation.

Decay heat clearly is something that BWR Owners Group has looked at and thought that we should move forward with.

The one thing that bothered me was one of the bullets talked about NRC's prescribed uncertainty treatment. And our understanding is we talked about in our committee was that the multiplier of 1.2 as stated in the ECCS criteria 50.46 talks about it as an uncertainty value. I know we had some discussion on uncertainty versus margin in here. It's an uncertainty value because back in 1972/71 we didn't know decay heat very well, and there's a lot of work that's been done since then that has clarified it. And, in fact, the 1979 standard came out and said here is the decay heat as we now know it based on some experimentation and here is now the uncertainty that we attach to it. And they said uses a two sigma value for uncertainty.

So, we see this change it should be very simple. We think take the 1.2 multiplier out in the 1971 standard and replace it with the current standard which has uncertainty built into it.

To summarize it another way --

DR. WALLIS: It's not quite the same thing, though. 1.2 factor is a conservative treatment

and the full treatment on uncertainty in risk-informed approach is not --

MR. REICK: Well, I wasn't --

DR. WALLIS: -- the conservative limit, but to look at the whole spectrum and make an evaluation.

MR. REICK: Now, I wasn't there back in the ECCS hearings, but if you read the ECCS rule it talks about the 1.2 being a factor because of the uncertainty in decay heat.

DR. WALLIS: Yes.

MR. REICK: It doesn't talk about it as being conservatism, it talks about uncertainty and the decay heat value.

DR. WALLIS: But essentially it's saying we think the uncertainty is like this, so we'll be conservative and we'll step outside the uncertainty value.

MR. REICK: But it's an uncertainty in the decay heat, not the uncertainty in the other 50.46 requirements and assumptions. And if we know decay heat better now and the standard has come out that says here is how the uncertainty should be applied to it, our position is let's apply that uncertainty. Whereas, the words --

DR. WALLIS: It would be a factor of 1.05 or something, say 1.2.

MR. REICK: Like 1.07 -- 1.08 I think they used the two sigma. Whereas, this in here says NRC prescribed uncertainty. So, essentially what I'm hearing is the NRC wants to take the margin created because we became more certain and then use that margin themselves as opposed to going to what the best estimate --

DR. WALLIS: Well, this is the old business of who knows the margin?

MR. REICK: Whose margin is it?

DR. APOSTOLAKIS: Is that they're saying? What are they saying?

MR. REICK: Well, if you look on their page 10 --

DR. APOSTOLAKIS: Page 10.

MR. REICK: On the second bullet it says "within NRC prescribed uncertainty treatment." So our position is use the uncertainty that the standard came up and define. They said here's the best --

DR. APOSTOLAKIS: Oh, but you yourself said though that the 1.08 is a two sigma?

MR. REICK: Yes.

DR. APOSTOLAKIS: They might three sigma?

MR. REICK: Right. They want three sigma. But what I'm saying is the industry came up with a standard that they thought was best estimate of with an uncertainty, and that ought to replace was back in early 1970s. But it sounds like there may be some of that uncertainty that staff wants to take up because of other unknowns or other nonconservatives that they have in their minds.

So our position is just simply replace the standard and that should be an easy rule change.

DR. WALLIS: So whatever it is it will be NRC prescribed, because they make the rule?

MR. REICK: Correct.

DR. APOSTOLAKIS: So it might be what you want?

MR. REICK: Right. And our position is just put the new standard that talks about the uncertainty of decay heat.

DR. APOSTOLAKIS: Have they objected to what you're proposing or are you speculating now?

MR. REICK: We're speculating because we don't know what the detail is yet.

DR. APOSTOLAKIS: You don't know. Okay.

MR. REICK: And that type of reasoning I think would apply in any other changes under A; that

is if it was uncertainty that was in the ECCS aspects back in the early '70s and we've reduced that uncertainty and that created margin, that that's margin we should have rather than taking the margin away for something else. That was the item on decay heat.

MR. OSTERIEDER: Yes, I guess I'd like to add a little bit.

I think the decay heat changes are certainly something we believe are going to be very appropriate. The Westinghouse Owners Group has a bit of a concern with the rest of the changes related to acceptance criteria. And I think some very distinguished gentlemen on this panel last time said that's like changing the works of Shakespeare if you're going to change acceptance criteria. And we're very concerned that the -- owing the decay heat in with other changes to acceptance criteria could be a very lengthy process and requiring a lot of discussions with this Committee. And I guess we're just generally concerned that the effort would be so big that we'd rather that effort be spent on the redefinition. But I think, you know, as stated here we think some people feel it can be done in a year. And with relatively smooth sailing, I would say to get

there in a year, but I think this is going to be a much longer process to get into the acceptance criteria in general and try to change those. It was a long process originally and we think it's going to be a long process now.

And I guess we think it would be more prudent to look at the decay heat independent or aside from and then get into the other acceptance criteria if we're going to go that route and we're concerned with spending what we think will be a sizeable amount of resources on that. and maybe it won't be, but our experiences don't show us that. I guess our point --

DR. BONACA: You don't think about just the consideration of LOOP and single failure. That would be a great area of opportunity for the industry, wouldn't it?

MR. OSTERIEDER: It could be in the area of opportunity. Partly some of the discussion today has enlightened us a bit and we need to think about it. We're not --

DR. SHACK: That's B, right?

MR. OSTERIEDER: That's B, right. Right. and I guess we'll have a few more comments on that, so I don't know if there's any other on A.

MR. REICK: I'd like the acceptance

criteria. Maybe Norm can help on this. Because I'm confused a little bit because I'm on another committee. I'm a committee for robust fuel with EPRI and in the industry and we've been working with the Argonne acceptance criteria. And recently there was a discussion that came out and said that the current acceptance criteria was based on post-quench cladding ductility, and it was based on experiments done many years ago that showed 2200 and 17 percent was based on a post-quench ductility. And all I read from this is that we're going from the current criteria to demonstrate adequate post-quench cladding ductility. I see no change.

DR. WALLIS: Part of the idea was that cladding wouldn't be necessarily the same in the future as if you had a performance based criteria.

MR. REICK: That's agreed.

DR. WALLIS: Then this could handle new cladding, which maybe could go to 2500 or something, whatever it is.

MR. REICK: I agree. What we've talked about in the industry is that new cladding would go through separate effects test. And by testing new cladding relative to old cladding, they can see how the effects would change, and thus base the criteria

on that. And typically we would say let's live with the existing criteria because the new cladding is better than the old cladding.

DR. WALLIS: Well, maybe the 2200 contains one of these factors, like 1.2 so that if you actually have more information, maybe you could get a better number.

I don't know why you'd want to go back to a more primitive number when a better one might be available?

MR. REICK: Well, what I'm saying is my understanding is the current criteria is only 2200 and 17 percent is already based on post-quench cladding ductility. And so I don't understand what change is being proposed here, and we're doing some testing on that.

DR. SHACK: Well, I think the answer is that suppose you had a cladding that was more corrosion resistent but was in fact embrittled more under a radiation so that in fact the true criteria for it was not an oxidation criterion anymore but essentially an irradiation criterion.

The true thing that you really have to end up with is some ductility. So, I think it was just there attempt that, you know, if you were using

zircaloy, you could still use 17 percent and 2200 F. But if you had a different material, the crucial thing was, in fact, to maintain the ductility, not --

MR. REICK: What I'm hearing you say is for existing claddings there is no change in criteria because our current criteria is already based on ductility. But for new claddings, there could be a change in criteria.

DR. SHACK: I'm not the NRC, but that would be my interpretation.

DR. BONACA: But my understanding --

MR. REICK: That's I -- that's what I hear. That's what I'm hearing.

DR. BONACA: -- reading the material --

MR. REICK: That's the acceptance criteria.

DR. BONACA: Reading the material we have. Okay.

DR. WALLIS: Is this ductility independent of burn up and does it change with radiation history?

MR. REICK: Yes, it does. And we're doing some --

DR. WALLIS: So if we go into a long burn up should we change this criteria?

MR. REICK: That's a whole separate

discussion the industry is having with the NRC on when you go to higher burn ups what criteria should change. This is talking about existing burn ups and we're not trying to lump them together. But there's a whole separate committee that's working on that, extending burn up.

DR. WALLIS: But it's not independent of this, surely. I mean, if you have a performance based criteria and it can handle extended burn up and so on, it seems a much more desirable thing.

MR. REICK: Yes. There will be a whole separate rulemaking that'll take 3 to 5 years before we get extended burn up. And this has been touted as shorter term, but I see no relaxation for the industry in changing acceptance criteria in the short term on that. So the only thing left today as I see it is decay heat. Now, that would take some additional discussions with the staff and talking about. I just see decay heat, and as I mentioned earlier, I think decay heat is a simple change.

DR. SHACK: But I think the first one was mostly just to give you the flexibility of doing something like -- besides ZIRLO or zircaloy without another rule change. I mean, as it is now every time you come up with a new cladding --

MR. HEYMER: I'm not saying that would be great. Our concern is that these discussions get protracted out and out and out. And there are some benefits that could be added in the short term, but let's not lose sight of that fact and also not -- let's not be afraid to sort of chop certain things off as we go down if we think we're running into some technical problems.

DR. WALLIS: I'm not surprised to see the NRC going for a more ambitious way of helping you guys to reduce conservatism then you want to let them do.

MR. HEYMER: Well, I think it's not necessarily a question of that. It's a question of concern over timing.

DR. WALLIS: So you don't think they can do it with the time available?

MR. HEYMER: Well, judging on my past experience, we're probably going to struggle a little bit on some of those.

DR. BONACA: Just before we move, and this is just for clarification for me, I had understood in reviewing this package that 2200°F, the criteria as we have right now, may be we're over restrictive criteria to the term meaning what is an adequate post-quench cladding ductility. Okay.

MR. HEYMER: And the advantage compared with the rest -- because we haven't read the material, everything made publicly available.

DR. BONACA: That would be my understanding. So there would be still some benefit even for current licensees by exploring ways or criteria that would still provide adequate post-quench cladding ductility but less restrictive than the current criteria? That's my understanding, and maybe I was wrong.

MR. HEYMER: Well, hopefully, the SECY would be released to the public and then we can provide some input on the policy.

MR. REICK: My reading of this it doesn't provide anything to current --

DR. BONACA: Okay.

MR. REICK: Cladding materials doesn't provide any relaxation, because the current criteria is based on post-quench ductility.

DR. BONACA: I understand. But the reading seemed to me that the implication was that that criterion was in amount to use to measure this, was over restrictive. I don't know what else could be proposed.

MR. OSTERIEDER: The other point related,

I guess, we just have to be careful with any required changes to acceptance criteria. If we're not careful, we may end up causing everybody to reanalyze for something that appears from what we heard today to be -- give more margin but some plants may not want to spend the effort. They may be satisfied with their current analysis. So, we just wanted to state the obvious, that we'd have to be careful that everybody wouldn't have to be required unless we felt we were doing this to -- for an issue that was not handled as appropriately as it should have been in the past.

DR. WALLIS: This is a remarkable sort of seesaw issue. I mean, when we meet sometimes you guys are all eager to press ahead and do stuff and NRC's dragging its feet. And the next time around the NRC's all eager to press ahead and you guys say "Let's drag out feet because they can't do it."

MR. HEYMER: We are happy and we're willing to move ahead and push on as expeditiously as possible. We just want to be careful that we don't get ourselves bogged down into so many details that we don't actually make some progress on stuff that is relatively straight forward.

MR. SIEBER: Well, it seems to me that there's a trade going on in squad 10. If you look at

the last bullet it talks about viewing with recognized nonconservatisms and model limitations. And I sort of got the impression that there was going to be a trade off between the decay heat multiplier and the decay heat curve versus the nonconservatisms which sort of all in one full swoop consumes at least some of the margin that they built in when they built in the 1.2 multiplier. So you may get a thing that you might like and something you may not like as an output.

MR. HEYMER: As I say, we were just giving you our first reactions.

DR. WALLIS: I guess the criterion for the NRC to do this is not that it saves money for industry. They're interested in public safety, and if this is the right to do it, that's the right way to do it.

MR. HEYMER: And we fully agree with that. It's just a question of if we can do it in the 12 months, great. We go on and do it. But if it takes 36 months, we'd much rather take some of the things that are, in fact, the low hanging fruit.

MR. OSTERIEDER: I guess I just want to make another comment on our being gungho in some cases and not in others. I think we continue to be gungho in large-break redefinition. Certainly we were a lot

more optimistic than the staff is. And we think that this effort is a big effort. And if we're going to do a big effort, we still think we should go for the risk-informed redefinition; that's why we're gungho on one and not the other.

As we've heard already, there's limited resources and you can only put it in certain areas. And if we're going to have a big effort, we're thinking that the redefinition is the more appropriate way to put the big effort.

DR. WALLIS: Well, whose resources are you talking about? Is it the effort that you folks would do to analyze these issues or is it the resources the NRC's going to put into it?

MR. OSTERIEDER: Well, I thought I heard in here that the NRC said that their effort, you know, their manpower is allocated to these efforts. So I'm concerned with their involvement.

DR. WALLIS: Yes.

MR. OSTERIEDER: Plus we've had a difficult time, and this isn't really a resource issue, I suppose, but just getting the next technical meeting scheduled has been a bit of a challenge. But, again, I don't know that that's a resource issue. It's getting the right people together.

DR. WALLIS: I think the last time we met industry was gungho and said we're going to put the resources behind this to make a really case for what we think should be done.

MR. HEYMER: And as regards the redefining large-break LOCA, that still is the case.

DR. WALLIS: Still is the case.

MR. HEYMER: But there does become an industry resource issue if regards to too much at once.

MR. OSTERIEDER: Right. And we have a number of resources allocated and ready to go, and we've kind of put the brakes on a bit if we're not going to have the staff looking at this to any great extent and we're going to be able to get the initiatives developed and agreed to after we do our work; that's what we're trying to sort out.

MR. HEYMER: As regards to the other topics, on LOOP LOCA, yet again that's something that there's an awful lot of information out there at the current time. There's a lot of information out on loss of off-site power, and there's been a lot of studies done on plant centered events. There's been a lot of work done as regards good reliability and what the impact of that could be in the last 9 months

or so.

So, we are going to think that's a relatively quick issue to get under our belt and we look forward to working with the staff in that regard. And in some cases, I think I'd be surprised if the technical work can't be done in less than 12 months, So, that's good.

On redefining the large-break LOCA, as Bob said a few moments ago, that still is where we have most of our resources focused and we're still very interested in moving ahead with that.

One of the issues that we did have on the table or the suggestions that we had made previously was that there be an enabling rule, fairly straight forward, which would then provide double ended guillotine break or an alternative break size as approved by the Commission. And it's just not quite clear to me whether that's still in the works or whether or not we're trying to come up with more detail criteria to put into the rule. It seems more like the latter, and that's something that we'll have to discuss internal and get back with the staff. That'll probably be a comment that we make once we get the SECY and have had a chance to review it.

MR. OSTERIEDER: Right. And that is when

you asked earlier on whether some of the changes, there was talk at the last meeting of the potential to put something in. And we certainly were excited by that potential knowing that we still have the technical issues to deal with as we do in either case. But now if we do move ahead and do something in the nearer term, then I guess we need to ask for an exemption or a petition or something to -- if the wording isn't going to be changed in the near term by the staff. So, that's a bit of a change from what we were hoping from your last meeting and we have to consider what that means.

MR. HEYMER: I think to sort of sum up, we're pleased that the process is moving forward now. We would probably like to see the emphasis still be placed on redefining a large-break LOCA. I think as somebody in this Committee mentioned, we're quite -- you know, industry to do the work and the NRC to review it. And we're more than ready to work with the staff to define what we need to do. We think we know what that is at the moment, but before we actually start pulling everything together and interacting with the staff, we'd like to sit down with them so that we can get a better scope on that. So we're really interested in moving forward.

We think there are some near term objectives that we can achieve, certainly within the 12 month time frame. And we look forward to reading the SECY when it's released.

MR. REICK: Let me add a comment from the BWR perspective.

DR. SHACK: Did you say B or P?

MR. REICK: BWR, boiling water reactors. Our committee agrees with the large-break LOCA redefinition of the priority, but we also looked at the other NRC proposed options and prioritized within our group other options. And we do like some of the options in here, I want to make sure that comes across.

The LOOP LOCA coincidence can be a benefit for the BWRs. And it was asked here what type of examples do you have. And the LOOP LOCA is, I think a good one to illustrate how we might benefit. For the large-break we require and we rely on the diesels; that is the LOOP in connection with the large-break requires the diesel to start so that you can have your low head pumps, your quick injecting pumps be available. Because they're driven by electrical motors.

For the small-break, we rely on steam

that's still available in the small-break to drive some of our pumps. And we have separate -- we have a separate diesel driven pump, separate from our main grid. So we don't have to rely on off site power.

So we may be able to relax our criteria, for example, on our fast start diesels. That is the large-break we won't need them and we don't need them for the small-break, and so we could relax the start requirements and have them start at a more reasonable time frame and, thus, improve the reliability of the diesels. And that is the diesels would not have to go through the fast starts and, thus, be degraded because of the fast starts and they could be started -- maybe they would start automatically, but it would be in a three minute time frame as opposed to 10 seconds or maybe they could even wait for a manual start when you need them for a small-break. So there could be some benefit in that. We're looking seriously at that.

The single failure criteria could fall into that, but we're still -- we still need some discussion on what the single failure would mean for us. I think it's still a little hazy on how you might factor that into your analyze.

DR. WALLIS: Could you put this in the sort of rational that optomizing the use of the

diesels so that you have them available when you really need them.

MR. REICK: Right.

DR. WALLIS: And they're most reliable when you need them, so in fact safety's improved?

MR. REICK: That's correct.

DR. WALLIS: Could you make that case?

MR. REICK: They are -- that's the case that we would make. They're most beneficial when you need them and they're more reliable because of the way you would operate them.

So we have -- you know, those are the key things we've looked at, decay heat and the benefit to a LOOP LOCA as opposed to single failure after the redefining the break size. There is some benefit in the proposals here and we're pleased to move forward on those.

That's all I wanted to say.

DR. SHACK: If there are no other questions, the staff has asked for a letter, and I think we'll want to put one together.

Do I have any thoughts or comments from people about what we should say in a letter?

DR. WALLIS: Well, about the letter, we don't have this document which isn't yet finished?

DR. SHACK: Well, we have a preliminary version of it.

DR. WALLIS: But it's not --

DR. SHACK: It hasn't been approved by the EDO.

MR. CUNNINGHAM: That's correct, it's still in the EDO's office. And we would -- obviously, we don't anticipate changes, but as soon as we get the signed version, then we would get it back to the Committee.

DR. WALLIS: Well, that would be before we have to write the letter?

MR. CUNNINGHAM: I hope it's in the next few days. Next week. Again, I don't anticipate major changes, but we could certainly try to -- if there are changes, we could lay out what the changes were and that sort of thing to help out the Committee.

DR. SHACK: But I would think that, you know, we could certainly talk about the options that are discussed in attachment 1 in the overall document of the options. And, you know, it might be a matter of which had higher priorities. But that's something we could comment on almost irrespective of what the staff decided the priorities with the options.

So, I think we could move ahead on the

letter myself. Well, maybe that's something we can discuss after people have had a chance to think about it a little bit.

DR. APOSTOLAKIS: Well, they're coming back to address the full Committee, right?

DR. SHACK: Right.

MR. LEITCH: We're almost all here anyway.

DR. BONACA: Maybe next week before, however, we could get a feedback.

DR. APOSTOLAKIS: If we don't like the letter this time, it'll be in September, right? Even if we slip one day, that's it. The Commission will vote when?

MR. ROSEN: I didn't hear any very negative views expressed, so I think we in general are in agreement with the approach. So I think it would be useful.

DR. BONACA: I think there is some opinion we have with priority for redefining the large-break.

DR. SHACK: Well, I mean the staff has said it's going to go forward. You know, they haven't stopped that work and it's, you know -- at this point it's just sort of a skepticism about whether -- but I think the short term benefits they're talking about are definitely benefits also. I mean, especially the

Appendix -- or the B one.

MR. SIEBER: Well, if somebody's pressed on the final acceptance criteria, it would certainly be handy to have some of that margin that would come out of the short term benefits.

DR. WALLIS: I would favor encouraging the staff, that we go ahead with what they've laid out here and not trying to meddle too much in redirecting them.

MR. SIEBER: Well, it's pretty early in the game, too. This is all feasibility study.

DR. SHACK: Right.

MR. SIEBER: And so the decisions as to what you finally will pursue and how much effort you put into it won't be made for another year. So, you know, there isn't too much that can be said other than, again, encouragement.

DR. KRESS: Well, I think they're on the right track. I see some details --

MR. ROSEN: The A&S standard has only been out 7 years. I mean, it's pretty young. It's really time for us -- of course, I'm kidding.

DR. KRESS: Well, I think there's some unanswered questions on how you deal with margins in the deterministic end of the thing. As we use more

realistic calculations, we approach these limits. But those limits were set knowing that you had a pretty good margin in the first place. And there may be some question about the appropriateness of the limits as you approach them.

I think Graham raised this issue that are the limits independent of the margins. And I think there are some questions that -- but that's for something later on.

MR. SIEBER: The more important question is who owns the margin.

DR. KRESS: Oh, I think definitely we ought to have an ACRS position on that. And my position, of course, will be that the licensee owns the margin.

MR. SIEBER: Well, provided you get the licensee to fix up nonconservatisms that may exist that the margin in the old days took care of one way or another. And so to me you can't do it piecemeal, you have to do like a package.

DR. KRESS: Well, I think I would agree with that. I think as a general principle the licensee owns the margins. Now there's a question about what margins are actually there and how do these limits get set, and what do the uncertainties do when

they overlap the margins. There's a lot of little questions, but I think as a general principle the ACRS thinks the licensee owns the margins.

MR. SIEBER: I didn't see any of that discussion in the feasibility study.

DR. SHACK: But I don't think the staff disagrees with that.

DR. KRESS: Yes, I don't think they do either.

DR. SHACK: They're acceptance limits and that's why they're called acceptance limits. Yo know, there's a debate on whether you've calculated things properly perhaps, but that's a review process.

MR. SIEBER: But the concept of defining what the margins are --

DR. KRESS: I think there's some debate there.

MR. SIEBER: Right. And I think that ought to be dealt with as part of this project.

DR. KRESS: That's part of the 8.

MR. SIEBER: Yes.

DR. WALLIS: Well, this would be the margins of the two signal or the three signal level, that sort of thing.

MR. SIEBER: Well, that would be one

aspect.

DR. KRESS: Well, here once again is a good place for some formal decision criteria to enter the picture. Right, George?

DR. WALLIS: Well, this is one of the questions we wrestle with all the time is whether or not --

DR. APOSTOLAKIS: Never disagree with you.

DR. BONACA: Well, so much of it we have to see for the work they do. For example, the issue of single failure or elimination of it, it's very significant in that it drops so many of the issues of LOCA; what you inject, what assumption you make, what is the break. All these. And so --

DR. KRESS: But I think they're well aware of that.

DR. BONACA: Yes, they're well aware of it. So what I'm saying all we can do is to follow progress and I'm sure they'll ask the right questions before we ask them.

So, you know, in the broader sense of eliminating, that's even a bigger --

MR. ROSEN: But that's long term.

DR. BONACA: That's long term.

DR. KRESS: But you know it's the right

direction. You're getting rid of some of these vague things that are closely related to risk somehow and actually getting them pinned down as to how much value they really are and what do they mean --

DR. BONACA: For the existing plants, however, those decisions were integral with the design of the plant. Many of the single failures were eliminated by designing the plant in a different way because that resulted in acceptable results. So, you had a lot of alternations between the analysts and the people designing the plants and how they ended up the way they are. So, you know, I think for a newer plant the design, I think today, with PRA you would have a much better approach in evaluating all the possible outcomes and considering also the probabilities for the sequences so that you know --

DR. KRESS: And there's where I keep harping on you to use your uncertainties correctly.

DR. BONACA: Yes, and I agree with that. But anyway, that it is along --

MR. ROSEN: I think you just made a very important point that I hadn't heard discussed before. The changes go back to 50.46 and all the other risk informed changes are changes that will apply to new plants as well.

DR. KRESS: Yes.

MR. ROSEN: And we're about to see I think -- I hope -- we hope some new plants.

DR. APOSTOLAKIS: Well, I don't know. 50.46, I mean, everything we're discussing today is really water, isn't it? Water? ECCS and all that?

MR. ROSEN: But what about changes to the single failure corrector?

DR. APOSTOLAKIS: That, yes.

DR. BONACA: But I would expect under the current regulatory environment, an applicant could come in and provide a study of single failure based on a PI, and that would be much more credible how you eliminate certain --

DR. APOSTOLAKIS: It's not even a single failure. It's a single failure of hardware, right? And put the operator there to defeat everything. And that's not the same --

DR. BONACA: But the point I'm making is that you assume -- see -- in search almost of a design that was acceptable, you assume those kind of failures. Now you would do it through a PRA.

DR. WALLIS: If we're looking ahead to new plants we should encourage the staff to get performance-based and not sort of specific based

entirely on the existing fleet of plants.

MR. UHRIG: But what impact would this have on the certified plant?

DR. KRESS: They have their own rule.

DR. WALLIS: But this business about the cladding and stuff, how would it apply to a peddle bed reactor? But if you had something which said that you've got retain fission products, then that applies to anything.

DR. KRESS: Yes, I think that's a good point that you make. I mean, why you worry about the ductility of the event.

DR. WALLIS: Ductility of the cladding of a peddle bed reactor, yes.

What is the ductility of these ceramics?

DR. KRESS: Sounds pretty good.

DR. SHACK: But you put in a nice buffer layer to absorb all the changes.

Are there any particular items we want brought up at the full Committee, they should be addressing anything?

DR. APOSTOLAKIS: This was a nice presentation for a full Committee.

DR. KRESS: Yes, and it wasn't that long, was it? They might have to shorten it some.

DR. APOSTOLAKIS: Yes, they can shorten it a little bit. But other than that --

DR. SHACK: I'm sure that's not a problem for you.

DR. WALLIS: Will NEI have a presentation or have you had time to think about before the full Committee?

MR. HEYMER: Since we haven't seen the SECY and we're not really available on Wednesday because we have an interaction with the senior NRC management, we weren't planning to say anything more than what we've said today.

DR. SHACK: Okay.

DR. BONACA: I have a question, Mr. Chairman, which is shall we give back this document here?

DR. APOSTOLAKIS: No. This pre-decisional, right?

MR. MAYFIELD: That's right. You just can't share it with anyone else. It's for your use only.

DR. BONACA: Then I will not share it with you.

DR. APOSTOLAKIS: We never share anyway.

DR. SHACK: Well, if there are no more

serious items to be discussed, I think we can adjourn the Subcommittee meeting.

(Whereupon, at 4:45 the Subcommittee was adjourned.)

CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: ACRS JOINT MEETING

Docket Number: (NOT APPLICABLE)

Location: ROCKVILLE, MARYLAND

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

John Mongoven
Official Reporter
Neal R. Gross & Co., Inc.

INTRODUCTORY STATEMENT BY THE CHAIRMAN OF THE
JOINT MEETING OF THE ACRS SUBCOMMITTEES
ON MATERIALS AND METALLURGY, THERMAL-HYDRAULIC PHENOMENA,
AND RELIABILITY AND PROBABILISTIC RISK ASSESSMENT
11545 ROCKVILLE PIKE, ROOM T-2B3
ROCKVILLE, MARYLAND
JULY 9, 2001

The meeting will now come to order. This is a joint meeting of the Advisory Committee on Reactor Safeguards (ACRS) Subcommittees on Materials and Metallurgy, Thermal-Hydraulic Phenomena, and Reliability and Probabilistic Risk Assessment. I am William Shack, Chairman of the Subcommittee on Materials and Metallurgy. Graham Wallis is Chairman of the Subcommittee on Thermal-Hydraulic Phenomena and George Apostolakis is Chairman of the Subcommittee on Reliability and PRA.

Subcommittee Members in attendance are Mario Bonaca, Peter Ford, Thomas Kress, Graham Leitch, Steve Rosen, Jack Sieber, and Robert Uhrig.

The purpose of this meeting is to discuss the status of risk-informed revisions to the technical requirements of 10 CFR 50.46 for emergency core cooling systems. The Subcommittees will gather information, analyze relevant issues and facts, and formulate proposed positions and actions, as appropriate, for deliberation by the full Committee. Michael T. Markley is the Cognizant ACRS Staff Engineer for this meeting.

The rules for participation in today's meeting have been announced as part of the notice of this meeting previously published in the *Federal Register* on June 27, 2001.

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

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

(Chairman's Comments-if any)

We will now proceed with the meeting and I call upon Mr. Thomas King to begin.

REVISED 6/28/01

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
JOINT MEETING OF THE ACRS SUBCOMMITTEES ON MATERIALS AND METALLURGY, THERMAL-HYDRAULIC PHENOMENA, AND RELIABILITY AND PROBABILISTIC RISK ASSESSMENT
ROOM T-2B3, 11545 ROCKVILLE PIKE, ROCKVILLE, MD
JULY 9, 2001

ACRS Contact: Michael T. Markley (301) 415-6885
E-mail: mtm@nrc.gov

- PROPOSED SCHEDULE -

TOPIC	PRESENTER	TIME
1) Introduction		**1:30-1:35 am**
• Review goals and objectives for this meeting; introductions	Bill Shack, ACRS	
• Risk-informing 10 CFR 50.46 for emergency core cooling systems; discussions from March 16, 2001 Joint Subcommittee meeting		
• Technical issues associated with large-break loss-of-coolant accidents (LBLOCA), leak-before-break phenomena (LBB), and probabilistic fracture mechanics (PFM)		
2) NRC Staff Presentation		**1:35-3:30 pm**
• Overview of Phase I activities	Tom King, RES	
• Results of feasibility study for risk-informing 10 CFR 50.46; Options: ECCS reliability, acceptance criteria evaluation model, LBLOCA redefinition	Mark Cunningham, RES Mary Drouin, RES M. Mayfield, RES A. Kuritsky, RES	
****BREAK****		**3:30-3:45 pm**
3) NRC Staff Presentation - continued		**3:45-4:30 pm**
• Phase IIA technical work, policy issues, and schedule	M. Cunningham, RES M. Drouin, RES M. Mayfield, RES A. Kuritsky, RES	
4) Industry Comments		**4:30-4:45 pm**
• Overall industry approach: Why redefine LBLOCA?	Adrian Heymer, NEI	
• Owners Group perspectives	TBD	
5) ACRS General Discussion and Adjournment		**4:45-5:00 pm**
• General discussion and comments by Members of the Subcommittee; items for full ACRS meetings	Bill Shack, ACRS	

Note: Presentation time should not exceed 50% of the total time allocated for a specific item.
Number of copies of presentation materials to be provided to the ACRS/ ACNW - 35.

RISK-INFORMING 10 CFR 50.46

Presented to
Advisory Committee on Reactor Safeguards
(Subcommittee)

Presented by
Mary Drouin and Alan Kuritzky
RES/DRAA/PRAB
U.S. Nuclear Regulatory Commission
(301) 415-6189

July 9, 2001

OUTLINE

- Purpose/goal of meeting
- Background - Option 3
- Activities
  - Feasibility assessment of changing 10 CFR 50.46
  - Feasibility assessment of additional changes to 10 CFR 50.46
  - Other Option 3 activities
- Tentative Recommendations and schedule

PURPOSE/GOAL OF MEETING

- Provide status report on staff's efforts to risk-inform 10 CFR 50.46
- Solicit feedback and comments from ACRS:
  - Options
  - Implementation issues
  - Feasibility
- Letter requested

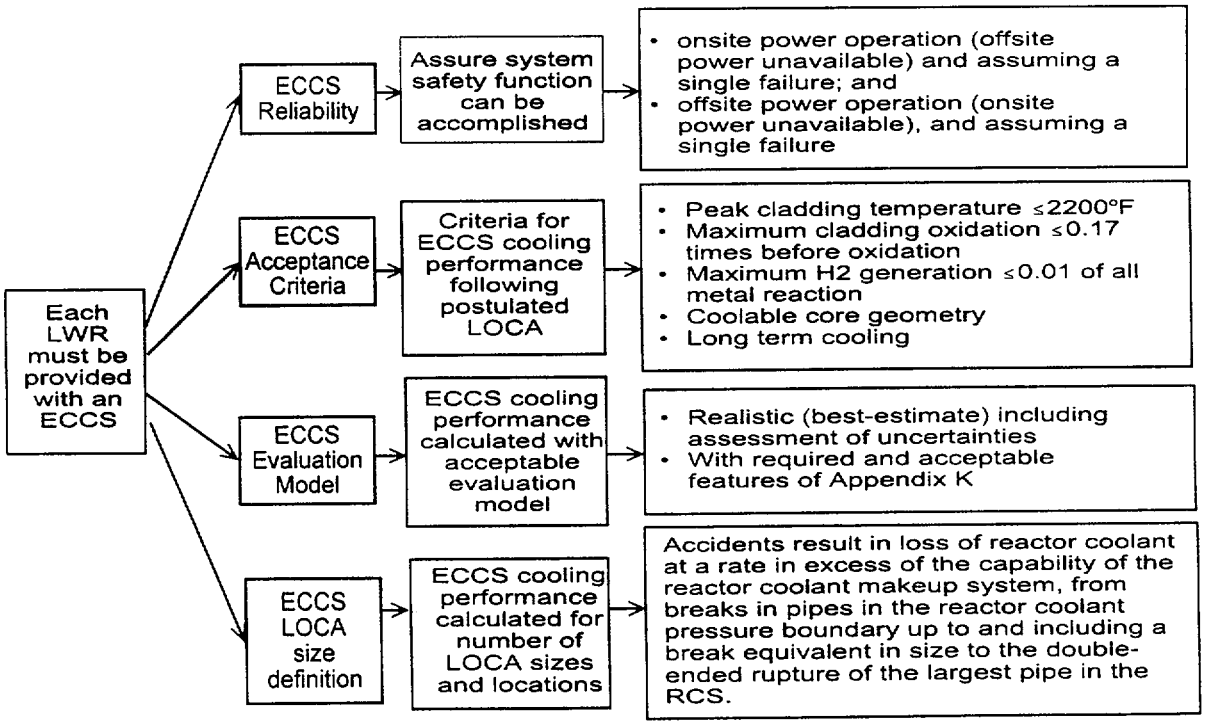
BACKGROUND

SECY-99-264 (Nov 9, 1999) defined plan for Option 3 work

OPTION 3 FRAMEWORK:

- Phase I:
  - Part A: Identify candidate requirement
  - Part B: Prioritize
  - Part C: Evaluate feasibility and provide recommendations to Commission
    - ★ Develop technical content and basis for alternative
    - ★ Identify policy issues
    - ★ Identify required technical work
    - ★ Identify required resources
- Phase II:
  - Part A: Perform technical work
  - Part B: Develop and implement rulemaking

OVERVIEW OF 50.46 (including Appendix K and GDC 35)



FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46

- Changes to reliability, acceptance criteria and evaluation model may be justified
- ECCS reliability resulting from technical requirements not commensurate with risk significance of the various LOCA sizes
- Unnecessary conservatisms exist in the requirements

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

- Current evaluation models of ECCS performance may be overly conservative for large-break LOCAs
- Current estimates of the frequency of large-break LOCAs are uncertain and are not low enough to allow elimination of all large-break LOCA sizes from the design bases
- Reliability of the ECCS is generally sufficient to assure that large-break LOCAs (> 6 inches in diameter) are not significant contributors to risk
- Plant equipment that is designed, at least in part, to the requirements of design-basis LOCAs also provides defense against a spectrum of beyond-design-basis accidents

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

- Staff Considering:
  - A. Changes to the technical requirements of the ***current*** 50.46 related to acceptance criteria and evaluation model
  - B. Development of a voluntary risk-informed ***alternative*** to the reliability requirements in 50.46
- Follows the guidelines in Option 3 framework
- Framework is designed to ensure that changes are risk-informed, and include consideration of defense-in-depth principles

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

A. Possible changes to the current 50.46

- Replace the current prescriptive ECCS acceptance criteria in 50.46 with a performance-based requirement
- This requirement would:
  - demonstrate adequate post-quench cladding ductility and adequate core-coolant flow area to ensure that the core remains amenable to cooling, and,
  - for the duration of the accident, maintain the calculated core temperature at an acceptably low value and remove decay heat.
- Allows use of cladding materials other than zircaloy or ZIRLO without licensees having to submit an exemption request

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

A. Possible changes to the current 50.46 (cont'd)

- Revise the requirements for the ECCS evaluation model to be based on more realistic analyses
- Specifically this update could involve:
  - replacing the current 1971 American Nuclear Society (ANS) decay heat curve with a model based on the 1994 ANS standard.
  - replacing the current decay heat multiplier of 1.2 with an NRC-prescribed uncertainty treatment.
  - deleting the limitation on PWR reflood steam cooling for small reflood rates.
  - replacing the Baker-Just zirconium steam model with the Cathcart-Pawel zirconium steam oxidation model for heat generation.
  - deleting the prohibition on return to nucleate boiling during blowdown.
- Rule requirements would include a provision that would account for recognized nonconservatisms and model limitations

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

Additional technical work would be required to support the actual rule changes

- Support removal of unnecessary conservatisms from Appendix K
- Develop guidelines for demonstrating adequate post-quench ductility as a replacement for the current prescriptive acceptance criteria
- Support development of the regulatory guides needed for implementing the modifications to the existing rule

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

B. Develop a voluntary risk-informed alternative 50.46

- Include technical requirements to ensure an ECCS reliability that is commensurate with the frequency of challenge to systems

- Two options to accomplish ECCS system reliability (in place of the simultaneous loss of offsite power requirement and single failure criterion)

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

B. Develop a voluntary risk-informed alternative 50.46 (cont'd)

1. A deterministic system reliability requirement based on risk information
   - e.g., an ECCS design requirement that only one train of ECCS is required for LOCAs larger than a specified size

2. An ECCS functional reliability requirement that is commensurate with the LOCA frequency
   - e.g., a requirement that ECCS design must be such that the core damage frequency [CDF] associated with a specified set of LOCAs is less than an NRC-specified CDF threshold

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

Additional technical work would be required to support the actual rule changes

- Determine acceptable methods and assumptions for performing LOCA CDF and ECCS reliability analyses for those alternatives requiring such analyses
- Determine appropriate reliability and CDF threshold values
- Identify features that tend to decrease the likelihood of loss of offsite power following a LOCA
- Determine acceptable methods and assumptions for estimating plant-specific probability of loss of offsite power given a LOCA.
- Support development of the regulatory guides needed for implementing the recommended risk-informed alternative rule

FEASIBILITY ASSESSMENT OF ADDITIONAL CHANGES TO 10 CFR 50.46

- Additional changes to 50.46 may also have merit:
  - evaluation of the definition of the spectrum of breaks and locations
- The extent of potential change to the definition of pipe break size is dependent on the state-of-knowledge of the frequency of LOCAs of various break sizes
- For example, if a set of LOCAs can be demonstrated to have a collective mean frequency of occurrence of below —
  - 10^{-4}/yr, some regulatory relief may be appropriate
  - 10^{-5}/yr, may be appropriate to remove these LOCAs from the plant design basis, with some mitigative capability
  - 10^{-6}/yr, may be appropriate to remove these LOCAs from the plant design basis
- Staff to continue to perform the technical work to determine its feasibility

FEASIBILITY ASSESSMENT OF ADDITIONAL CHANGES TO 10 CFR 50.46 (cont'd)

- The staff will continue to meet with representatives of the nuclear industry in public meetings to address and resolve the technical issues
- These issues include, for example,
  - initial flaw distributions, degradation mechanisms, material response and uncertainty analysis
- If found feasible, the staff would recommend additional changes, potentially including rulemaking to change the wording in 50.46 and Appendices A and K of Part 50 which would allow the licensee to use an alternate pipe size, subject to some level of NRC approval

OTHER OPTION 3 ACTIVITIES

- GDC 35 requires that the ECCS safety function be accomplished assuming a single failure
- Considering replacing this single failure criterion in the alternative rule, but only as it affects ECCS
- The single failure criterion is applied to more than just the ECCS. GDCs 17, 34, 38, 41 and 44 also contain the single failure criterion.
- A generic change to the Part 50 Appendix A single failure criterion definition may be warranted
  - Staff intends to assess the feasibility of a single generic change under Option 3.

OTHER OPTION 3 ACTIVITIES (cont'd)

- Such a risk-informed definition would also address the Commission's guidance in the SRM of February 3, 2000
- The staff has also begun to investigate changes to the special treatment technical requirements of Part 50
- The staff has deferred further work on this to better focus its resources on assessments of 50.44 and 50.46, but would reassess its priority late this year

TENTATIVE RECOMMENDATIONS AND SCHEDULE

- Modification of the existing 10 CFR 50.46 and Appendix K:
  - Develop proposed rule — 12 months from date of SRM or 2 months after completion of technical work (whichever is later)
  - Perform technical work — On or before July 2002
- Development of a risk-informed alternative to 10 CFR 50.46, Appendix K and GDC 35:
  - Develop proposed rule — 12 months from date of SRM or 2 months after completion of technical work (whichever is later)
  - Perform technical work — On or before April 2002
- Continue longer-term feasibility assessment on additional changes to 50.46, including rigorous analysis of LOCA frequencies
  - Up to 3 years