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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	

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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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

8 Just briefly on the background, we go back  
9 to SECY-264, which was the original plan for the  
10 Option 3 work. And we also had a framework. And the  
11 two important things to remember was a big lesson on  
12 50.44 is that part of Option 3 has two phases to it.  
13 And this first phase is strictly a feasibility study.  
14 Is it feasible to do the things that we would  
15 ultimately recommend to the Commission. That does  
16 mean that we have done all the technical work that  
17 would be needed to support a rulemaking, because that  
18 technical work is part of Phase 2 when we get into the  
19 implementation once we have received approval from the  
20 Commission to proceed forward. And there seems to have  
21 been some confusion there. So, I just wanted to  
22 quickly highlight that again that the Phase I when we  
23 complete it and we make our recommendation to the  
24 Commission, that does mean that all the technical work  
25 is done.

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

4 DR. WALLIS: Besides feasibility, are you  
5 looking at desirability as some sort of criterion for-  
6 -

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

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

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

13 DR. WALLIS: Okay.

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

16 DR. WALLIS: That's right.

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

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

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

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

3 Now, getting into 50.46. We talk about  
4 50.46 and, and they used that number 50.46 rather  
5 loosely. But when you go and you look at Part 50 and  
6 you talk about the ECCS performance, which is really  
7 more what we're talking about, then you're really  
8 talking about 50.46, you're talking about Appendix K  
9 and you're talking about GDC 35. These you have to  
10 handle together. You can't just deal with 50.46 and  
11 exclude Appendix K and GDC 35. They work together as  
12 one entity.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

23 DR. WALLIS: Balance versus?

24 MR. KURITSKY: In other words --

25 DR. WALLIS: When it gets below a certain

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

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

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

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

14 DR. APOSTOLAKIS: Yes. What does it mean?

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

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

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

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

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

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

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

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

6 DR. APOSTOLAKIS: Okay.

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

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

11 DR. BONACA: One of those.

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

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

18 DR. APOSTOLAKIS: Okay.

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

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

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

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

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

9 MS. DROUIN: Yes, that comes into play.

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

12 MS. DROUIN: Correct.

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

18 DR. APOSTOLAKIS: Maybe you said?

19 DR. WALLIS: Are these just conservative?

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

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

25 MR. KURITSKY: Yes, it is --

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

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

7 DR. BONACA: I understand.

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

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

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

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

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1 deal the more likely.

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

4 DR. WALLIS: Right. That's right.

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

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

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

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

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1 as design based accidents.

2 DR. APOSTOLAKIS: How long should they be?

3 MR. KURITSKY: Well, we haven't put our  
4 finger on the exact number. Certainly it'd be below  
5  $10^{-6}$  confidently.

6 DR. APOSTOLAKIS: Mean value?

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

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

22 MR. KURITSKY: Exactly.

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

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1 requirements.

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

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

16 MR. KURITSKY: Right. Exactly.

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

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

24 DR. APOSTOLAKIS: But never high numbers?

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

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1 pipe would be high.

2 DR. APOSTOLAKIS: They would be?

3 DR. SHACK: Yes.

4 DR. APOSTOLAKIS: Then we would believe  
5 them.

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

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

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

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

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

20 DR. WALLIS: So regulatory assumptions?

21 MR. KURITSKY: Right. Right.

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

25 MR. KURITSKY: Okay. What I just

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

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

13 MR. KURITSKY: Yes.

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

17 MR. KURITSKY: Right.

18 DR. WALLIS: -- code modeling part.

19 MR. KURITSKY: Right.

20 DR. WALLIS: Okay.

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

23 MR. KURITSKY: Right.

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

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

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

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

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

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

25 So you're right, some of these things are

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1 just fine tuning what's there already.

2 DR. SHACK: Where did we leave off?

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

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

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

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

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1 for that has good significance.

2 DR. APOSTOLAKIS: Can you give an example?

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

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

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

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

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1 for some issues.

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

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

8 MR. KURITSKY: Right.

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

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

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

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1 MR. KURITSKY: Right.

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

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

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

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

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

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

21 DR. WALLIS: Right.

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

25 DR. APOSTOLAKIS: Again, going to the last

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1 bullet, are we regulating now beyond design basis  
2 accidents?

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

5 DR. APOSTOLAKIS: Then where do we go?

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

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

11 DR. APOSTOLAKIS: Okay.

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

14 DR. APOSTOLAKIS: We have?

15 DR. KRESS: We always have.

16 DR. APOSTOLAKIS: Like when?

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

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

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

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1 for whatever equipment you have.

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

4 DR. BONACA: No.

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

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

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

13 MR. KURITSKY: Yes, and PRAs, yes.

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

17 MR. KURITSKY: Right. Right.

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

21 DR. KRESS: You always worry about that.

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

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1 DR. KRESS: That's exactly right.

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

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

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

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

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

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

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

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1 beyond design basis.

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

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

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

13 DR. APOSTOLAKIS: Sure.

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

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

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

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

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

7               DR. APOSTOLAKIS: Not the sequence.

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

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

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

16              DR. KRESS: Maybe not low enough.

17              DR. APOSTOLAKIS: Maybe.

18              DR. KRESS: Your assessment might not be.

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

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

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

2 DR. APOSTOLAKIS: Yes.

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

9 DR. APOSTOLAKIS: Okay.

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

12 MS. DROUIN: Correct.

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

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

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

21 DR. APOSTOLAKIS: But not the other way.

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

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

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1 care on the basis of other things.

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

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

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

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

8 DR. WALLIS: We're doing both.

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

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

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

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

23 DR. KRESS: We had three ranges of  
24 frequencies.

25 MS. DROUIN: That's right.

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1 DR. KRESS: And they had to -

2 DR. APOSTOLAKIS: All right. I remember  
3 that.

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

6 DR. APOSTOLAKIS: Okay.

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

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

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

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

13 DR. KRESS: No, please don't.

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

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

20 MR. KURITSKY: The near term. Near term.

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

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

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

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1 keeps your attention.

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

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

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

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

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

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

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

7 DR. KRESS: Yes.

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

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

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

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

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

23 MR. KURITSKY: Right.

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

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

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

7 MR. KURITSKY: Right.

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

10 DR. WALLIS: That's right.

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

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

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

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

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

25 DR. BONACA: No, the question is how do

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1 you do that. I mean --

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

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

6 DR. WALLIS: B sounds very interesting.

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

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

14 B is much more iffy and much more  
15 interesting.

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

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

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

23 DR. WALLIS: Okay. I understand.

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

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1 DR. WALLIS: That's right.

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

4 MR. KURITSKY: Any rule change in 12  
5 months.

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

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

13 MS. DROUIN: Yes.

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

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

19 MR. KURITSKY: Yes.

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

23 DR. KRESS: Well, you might.

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

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

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

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

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

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

25 DR. APOSTOLAKIS: The question is in A.

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1 MS. DROUIN: It wouldn't be mandatory.

2 DR. APOSTOLAKIS: Huh?

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

5 DR. APOSTOLAKIS: No, but in A you're  
6 explicitly talking about acceptance criteria and  
7 evaluation. And I'm wondering why you don't also  
8 mention reliability requirements. They're very  
9 explicit. I mean, you can say don't do this anymore.  
10 You don't have to have a risk-informed alternative to  
11 do that. You can easily say as part of the current  
12 50.46 we're changing this. No?

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

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

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

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

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

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1 DR. KRESS: Right.

2 DR. APOSTOLAKIS: Right.

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

5 DR. APOSTOLAKIS: No.

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

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

17 DR. KRESS: Yes.

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

25 The other one, it's more of this

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

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

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

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

25 DR. APOSTOLAKIS: So the second bullet

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1 then really refers to B only?

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

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

6 MS. DROUIN: I'm sorry?

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

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

11 DR. APOSTOLAKIS: It's just in there?

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

14 DR. APOSTOLAKIS: Okay.

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

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

19 MS. DROUIN: Yes.

20 DR. WALLIS: Are you going to say what  
21 risk benefit is there from that and suppose it were  
22 2250 or 2300, what would be the additional risk? And  
23 then you're going to make choice based on risk? Is  
24 that the kind of thing you're going to do?

25 MR. KURITSKY: Well, I think --

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

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

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

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

9 MS. DROUIN: No.

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

14 MS. DROUIN: Yes.

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

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

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

25 MS. DROUIN: Yes.

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

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

11 DR. KRESS: Just clarifies it?

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

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

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

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

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

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

19 DR. KRESS: Yes.

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

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

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

7 MR. KURITSKY: Right. Right.

8 DR. KRESS: Okay.

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

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

16 MS. DROUIN: Yes.

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

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

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

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

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

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

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

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

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

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

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

25 DR. KRESS: Well, they have an oxidation

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

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

8 DR. KRESS: Not with that level, no.

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

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

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

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

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

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

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

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1           And in the near term what we're  
2 specifically looking at would be changes to Appendix  
3 K to use more, as we mentioned before, more current,  
4 more realistic information. And specifically this  
5 could involve taking the main pieces -- what's  
6 currently for the -- the '71 ANS decayed standard  
7 using a multiplier of 1.2 to account for uncertainty.  
8 And we'd be looking to use instead something like the  
9 '94 ANS standard and then coming up with an NRC-  
10 prescribed uncertainty treatment because the '94  
11 standard has a lot more options and perimeter and  
12 uncertainty treatments. It's a little more  
13 complicated than just applying factor, which is done  
14 for the '71 standard. So that's one of the main  
15 pieces that we're looking at under changes to Appendix  
16 K.

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

25           And lastly, we're also looking at the

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

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

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

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

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

3 MS. DROUIN: Yes.

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

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

9 MR. KURITSKY: Okay. As part of these  
10 changes that we -- these proposed changes that we're  
11 considering, there'd be additional technical work that  
12 would have to be done. As Mary mentioned, right now  
13 this Phase 1 work is a feasibility study and there is  
14 additional work that would have to be done under Phase  
15 2 in order to support rulemaking.

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

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

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

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

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

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

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

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

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1 quench ductility.

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

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

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

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

12 MR. KURITSKY: Yes.

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

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

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

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

22 DR. WALLIS: Yes.

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

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

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

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

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

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

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

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

21 DR. WALLIS: Right.

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

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

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

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

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

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

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

13 DR. APOSTOLAKIS: December 2003.

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

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

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

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

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

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

3 MS. DROUIN: Norm's going to --

4 MR. KURITSKY: Norm is here.

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

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

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

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

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

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

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

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

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

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

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

9 DR. KRESS: Yes, but for A --

10 MS. DROUIN: Yes.

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

13 MS. DROUIN: Oh, absolutely, yes.

14 DR. KRESS: Oh, okay.

15 MS. DROUIN: Yes.

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

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

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

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

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

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

13 MS. DROUIN: I think that --

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

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

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

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1 MR. ROSEN: Okay. Thank you.

2 MS. DROUIN: Were we on 12.

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

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

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

23 MR. KURITSKY: Yes, again --

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

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

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

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

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

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

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

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

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

18 DR. KRESS: That is a success criteria.

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

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

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

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

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

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

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

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

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

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

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

10 DR. KRESS: Or a confidence level.

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

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

22 DR. KRESS: Yes.

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

25 DR. KRESS: Because I think people would

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1 treat it differently if --

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

7 DR. KRESS: Yes.

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

12 DR. KRESS: Yes.

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

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

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

20 DR. APOSTOLAKIS: You're not touching  
21 that?

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

24 DR. APOSTOLAKIS: All LOCAs?

25 MR. KURITSKY: This would be all LOCAs.

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

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

5 DR. APOSTOLAKIS: So this is the current--

6 MR. KURITSKY: It's the current  
7 definition.

8 DR. APOSTOLAKIS: The current definition,  
9 current frequencies?

10 MR. KURITSKY: Yes.

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

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

16 MR. KURITSKY: Yes.

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

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

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

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

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1 DR. APOSTOLAKIS: Yes. Yes.

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

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

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

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

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

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

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

13 DR. WALLIS: Why?

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

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

19 MR. KURITSKY: Right.

20 DR. WALLIS: Okay.

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

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

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

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

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

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

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

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

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

12 So anyway, so getting back, under option  
13 1 it's something the NRC will specify. We'll  
14 establish it and it will be specified. And so a  
15 licensee who chooses this option will go ahead, they  
16 will not require any NRC review and approval, because  
17 it would already be there, they can pick it.

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

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

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

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

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

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

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

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

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

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

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

12 MR. KURITSKY: In that regard, yes.

13 DR. WALLIS: Okay.

14 DR. KRESS: Based on the current Appendix  
15 K?

16 MR. ROSEN: Or best estimate.

17 DR. KRESS: Best estimate.

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

21 MR. KURITSKY: That's right.

22 MR. LAUBEN: This is Norm Lauben again.

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

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

8 DR. WALLIS: Small large breaks, too.

9 MR. LAUBEN: Excuse me?

10 DR. WALLIS: And small large breaks.

11 MR. LAUBEN: And small large breaks,  
12 right.

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

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

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

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

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

6 MR. KURITSKY: Yes.

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

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

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

20 MR. KURITSKY: You mean the second option?

21 DR. SHACK: Yes.

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

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1 underneath that threshold.

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

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

25 MR. ROSEN: The first one's more

1 prescriptive and the second one will be more  
2 performance based.

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

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

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

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

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

23 MR. KURITSKY: The first one --

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

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

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

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

17 DR. SHACK: Progress, right?

18 DR. WALLIS: That's progress.

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

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1 to pursue.

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

12 Again, the --

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

15 MS. DROUIN: Yes.

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

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

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

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

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

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

24 MS. DROUIN: Absolutely.

25 MR. ROSEN: So then a utility could then

1 still make small changes to that based on 1.174?

2 MS. DROUIN: Absolutely. Absolutely true.

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

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

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

12 DR. APOSTOLAKIS: That's the issue.

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

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

20 This is Mark Cunningham from the staff.

21 DR. APOSTOLAKIS: That's one issue.

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

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

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

4 DR. APOSTOLAKIS: Yes.

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

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

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

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

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

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

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

22 And the second --

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

25 MR. KURITSKY: It can go either way.

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

6               Q       So it's of common cause then?

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

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

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

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

21              MR. ROSEN: Right. Right.

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

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

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

4 MS. DROUIN: That's correct.

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

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

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

17 MR. KURITSKY: Right.

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

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

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

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

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

7 MR. KURITSKY: Right.

8 MR. ROSEN: And how many LOOPS are caused  
9 by a scram?

10 MR. KURITSKY: Right.

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

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

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

22 MR. KURITSKY: Right.

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

25 MR. KURITSKY: Right.

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

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

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

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

25 MR. LEITCH: I thought some of the work

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

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

12 MR. LEITCH: Yes.

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

17 MR. LEITCH: Right.

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

25 MR. LEITCH: Liability, yes. Okay.

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

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

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

22 DR. APOSTOLAKIS: Absolutely.

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

25 DR. KRESS: And I know I keep harping on

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

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

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

8 MS. DROUIN: Yes.

9 MR. KURITSKY: That's kind of what Phase  
10 2 does.

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

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

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

23 MR. KURITSKY: Yes.

24 MS. DROUIN: Yes.

25 DR. WALLIS: It'll be interesting to see

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1 how comprehensive and long it is.

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

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

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

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

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

14 MS. DROUIN: That's right.

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

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

22 The extent of potential change to 50.46 --

23 DR. KRESS: What do you mean by  
24 definition?

25 MR. KURITSKY: The specificity of the

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1 size.

2 DR. KRESS: The speculation, rather.

3 MR. KURITSKY: The spectrum, specified  
4 rate spectrum.

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

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

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

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

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

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

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

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

11 DR. KRESS: Yes.

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

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

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

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

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

9 DR. KRESS: Yes. Right.

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

12 DR. KRESS: Yes. Yes.

13 DR. WALLIS: And so --

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

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

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

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

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

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

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

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

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

22 DR. BONACA: That's right.

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

25 DR. BONACA: So for that particular case

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

4 MR. KURITSKY: Don't need it.

5 DR. BONACA: That's right.

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

8 MR. KURITSKY: Yes. Yes.

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

11 MR. KURITSKY: Yes.

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

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

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

20 MR. KURITSKY: That is --

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

23 DR. BONACA: And to Peter.

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

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

4 DR. BONACA: Too hard.

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

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

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

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

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

6 DR. SHACK: Not a safer cow, right?

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

19 DR. BONACA: Absolutely.

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

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

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

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

7 DR. SHACK: That's easy.

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

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

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

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

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

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

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

13 MR. KURITSKY: Excuse me?

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

16 MR. KURITSKY: Well, the --

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

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

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

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

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

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

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

12 DR. WALLIS: Right.

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

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

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

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1 bullet? It's all materials problems?

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

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

15 DR. BONACA: The containment ropes.

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

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

23 MR. KURITSKY: Surrogate.

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

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

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

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

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1 MR. LEITCH: What is in it for NRC?

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

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

9 MR. ROSEN: Exactly.

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

13 MR. ROSEN: That's exactly right.

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

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

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

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

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

5 DR. SHACK: Right.

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

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

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

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

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

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

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

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

25 DR. APOSTOLAKIS: Never stopped you

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1 before.

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

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

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

18 MS. DROUIN: Yes.

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

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

25 MS. DROUIN: Well, it goes with the 50.46

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1 and Appendix K.

2 MR. KURITSKY: Right, 50.46 and Appendix  
3 K.

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

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

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

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

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

25 MS. DROUIN: Correct.

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

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

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

7 DR. APOSTOLAKIS: A huge change.

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

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

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

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

22 DR. BONACA: But still you would have --

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

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

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

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

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

21 MR. ROSEN: Yes.

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

24 MS. DROUIN: Absolutely.

25 DR. KRESS: Especially the first part;

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1 what changes are going to result.

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

4 DR. KRESS: With the reliability  
5 statement.

6 MS. DROUIN: Yes.

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

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

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

15 MS. DROUIN: Perhaps.

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

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1 have all the design basis of the plant.

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

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

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

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

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

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

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

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

7 MS. DROUIN: Yes.

8 DR. APOSTOLAKIS: 50.69?

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

11 MS. DROUIN: Option 3 aspect.

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

14 MR. CUNNINGHAM: The work that Mary is  
15 talking about would be a step beyond what's in Option  
16 2 today. It would be to change the -- Option 2 looks  
17 at what's the scope of equipment that has to be  
18 subject to --

19 DR. APOSTOLAKIS: Right.

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

25 DR. APOSTOLAKIS: And that's it?

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1 MS. DROUIN: Okay. Schedule.

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

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

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

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

21 MS. DROUIN: Yes.

22 DR. APOSTOLAKIS: Someone didn't just say  
23 let's do it in a year. What's the magic about July 2,  
24 2002 since everything is --

25 DR. WALLIS: No. By saying they can do

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

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

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

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

14 DR. WALLIS: What's the uncertainty on the  
15 12 months.

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

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

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

23 DR. APOSTOLAKIS: And you fail.

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

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1 of stuff --

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

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

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

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

10 DR. BONACA: Development.

11 DR. WALLIS: Right.

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

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

16 MS. DROUIN: Absolutely.

17 DR. WALLIS: Okay.

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

20 DR. SHACK: Short letter.

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

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

3 Again, we're going to continue, we aren't  
4 going to stop our technical work. We're going to  
5 continue on that and we feel that can be done by April  
6 2002. And the development of the proposed, again, 12  
7 months from the SRM or two months after the completion  
8 of the technical work.

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

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

14 DR. BONACA: I understand. Okay.

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

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

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

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

3 MR. KURITSKY: So those would be interim  
4 changes.

5 DR. APOSTOLAKIS: Huh?

6 MR. KURITSKY: These will be interim  
7 changes.

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

12 DR. APOSTOLAKIS: Or something else?

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

16 DR. APOSTOLAKIS: Yes. They are, yes.

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

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

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1 requirements in GDC 35. So that way whether or not  
2 the actual wording change occurs in GDC 35 or in  
3 50.46, we haven't decided that yet.

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

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

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

19 MS. DROUIN: Mark?

20 MR. CUNNINGHAM: Well, of course. Mary  
21 said something a little bit ago that plays into this.  
22 In the context of Option 3 the focus over the next  
23 couple of years is going to be changes to 50.44 and  
24 50.46. That was to make sure that the resources we've  
25 got available here are focused where we want them to

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

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

10 DR. WALLIS: Now this is an RES activity?

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

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

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

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

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

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1 meeting on this subject would be.

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

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

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

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

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

16 MS. DROUIN: Yes.

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

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

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

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

6 MR. CUNNINGHAM: 50.46, yes.

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

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

12 MS. DROUIN: Any other questions?

13 DR. SHACK: No more questions?

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

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

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

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

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

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

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

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

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

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

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

22           Terry, did you want to comment?

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

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

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

19           So, we see this change it should be very  
20 simple. We think take the 1.2 multiplier out in the  
21 1971 standard and replace it with the current standard  
22 which has uncertainty built into it.

23           To summarize it another way --

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

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

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

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

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

11 DR. WALLIS: Yes.

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

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

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

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

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

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

12 MR. REICK: Whose margin is it?

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

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

17 DR. APOSTOLAKIS: Page 10.

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

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

24 MR. REICK: Yes.

25 DR. APOSTOLAKIS: They might three sigma?

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

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

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

13 MR. REICK: Correct.

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

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

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

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

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

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

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

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

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

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

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

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

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

21 DR. SHACK: That's B, right?

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

25 MR. REICK: I'd like the acceptance

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

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

17 MR. REICK: That's agreed.

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

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

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

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

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

11 MR. REICK: Well, what I'm saying is my  
12 understanding is the current criteria is only 2200 and  
13 17 percent is already based on post-quench cladding  
14 ductility. And so I don't understand what change is  
15 being proposed here, and we're doing some testing on  
16 that.

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

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

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

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

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

11 DR. BONACA: But my understanding --

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

14 DR. BONACA: -- reading the material --

15 MR. REICK: That's the acceptance  
16 criteria.

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

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

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

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

25 MR. REICK: That's a whole separate

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

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

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

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

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

9 DR. WALLIS: I'm not surprised to see the  
10 NRC going for a more ambitious way of helping you guys  
11 to reduce conservatism then you want to let them do.

12 MR. HEYMER: Well, I think it's not  
13 necessarily a question of that. It's a question of  
14 concern over timing.

15 DR. WALLIS: So you don't think they can  
16 do it with the time available?

17 MR. HEYMER: Well, judging on my past  
18 experience, we're probably going to struggle a little  
19 bit on some of those.

20 DR. BONACA: Just before we move, and this  
21 is just for clarification for me, I had understood in  
22 reviewing this package that 2200°F, the criteria as we  
23 have right now, may be we're over restrictive criteria  
24 to the term meaning what is an adequate post-quench  
25 cladding ductility. Okay.

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1 MR. HEYMER: And the advantage compared  
2 with the rest -- because we haven't read the material,  
3 everything made publicly available.

4 DR. BONACA: That would be my  
5 understanding. So there would be still some benefit  
6 even for current licensees by exploring ways or  
7 criteria that would still provide adequate post-quench  
8 cladding ductility but less restrictive than the  
9 current criteria? That's my understanding, and maybe  
10 I was wrong.

11 MR. HEYMER: Well, hopefully, the SECY  
12 would be released to the public and then we can  
13 provide some input on the policy.

14 MR. REICK: My reading of this it doesn't  
15 provide anything to current --

16 DR. BONACA: Okay.

17 MR. REICK: Cladding materials doesn't  
18 provide any relaxation, because the current criteria  
19 is based on post-quench ductility.

20 DR. BONACA: I understand. But the  
21 reading seemed to me that the implication was that  
22 that criterion was in amount to use to measure this,  
23 was over restrictive. I don't know what else could be  
24 proposed.

25 MR. OSTERIEDER: The other point related,

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1 I guess, we just have to be careful with any required  
2 changes to acceptance criteria. If we're not careful,  
3 we may end up causing everybody to reanalyze for  
4 something that appears from what we heard today to be  
5 -- give more margin but some plants may not want to  
6 spend the effort. They may be satisfied with their  
7 current analysis. So, we just wanted to state the  
8 obvious, that we'd have to be careful that everybody  
9 wouldn't have to be required unless we felt we were  
10 doing this to -- for an issue that was not handled as  
11 appropriately as it should have been in the past.

12 DR. WALLIS: This is a remarkable sort of  
13 seesaw issue. I mean, when we meet sometimes you guys  
14 are all eager to press ahead and do stuff and NRC's  
15 dragging its feet. And the next time around the NRC's  
16 all eager to press ahead and you guys say "Let's drag  
17 out feet because they can't do it."

18 MR. HEYMER: We are happy and we're  
19 willing to move ahead and push on as expeditiously as  
20 possible. We just want to be careful that we don't  
21 get ourselves bogged down into so many details that we  
22 don't actually make some progress on stuff that is  
23 relatively straight forward.

24 MR. SIEBER: Well, it seems to me that  
25 there's a trade going on in squad 10. If you look at

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1 the last bullet it talks about viewing with recognized  
2 nonconservatisms and model limitations. And I sort of  
3 got the impression that there was going to be a trade  
4 off between the decay heat multiplier and the decay  
5 heat curve versus the nonconservatisms which sort of  
6 all in one full swoop consumes at least some of the  
7 margin that they built in when they built in the 1.2  
8 multiplier. So you may get a thing that you might  
9 like and something you may not like as an output.

10 MR. HEYMER: As I say, we were just giving  
11 you our first reactions.

12 DR. WALLIS: I guess the criterion for the  
13 NRC to do this is not that it saves money for  
14 industry. They're interested in public safety, and if  
15 this is the right to do it, that's the right way to do  
16 it.

17 MR. HEYMER: And we fully agree with that.  
18 It's just a question of if we can do it in the 12  
19 months, great. We go on and do it. But if it takes  
20 36 months, we'd much rather take some of the things  
21 that are, in fact, the low hanging fruit.

22 MR. OSTERIEDER: I guess I just want to  
23 make another comment on our being gungho in some cases  
24 and not in others. I think we continue to be gungho  
25 in large-break redefinition. Certainly we were a lot

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1 more optimistic than the staff is. And we think that  
2 this effort is a big effort. And if we're going to do  
3 a big effort, we still think we should go for the  
4 risk-informed redefinition; that's why we're gungho on  
5 one and not the other.

6 As we've heard already, there's limited  
7 resources and you can only put it in certain areas.  
8 And if we're going to have a big effort, we're  
9 thinking that the redefinition is the more appropriate  
10 way to put the big effort.

11 DR. WALLIS: Well, whose resources are you  
12 talking about? Is it the effort that you folks would  
13 do to analyze these issues or is it the resources the  
14 NRC's going to put into it?

15 MR. OSTERIEDER: Well, I thought I heard  
16 in here that the NRC said that their effort, you know,  
17 their manpower is allocated to these efforts. So I'm  
18 concerned with their involvement.

19 DR. WALLIS: Yes.

20 MR. OSTERIEDER: Plus we've had a  
21 difficult time, and this isn't really a resource  
22 issue, I suppose, but just getting the next technical  
23 meeting scheduled has been a bit of a challenge. But,  
24 again, I don't know that that's a resource issue.  
25 It's getting the right people together.

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1 DR. WALLIS: I think the last time we met  
2 industry was gungho and said we're going to put the  
3 resources behind this to make a really case for what  
4 we think should be done.

5 MR. HEYMER: And as regards the redefining  
6 large-break LOCA, that still is the case.

7 DR. WALLIS: Still is the case.

8 MR. HEYMER: But there does become an  
9 industry resource issue if regards to too much at  
10 once.

11 MR. OSTERIEDER: Right. And we have a  
12 number of resources allocated and ready to go, and  
13 we've kind of put the brakes on a bit if we're not  
14 going to have the staff looking at this to any great  
15 extent and we're going to be able to get the  
16 initiatives developed and agreed to after we do our  
17 work; that's what we're trying to sort out.

18 MR. HEYMER: As regards to the other  
19 topics, on LOOP LOCA, yet again that's something that  
20 there's an awful lot of information out there at the  
21 current time. There's a lot of information out on  
22 loss of off-site power, and there's been a lot of  
23 studies done on plant centered events. There's been  
24 a lot of work done as regards good reliability and  
25 what the impact of that could be in the last 9 months

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1 or so.

2 So, we are going to think that's a  
3 relatively quick issue to get under our belt and we  
4 look forward to working with the staff in that regard.  
5 And in some cases, I think I'd be surprised if the  
6 technical work can't be done in less than 12 months,  
7 So, that's good.

8 On redefining the large-break LOCA, as Bob  
9 said a few moments ago, that still is where we have  
10 most of our resources focused and we're still very  
11 interested in moving ahead with that.

12 One of the issues that we did have on the  
13 table or the suggestions that we had made previously  
14 was that there be an enabling rule, fairly straight  
15 forward, which would then provide double ended  
16 guillotine break or an alternative break size as  
17 approved by the Commission. And it's just not quite  
18 clear to me whether that's still in the works or  
19 whether or not we're trying to come up with more  
20 detail criteria to put into the rule. It seems more  
21 like the latter, and that's something that we'll have  
22 to discuss internal and get back with the staff.  
23 That'll probably be a comment that we make once we get  
24 the SECY and have had a chance to review it.

25 MR. OSTERIEDER: Right. And that is when

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1 you asked earlier on whether some of the changes,  
2 there was talk at the last meeting of the potential to  
3 put something in. And we certainly were excited by  
4 that potential knowing that we still have the  
5 technical issues to deal with as we do in either case.  
6 But now if we do move ahead and do something in the  
7 nearer term, then I guess we need to ask for an  
8 exemption or a petition or something to -- if the  
9 wording isn't going to be changed in the near term by  
10 the staff. So, that's a bit of a change from what we  
11 were hoping from your last meeting and we have to  
12 consider what that means.

13 MR. HEYMER: I think to sort of sum up,  
14 we're pleased that the process is moving forward now.  
15 We would probably like to see the emphasis still be  
16 placed on redefining a large-break LOCA. I think as  
17 somebody in this Committee mentioned, we're quite --  
18 you know, industry to do the work and the NRC to  
19 review it. And we're more than ready to work with the  
20 staff to define what we need to do. We think we know  
21 what that is at the moment, but before we actually  
22 start pulling everything together and interacting with  
23 the staff, we'd like to sit down with them so that we  
24 can get a better scope on that. So we're really  
25 interested in moving forward.

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1           We think there are some near term  
2 objectives that we can achieve, certainly within the  
3 12 month time frame. And we look forward to reading  
4 the SECY when it's released.

5           MR. REICK: Let me add a comment from the  
6 BWR perspective.

7           DR. SHACK: Did you say B or P?

8           MR. REICK: BWR, boiling water reactors.  
9 Our committee agrees with the large-break LOCA  
10 redefinition of the priority, but we also looked at  
11 the other NRC proposed options and prioritized within  
12 our group other options. And we do like some of the  
13 options in here, I want to make sure that comes  
14 across.

15           The LOOP LOCA coincidence can be a benefit  
16 for the BWRs. And it was asked here what type of  
17 examples do you have. And the LOOP LOCA is, I think  
18 a good one to illustrate how we might benefit. For  
19 the large-break we require and we rely on the diesels;  
20 that is the LOOP in connection with the large-break  
21 requires the diesel to start so that you can have your  
22 low head pumps, your quick injecting pumps be  
23 available. Because they're driven by electrical  
24 motors.

25           For the small-break, we rely on steam

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1 that's still available in the small-break to drive  
2 some of our pumps. And we have separate -- we have a  
3 separate diesel driven pump, separate from our main  
4 grid. So we don't have to rely on off site power.

5 So we may be able to relax our criteria,  
6 for example, on our fast start diesels. That is the  
7 large-break we won't need them and we don't need them  
8 for the small-break, and so we could relax the start  
9 requirements and have them start at a more reasonable  
10 time frame and, thus, improve the reliability of the  
11 diesels. And that is the diesels would not have to go  
12 through the fast starts and, thus, be degraded because  
13 of the fast starts and they could be started -- maybe  
14 they would start automatically, but it would be in a  
15 three minute time frame as opposed to 10 seconds or  
16 maybe they could even wait for a manual start when you  
17 need them for a small-break. So there could be some  
18 benefit in that. We're looking seriously at that.

19 The single failure criteria could fall  
20 into that, but we're still -- we still need some  
21 discussion on what the single failure would mean for  
22 us. I think it's still a little hazy on how you might  
23 factor that into your analyze.

24 DR. WALLIS: Could you put this in the  
25 sort of rational that optimizing the use of the

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1 diesels so that you have them available when you  
2 really need them.

3 MR. REICK: Right.

4 DR. WALLIS: And they're most reliable  
5 when you need them, so in fact safety's improved?

6 MR. REICK: That's correct.

7 DR. WALLIS: Could you make that case?

8 MR. REICK: They are -- that's the case  
9 that we would make. They're most beneficial when you  
10 need them and they're more reliable because of the way  
11 you would operate them.

12 So we have -- you know, those are the key  
13 things we've looked at, decay heat and the benefit to  
14 a LOOP LOCA as opposed to single failure after the  
15 redefining the break size. There is some benefit in  
16 the proposals here and we're pleased to move forward  
17 on those.

18 That's all I wanted to say.

19 DR. SHACK: If there are no other  
20 questions, the staff has asked for a letter, and I  
21 think we'll want to put one together.

22 Do I have any thoughts or comments from  
23 people about what we should say in a letter?

24 DR. WALLIS: Well, about the letter, we  
25 don't have this document which isn't yet finished?

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1 DR. SHACK: Well, we have a preliminary  
2 version of it.

3 DR. WALLIS: But it's not --

4 DR. SHACK: It hasn't been approved by the  
5 EDO.

6 MR. CUNNINGHAM: That's correct, it's  
7 still in the EDO's office. And we would -- obviously,  
8 we don't anticipate changes, but as soon as we get the  
9 signed version, then we would get it back to the  
10 Committee.

11 DR. WALLIS: Well, that would be before we  
12 have to write the letter?

13 MR. CUNNINGHAM: I hope it's in the next  
14 few days. Next week. Again, I don't anticipate major  
15 changes, but we could certainly try to -- if there are  
16 changes, we could lay out what the changes were and  
17 that sort of thing to help out the Committee.

18 DR. SHACK: But I would think that, you  
19 know, we could certainly talk about the options that  
20 are discussed in attachment 1 in the overall document  
21 of the options. And, you know, it might be a matter  
22 of which had higher priorities. But that's something  
23 we could comment on almost irrespective of what the  
24 staff decided the priorities with the options.

25 So, I think we could move ahead on the

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1 letter myself. Well, maybe that's something we can  
2 discuss after people have had a chance to think about  
3 it a little bit.

4 DR. APOSTOLAKIS: Well, they're coming  
5 back to address the full Committee, right?

6 DR. SHACK: Right.

7 MR. LEITCH: We're almost all here anyway.

8 DR. BONACA: Maybe next week before,  
9 however, we could get a feedback.

10 DR. APOSTOLAKIS: If we don't like the  
11 letter this time, it'll be in September, right? Even  
12 if we slip one day, that's it. The Commission will  
13 vote when?

14 MR. ROSEN: I didn't hear any very  
15 negative views expressed, so I think we in general are  
16 in agreement with the approach. So I think it would  
17 be useful.

18 DR. BONACA: I think there is some opinion  
19 we have with priority for redefining the large-break.

20 DR. SHACK: Well, I mean the staff has  
21 said it's going to go forward. You know, they haven't  
22 stopped that work and it's, you know -- at this point  
23 it's just sort of a skepticism about whether -- but I  
24 think the short term benefits they're talking about  
25 are definitely benefits also. I mean, especially the

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1 Appendix -- or the B one.

2 MR. SIEBER: Well, if somebody's pressed  
3 on the final acceptance criteria, it would certainly  
4 be handy to have some of that margin that would come  
5 out of the short term benefits.

6 DR. WALLIS: I would favor encouraging the  
7 staff, that we go ahead with what they've laid out  
8 here and not trying to meddle too much in redirecting  
9 them.

10 MR. SIEBER: Well, it's pretty early in the  
11 game, too. This is all feasibility study.

12 DR. SHACK: Right.

13 MR. SIEBER: And so the decisions as to  
14 what you finally will pursue and how much effort you  
15 put into it won't be made for another year. So, you  
16 know, there isn't too much that can be said other  
17 than, again, encouragement.

18 DR. KRESS: Well, I think they're on the  
19 right track. I see some details --

20 MR. ROSEN: The A&S standard has only been  
21 out 7 years. I mean, it's pretty young. It's really  
22 time for us -- of course, I'm kidding.

23 DR. KRESS: Well, I think there's some  
24 unanswered questions on how you deal with margins in  
25 the deterministic end of the thing. As we use more

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1 realistic calculations, we approach these limits. But  
2 those limits were set knowing that you had a pretty  
3 good margin in the first place. And there may be some  
4 question about the appropriateness of the limits as  
5 you approach them.

6 I think Graham raised this issue that are  
7 the limits independent of the margins. And I think  
8 there are some questions that -- but that's for  
9 something later on.

10 MR. SIEBER: The more important question  
11 is who owns the margin.

12 DR. KRESS: Oh, I think definitely we  
13 ought to have an ACRS position on that. And my  
14 position, of course, will be that the licensee owns  
15 the margin.

16 MR. SIEBER: Well, provided you get the  
17 licensee to fix up nonconservatism that may exist  
18 that the margin in the old days took care of one way  
19 or another. And so to me you can't do it piecemeal,  
20 you have to do like a package.

21 DR. KRESS: Well, I think I would agree  
22 with that. I think as a general principle the  
23 licensee owns the margins. Now there's a question  
24 about what margins are actually there and how do these  
25 limits get set, and what do the uncertainties do when

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1 they overlap the margins. There's a lot of little  
2 questions, but I think as a general principle the ACRS  
3 thinks the licensee owns the margins.

4 MR. SIEBER: I didn't see any of that  
5 discussion in the feasibility study.

6 DR. SHACK: But I don't think the staff  
7 disagrees with that.

8 DR. KRESS: Yes, I don't think they do  
9 either.

10 DR. SHACK: They're acceptance limits and  
11 that's why they're called acceptance limits. Yo know,  
12 there's a debate on whether you've calculated things  
13 properly perhaps, but that's a review process.

14 MR. SIEBER: But the concept of defining  
15 what the margins are --

16 DR. KRESS: I think there's some debate  
17 there.

18 MR. SIEBER: Right. And I think that  
19 ought to be dealt with as part of this project.

20 DR. KRESS: That's part of the 8.

21 MR. SIEBER: Yes.

22 DR. WALLIS: Well, this would be the  
23 margins of the two signal or the three signal level,  
24 that sort of thing.

25 MR. SIEBER: Well, that would be one

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1 aspect.

2 DR. KRESS: Well, here once again is a  
3 good place for some formal decision criteria to enter  
4 the picture. Right, George?

5 DR. WALLIS: Well, this is one of the  
6 questions we wrestle with all the time is whether or  
7 not --

8 DR. APOSTOLAKIS: Never disagree with you.

9 DR. BONACA: Well, so much of it we have  
10 to see for the work they do. For example, the issue  
11 of single failure or elimination of it, it's very  
12 significant in that it drops so many of the issues of  
13 LOCA; what you inject, what assumption you make, what  
14 is the break. All these. And so --

15 DR. KRESS: But I think they're well aware  
16 of that.

17 DR. BONACA: Yes, they're well aware of  
18 it. So what I'm saying all we can do is to follow  
19 progress and I'm sure they'll ask the right questions  
20 before we ask them.

21 So, you know, in the broader sense of  
22 eliminating, that's even a bigger --

23 MR. ROSEN: But that's long term.

24 DR. BONACA: That's long term.

25 DR. KRESS: But you know it's the right

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1 direction. You're getting rid of some of these vague  
2 things that are closely related to risk somehow and  
3 actually getting them pinned down as to how much value  
4 they really are and what do they mean --

5 DR. BONACA: For the existing plants,  
6 however, those decisions were integral with the design  
7 of the plant. Many of the single failures were  
8 eliminated by designing the plant in a different way  
9 because that resulted in acceptable results. So, you  
10 had a lot of alternations between the analysts and the  
11 people designing the plants and how they ended up the  
12 way they are. So, you know, I think for a newer plant  
13 the design, I think today, with PRA you would have a  
14 much better approach in evaluating all the possible  
15 outcomes and considering also the probabilities for  
16 the sequences so that you know --

17 DR. KRESS: And there's where I keep  
18 harping on you to use your uncertainties correctly.

19 DR. BONACA: Yes, and I agree with that.  
20 But anyway, that it is along --

21 MR. ROSEN: I think you just made a very  
22 important point that I hadn't heard discussed before.  
23 The changes go back to 50.46 and all the other risk  
24 informed changes are changes that will apply to new  
25 plants as well.

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1 DR. KRESS: Yes.

2 MR. ROSEN: And we're about to see I think  
3 -- I hope -- we hope some new plants.

4 DR. APOSTOLAKIS: Well, I don't know.  
5 50.46, I mean, everything we're discussing today is  
6 really water, isn't it? Water? ECCS and all that?

7 MR. ROSEN: But what about changes to the  
8 single failure corrector?

9 DR. APOSTOLAKIS: That, yes.

10 DR. BONACA: But I would expect under the  
11 current regulatory environment, an applicant could  
12 come in and provide a study of single failure based on  
13 a PI, and that would be much more credible how you  
14 eliminate certain --

15 DR. APOSTOLAKIS: It's not even a single  
16 failure. It's a single failure of hardware, right?  
17 And put the operator there to defeat everything. And  
18 that's not the same --

19 DR. BONACA: But the point I'm making is  
20 that you assume -- see -- in search almost of a design  
21 that was acceptable, you assume those kind of  
22 failures. Now you would do it through a PRA.

23 DR. WALLIS: If we're looking ahead to new  
24 plants we should encourage the staff to get  
25 performance-based and not sort of specific based

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1 entirely on the existing fleet of plants.

2 MR. UHRIG: But what impact would this  
3 have on the certified plant?

4 DR. KRESS: They have their own rule.

5 DR. WALLIS: But this business about the  
6 cladding and stuff, how would it apply to a peddle bed  
7 reactor? But if you had something which said that  
8 you've got retain fission products, then that applies  
9 to anything.

10 DR. KRESS: Yes, I think that's a good  
11 point that you make. I mean, why you worry about the  
12 ductility of the event.

13 DR. WALLIS: Ductility of the cladding of  
14 a peddle bed reactor, yes.

15 What is the ductility of these ceramics?

16 DR. KRESS: Sounds pretty good.

17 DR. SHACK: But you put in a nice buffer  
18 layer to absorb all the changes.

19 Are there any particular items we want  
20 brought up at the full Committee, they should be  
21 addressing anything?

22 DR. APOSTOLAKIS: This was a nice  
23 presentation for a full Committee.

24 DR. KRESS: Yes, and it wasn't that long,  
25 was it? They might have to shorten it some.

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1 DR. APOSTOLAKIS: Yes, they can shorten it  
2 a little bit. But other than that --

3 DR. SHACK: I'm sure that's not a problem  
4 for you.

5 DR. WALLIS: Will NEI have a presentation  
6 or have you had time to think about before the full  
7 Committee?

8 MR. HEYMER: Since we haven't seen the  
9 SECY and we're not really available on Wednesday  
10 because we have an interaction with the senior NRC  
11 management, we weren't planning to say anything more  
12 than what we've said today.

13 DR. SHACK: Okay.

14 DR. BONACA: I have a question, Mr.  
15 Chairman, which is shall we give back this document  
16 here?

17 DR. APOSTOLAKIS: No. This pre-  
18 decisional, right?

19 MR. MAYFIELD: That's right. You just  
20 can't share it with anyone else. It's for your use  
21 only.

22 DR. BONACA: Then I will not share it with  
23 you.

24 DR. APOSTOLAKIS: We never share anyway.

25 DR. SHACK: Well, if there are no more

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1 serious items to be discussed, I think we can adjourn  
2 the Subcommittee meeting.

3 (Whereupon, at 4:45 the Subcommittee was  
4 adjourned.)

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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.



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Official Reporter  
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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 Michael T. Markley (301) 415-6885  
Contact: E-mail: [mtm@nrc.gov](mailto:mtm@nrc.gov)

**- PROPOSED SCHEDULE -**

<b>TOPIC</b>	<b>PRESENTER</b>	<b>TIME</b>
<b>1) Introduction</b>		<b>1:30-1:35 am</b>
<ul style="list-style-type: none"> <li>• Review goals and objectives for this meeting; introductions</li> <li>• Risk-informing 10 CFR 50.46 for emergency core cooling systems; discussions from March 16, 2001 Joint Subcommittee meeting</li> <li>• Technical issues associated with large-break loss-of-coolant accidents (LBLOCA), leak-before-break phenomena (LBB), and probabilistic fracture mechanics (PFM)</li> </ul>	Bill Shack, ACRS	
<b>2) NRC Staff Presentation</b>		<b>1:35-3:30 pm</b>
<ul style="list-style-type: none"> <li>• Overview of Phase I activities</li> <li>• Results of feasibility study for risk-informing 10 CFR 50.46; Options: ECCS reliability, acceptance criteria evaluation model, LBLOCA redefinition</li> </ul>	Tom King, RES  Mark Cunningham, RES Mary Drouin, RES M. Mayfield, RES A. Kuritsky, RES	
<b>**BREAK**</b>		
<b>3) NRC Staff Presentation - continued</b>		<b>3:30-3:45 pm</b> <b>3:45-4:30 pm</b>
<ul style="list-style-type: none"> <li>• Phase IIA technical work, policy issues, and schedule</li> </ul>	M. Cunningham, RES M. Drouin, RES M. Mayfield, RES A. Kuritsky, RES	
<b>4) Industry Comments</b>		<b>4:30-4:45 pm</b>
<ul style="list-style-type: none"> <li>• Overall industry approach: Why redefine LBLOCA?</li> <li>• Owners Group perspectives</li> </ul>	Adrian Heymer, NEI  TBD	
<b>5) ACRS General Discussion and Adjournment</b>		<b>4:45-5:00 pm</b>
<ul style="list-style-type: none"> <li>• General discussion and comments by Members of the Subcommittee; items for full ACRS meetings</li> </ul>	Bill Shack, ACRS	

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**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:

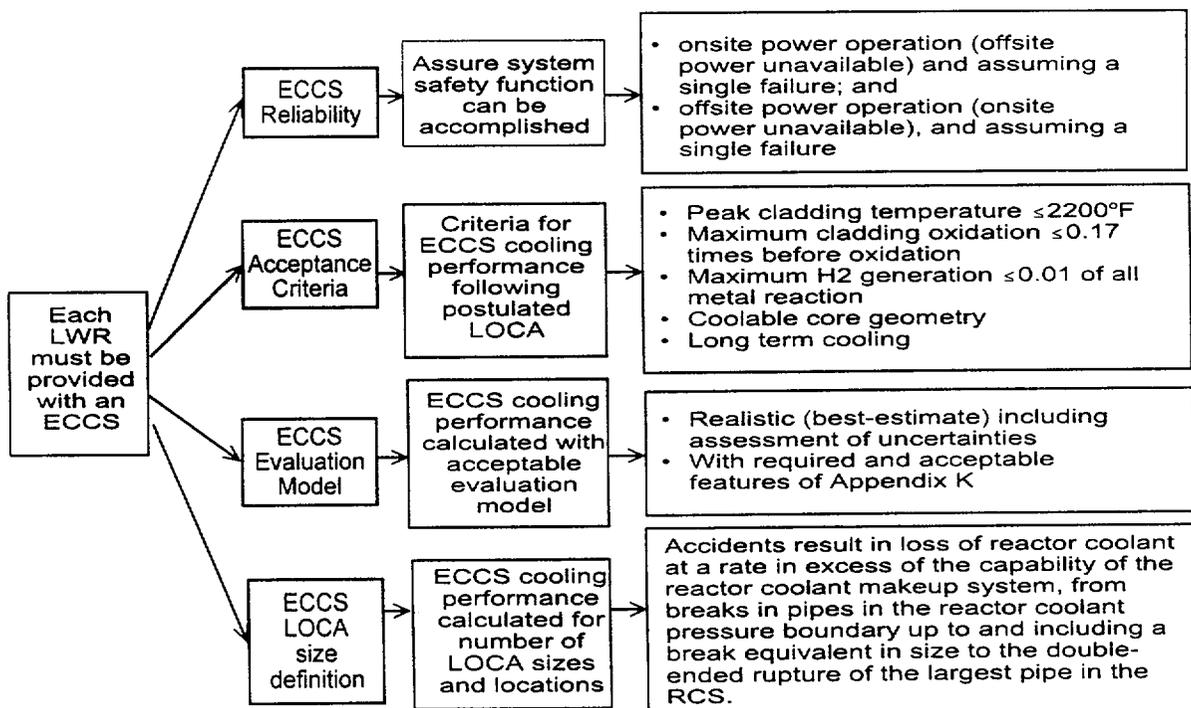
- ▶ Part A: Identify candidate requirement
- ▶ Part B: Prioritize
- ▶ Part C: Evaluate feasibility and provide recommendations to Commission
  - ★ Develop technical content and basis for alternative
  - ★ Identify policy issues
  - ★ Identify required technical work
  - ★ Identify required resources

### ■ Phase II:

- ▶ Part A: Perform technical work
- ▶ Part B: Develop and implement rulemaking

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## OVERVIEW OF 50.46 (including Appendix K and GDC 35)



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# **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

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# **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

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## 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

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## 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

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# 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

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# 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

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# 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)

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# 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

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# 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

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# 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

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# 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

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## 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.

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## **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

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## **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

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