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## NUCLEAR REGULATORY COMMISSION

# ORIGINAL

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Joint Meeting of the Subcommittees on  
Materials and Metallurgy, Thermal-Hydraulic  
Phenomena, and Reliability and Probabilistic  
Risk Assessment

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UNITED STATES OF AMERICA

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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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

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FRIDAY,

MARCH 16, 2001

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ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear  
Regulatory Commission, Two White Flint North, Room  
T-2B3, 11545 Rockville Pike, at 8:30 a.m., William J.  
Shack, Chairman of the Materials and Metallurgy  
Subcommittee, presiding.

COMMITTEE MEMBERS:

WILLIAM J. SHACK, Chairman, Materials and  
Metallurgy Subcommittee

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1 COMMITTEE MEMBERS: (cont'd)

2 GRAHAM B. WALLIS, Chairman, Thermal-Hydraulic

3 Phenomena Subcommittee

4 GEORGE APOSTOLAKIS, Chairman, Reliability and

5 Probability Risk Assessment Subcommittee

6 MARIO V. BONACA, Member

7 THOMAS S. KRESS, Member

8 JOHN D. SIEBER, Member

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## I-N-D-E-X

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

(8:29 a.m.)

CHAIRMAN SHACK: The meeting will now come to order.

This is a joint meeting of the Advisory Committee on Reactor Safeguards, 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, Thomas Kress, and Jack Sieber.

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 also discuss the proposed final report on the NRC Safety Research Program. 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

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1 staff engineer for this meeting.

2 The rules for participation in today's  
3 meeting have been announced as part of the notice of  
4 this meeting previously published in the Federal  
5 Register on March 1, 2001, and later amended to  
6 provide for discussion of the report on the NRC Safety  
7 Research Program.

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

13 We have received no written comments or  
14 requests for time to make oral statements from members  
15 of the public regarding today's meeting.

16 For those who came to attend the 50.46, we  
17 will be taking about an hour. That will -- we'll  
18 start the discussion of 50.46 at about 9:35.

19 At the moment, I'll turn it over to George  
20 Apostolakis to discuss the Safety Research Report.

21 MEMBER APOSTOLAKIS: Thank you, Bill.

22 As the members know, we have a new version  
23 of the report to the NRC on the Reactor Safety  
24 Research Program, and we would like to discuss some of  
25 the outstanding issues today and possibly vote on it.

1           So, Dr. Kress, would you lead us, please,  
2 through this?

3           MEMBER KRESS: Yes. Members should have  
4 a handout, the new draft version, which fortunately  
5 now has page numbers on it. And there are a number of  
6 items of disagreement or contention, and what I'm  
7 proposing we do is you have a sheet -- I think you  
8 should have a sheet that looks like this. These are  
9 the page numbers where those items are.

10           There's only really a few of them, but  
11 some of them are more contentious than others. And my  
12 proposal is that we take up the two most contentious  
13 ones first, and see if we can discuss it and come to  
14 some sort of agreement. That would be pages 11, 12,  
15 13, and 15.

16           MEMBER APOSTOLAKIS: Okay. So you are  
17 skipping the others?

18           MEMBER KRESS: Well, not yet. But we'll  
19 come back to them.

20           MEMBER APOSTOLAKIS: Oh, okay.

21           MEMBER KRESS: I just want to start with  
22 these --

23           MEMBER APOSTOLAKIS: All right.

24           MEMBER KRESS: -- because I think the  
25 others are probably relatively easy.

1 MEMBER APOSTOLAKIS: Okay. So you're  
2 saying 11?

3 MEMBER KRESS: Pages 11, 12, 13, and shut  
4 down --

5 MEMBER APOSTOLAKIS: Okay.

6 CHAIRMAN SHACK: This whole thing? We  
7 have two versions.

8 MEMBER APOSTOLAKIS: It is an alternate to  
9 what. To the previous paragraph? The one on page 10?

10 MR. EL-ZEFTAWY: The one on 12 was a  
11 recommendation to scratch the whole section of the  
12 standard for PRA.

13 MEMBER APOSTOLAKIS: Oh, oh, wait a  
14 minute. Wait a minute. So up to page 10, line 198,  
15 there is nothing, there is no change.

16 MR. EL-ZEFTAWY: Right.

17 MEMBER APOSTOLAKIS: So then you have one  
18 paragraph versus the standard for the PRA.

19 MR. EL-ZEFTAWY: Right. The one that's  
20 starting in -- on page 11, that's a new paragraph.

21 MEMBER APOSTOLAKIS: So line 199, line  
22 220, those would be the alternatives.

23 MR. EL-ZEFTAWY: Right. And then you have  
24 to decide if you're going to scratch from 220 all the  
25 way to 236.

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1 MEMBER APOSTOLAKIS: Yes, and adopt 199  
2 through 218.

3 MR. EL-ZEFTAWY: Correct.

4 MEMBER KRESS: That's the issue.

5 MEMBER APOSTOLAKIS: Okay. Okay.

6 MEMBER KRESS: Now, should we let members  
7 have time to read both of these first and then discuss  
8 them?

9 MEMBER WALLIS: Well, what's that page?  
10 It seems to be the one from --

11 MEMBER KRESS: That's the problem. The  
12 alternate has a much different thought process and  
13 much different than the other one.

14 CHAIRMAN SHACK: Well, actually, what I  
15 proposed for the alternate was it would replace the  
16 lines from 184, starting on the risk management tools  
17 used by industry, through 198, so it's --

18 MEMBER APOSTOLAKIS: See, that's what I  
19 thought.

20 CHAIRMAN SHACK: It's an alternate that  
21 replaces a fair chunk of that paragraph, rather than  
22 an addition.

23 MEMBER KRESS: So that replaces 184  
24 through 198.

25 MEMBER WALLIS: Well, that makes some

1 sense but that really changed the subject.

2 MEMBER APOSTOLAKIS: Yes. I thought the  
3 issue of standards for PRAs is an entirely different

4 --

5 CHAIRMAN SHACK: That's a different --  
6 yes, it just happens to come together here, but --

7 MEMBER APOSTOLAKIS: Oh, okay. So the  
8 alternate, then, in our report would replace the risk  
9 management tools. Because I thought when I saw the e-  
10 mail that this was really a rephrasing of that --

11 CHAIRMAN SHACK: Right. It's a rephrasing  
12 of the 184 to 198 section.

13 MEMBER APOSTOLAKIS: Well, I'm for the  
14 alternate.

15 CHAIRMAN SHACK: I would also just suggest  
16 that from reading last night the 177/179, I would take  
17 out the "It can be argued that licensees are  
18 adequately managing risk during planned outages." And  
19 just go directly to "The nuclear industry has made  
20 substantial efforts."

21 MEMBER APOSTOLAKIS: Wait a minute.

22 MEMBER KRESS: I think I would support  
23 that.

24 MEMBER APOSTOLAKIS: Where is that?

25 CHAIRMAN SHACK: It's on 177.

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1 MEMBER KRESS: Now, let me tell you --

2 MEMBER APOSTOLAKIS: And then you would go  
3 directly to where?

4 CHAIRMAN SHACK: I would take that  
5 sentence out and then take off the introductory  
6 phrase, "It is certainly true that," and just say,  
7 "The nuclear industry has made substantial" --

8 MEMBER KRESS: And start there. But let  
9 me -- now, I was against this change.

10 CHAIRMAN SHACK: Completely.

11 MEMBER KRESS: Completely. That was the  
12 word. And let me tell you why. The major message in  
13 these lines 184 down can be found in lines 184 and 185  
14 and 186 and part of 187. And that major message has  
15 been done away with, and that's a message I think  
16 needs to be said because it -- to me, it is the -- it  
17 highlights the major difference between what the  
18 industry does and needs and what the regulatory agency  
19 does and needs.

20 So I didn't want to lose that message,  
21 which the alternate -- the alternate proposal loses  
22 that.

23 CHAIRMAN SHACK: Deliberately.

24 MEMBER KRESS: Deliberately, of course.

25 MEMBER WALLIS: Why did you want to lose

1 it?

2 CHAIRMAN SHACK: Because I personally  
3 think that, you know, we've made that argument in our  
4 '99 letter, that there was this distinction between  
5 what the NRC was interested in and what the licensee  
6 was interested in. I think that's a false  
7 distinction. You know, if we're out here to just --  
8 to computer this number, I don't think that's  
9 important.

10 MEMBER KRESS: It's not a false  
11 distinction, because there are two reasons for having  
12 shutdown risk assessments. One of them is to manage  
13 that shutdown risk, as it is ongoing, and that -- the  
14 tools for that are what the industry uses and they're  
15 good tools. NRC needs to know about those tools and  
16 needs to be able to do that also.

17 But that doesn't help them at all when  
18 they go to risk-inform the regulations. Those tools  
19 tell them nothing. It just gives them a little -- a  
20 few insights. This tells them nothing about the risk  
21 contribution of shutdown. That's the problem.

22 And if you want the risk contribution due  
23 to shutdown to factor in to your risk-informing the  
24 regulations, you have to have this difference. And  
25 it's a different animal. It's not easy to do. And

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1 that's the reason it hasn't been done; it's not easy.  
2 And that's why some research is needed.

3 But that's my whole problem. If you want  
4 to risk-inform the regulations, you have to have this  
5 component in there. And that's my problem.

6 CHAIRMAN SHACK: I mean, I will argue that  
7 the reason I want to do shutdown risk studies is I  
8 want to be able to make the statement that we made  
9 that there are unlikely to be any major contributors  
10 to risk that have not been identified that we can make  
11 about normal operations. I don't think we can make  
12 that statement about shutdown risk. I don't think we  
13 can make it about fire risk.

14 MEMBER KRESS: I don't mind making that  
15 statement also. I just don't want to lose this  
16 distinction, though, because to me it's the major  
17 distinction. I wouldn't mind adding --

18 CHAIRMAN SHACK: Being the major one is,  
19 in fact, that you want the assurance that you've  
20 identified to measure the contributors to this.

21 MEMBER KRESS: Well, I think this is  
22 equally important. I think they have equal  
23 importance.

24 CHAIRMAN SHACK: That's why we completely  
25 disagree.

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1 MEMBER WALLIS: I don't understand really  
2 why there's so much disagreement. Can't you retain  
3 the sentence -- two sentences that Tom would like to  
4 retain? Is there something offensive about them?

5 CHAIRMAN SHACK: What's offensive about  
6 it, of course, is it was stuffed the last time we sent  
7 it up.

8 MEMBER KRESS: Well, you know, that  
9 shouldn't be any reason why we -- we shouldn't give  
10 good advice.

11 CHAIRMAN SHACK: I think it puts the wrong  
12 emphasis on why you're doing it.

13 MEMBER APOSTOLAKIS: I don't see the two  
14 points of view being very different, and I don't see  
15 why you would have to say which one is more important  
16 than the other, although I tend to agree with Bill.  
17 I think, you know, if there is a question of not  
18 knowing of some vulnerability, that is really the most  
19 important thing you would like to know about it.

20 But why do we have to say what's more  
21 important?

22 MEMBER KRESS: Well, I don't think you  
23 have to. I would be in favor of keeping both  
24 sentences. I just don't want to lose this thought.

25 MEMBER WALLIS: I think you could keep one

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1 of these, you can just take it on the end of that  
2 section. It's not incompatible, is it?

3 MEMBER KRESS: That would suit me.

4 MEMBER APOSTOLAKIS: Okay. So somebody  
5 will do that?

6 MEMBER WALLIS: Tom will do that. Tom has  
7 dictatorial authority.

8 MEMBER APOSTOLAKIS: Editorial or  
9 dictatorial?

10 MEMBER WALLIS: It's one of those Latin  
11 terms that you would have to -- the concept is  
12 probably unknown in --

13 MEMBER KRESS: Okay. Now, that sort of  
14 gets us on the road for maybe resolving that one. The  
15 next one is this section on -- starting on line 219.  
16 And I think the proposal there was to just zap that  
17 section all together. That's the question. Do we  
18 want to zap that section?

19 MEMBER APOSTOLAKIS: Well, since I  
20 proposed that, it's not that I'm against the agency  
21 spending resources to support the development of  
22 standards for PRA. It's just that I thought that this  
23 is something that the agency has committed to do.  
24 It's something that they will do. And I don't view  
25 that as research. So I didn't think it belonged

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1 there, but I didn't really --

2 CHAIRMAN SHACK: Well, there is research  
3 in lines 231, 232, 233, where you essentially define  
4 necessary features of PRAs.

5 MEMBER APOSTOLAKIS: Well, but that's part  
6 of this activity. This is not where we talk about  
7 necessary and sufficient, is it?

8 MEMBER KRESS: No. We'll get to that.

9 MEMBER WALLIS: I thought we ought to  
10 retain it, because this is a major issue with the --  
11 it's on the Commission's radar screen. They are  
12 worried about PRA quality and how to respond to  
13 critics. The quality is so lousy you can't use it,  
14 and --

15 MEMBER BONACA: We can put in a statement,  
16 George, that affects your point of view. This has  
17 already been dealt with in large part. We recognize  
18 that. But it's as important --

19 MEMBER KRESS: Well, let me tell you what  
20 my take is on this. My take is is the industry and  
21 the agency are on divergent courses. Industry is  
22 going out to -- through a certification process to  
23 certify the plant-specific PRAs. And the agency is  
24 going forth with this development of standards.

25 And I see the two as somewhat similar but

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1 not completely compatible. And what I think will  
2 happen is the agency will have this set of standards  
3 to look at, but the industry will come in for some  
4 request for an exemption or a change or rule --  
5 rulemaking or whatever, and the plant that comes in  
6 will bring his certified PRA certified by the industry  
7 process.

8 And the staff will be sitting there with  
9 another whole set of standards. And they will have to  
10 somehow reconcile the two, and that's what I'm asking  
11 for here is to give some thought to how they're going  
12 to reconcile the two and see if there is some  
13 relationship between the standards and the  
14 certification, and maybe even adopt one or the other  
15 or both of them, show how they're related to each  
16 other.

17 So I thought we needed a section on  
18 standards to deal with what I see as an upcoming  
19 issue. And that's why I didn't want to zap this  
20 section.

21 CHAIRMAN SHACK: But I thought they  
22 already had a program in place to --

23 MEMBER KRESS: Yes, they have --

24 CHAIRMAN SHACK: -- at how good -- you  
25 know, whether the peer review was a grade 3 -- is

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1       adequate for Option --

2               MEMBER KRESS: Well, I'm sorry, I didn't  
3       see --

4               MEMBER APOSTOLAKIS: And also, didn't the  
5       staff also report some time ago where they had the  
6       necessary features? That was really nice, where they  
7       also had Appendix B and we recommended that they  
8       expand the --

9               MEMBER KRESS: They had necessary but not  
10      sufficient.

11              MEMBER APOSTOLAKIS: But it's not  
12      sufficient here either. In fact, it says sufficiency  
13      is very difficulty. So all of these things either  
14      have been done or are in the process of being  
15      completed. That's all.

16              MEMBER KRESS: Well, you know, everything  
17      we talk about is -- I don't know why this one should  
18      be different.

19              MEMBER WALLIS: They don't want to --

20              MEMBER APOSTOLAKIS: I don't see it as  
21      research. But, anyway, I'm not going to --

22              MEMBER KRESS: Well, research is a good --  
23      has got a broad envelope in this agency.

24              MEMBER APOSTOLAKIS: All right. Well,  
25      that's fine with me. We can keep it. I didn't feel

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1 strongly about it. It's just that I thought it was  
2 something that was being done anyway.

3 But this also is nice because it says  
4 clearly that you cannot define "sufficiency"  
5 requirements, which we will remember a little bit  
6 later.

7 MR. EL-ZEFTAWY: That word has been taken  
8 out, the 242 -- line 242. When it comes to  
9 sufficient, we took the word "sufficiency" --

10 MEMBER APOSTOLAKIS: Where is 242? That's  
11 on -- what do you mean?

12 MR. EL-ZEFTAWY: But, I mean, originally  
13 we had "sufficient and necessary," and we took the  
14 word "sufficient" out.

15 CHAIRMAN SHACK: On 242, it was "necessary  
16 and sufficient features of probabilistic risk  
17 assessment" once upon a time. That -- we nailed that  
18 --

19 MEMBER APOSTOLAKIS: Okay. So that's an  
20 old letter.

21 CHAIRMAN SHACK: Yes.

22 MEMBER WALLIS: So as long as the PRA  
23 methods are insufficient, that would be okay?

24 CHAIRMAN SHACK: Yes.

25 MEMBER APOSTOLAKIS: Okay. So we could --

1 so we keep that.

2 MEMBER KRESS: So we keep this, and that  
3 resolves that issue. Well, we're making headway.  
4 These other things I think --

5 CHAIRMAN SHACK: Well, I think there's a  
6 question why George wants SPAR out.

7 MEMBER KRESS: Yes, that's on 13.

8 MEMBER APOSTOLAKIS: Because it's --  
9 really, the whole thing addresses the issue of codes.  
10 SPAR is a model. I mean, they are taking the IPs and  
11 putting them on SAPPHIRE, right? Is that what SPAR  
12 is, essentially? No?

13 MR. KING: Well, it's not taking the IPs.  
14 It's taking our own models, which in many cases are  
15 better than what the IPs had.

16 MEMBER APOSTOLAKIS: Right. Right.

17 MEMBER KRESS: But they are in a sense  
18 PRAs. They're very --

19 MR. KING: No, plant-specific now. We've  
20 got -- we're developing SPAR models for each plant.

21 MEMBER KRESS: But they could not --

22 MEMBER APOSTOLAKIS: But the whole point  
23 of this paragraph was to address the need to peer  
24 review the fundamental tool of SAPPHIRE. Now, whether  
25 you use SAPPHIRE to do other things, I mean, I would

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1       --

2               CHAIRMAN SHACK: Well, I thought it was  
3 more risk assessment tools. I was going to suggest  
4 changing lines 241 and 242 to read, "An agency effort  
5 to define the kinds of risk assessment tools needed to  
6 support regulatory processes might well provide the  
7 agency" --

8               MEMBER APOSTOLAKIS: In my mind, the  
9 important recommendation is 244. The SAPPHIRE code  
10 has reached a stage of development that the public  
11 deserves to see a comprehensive peer review of this  
12 code. This is the message here.

13              MEMBER KRESS: Yes.

14              CHAIRMAN SHACK: But I think Dana has been  
15 adamant that they need better risk assessment tools,  
16 and so I think he would look at both the --

17              MEMBER APOSTOLAKIS: But we say that  
18 somewhere else. This is not the place. This is -- he  
19 doesn't discuss SPAR. He just mentions them in  
20 passing.

21              MEMBER KRESS: That's the only place in  
22 here we say anything about SPAR.

23              CHAIRMAN SHACK: Well, I mean, you might  
24 say we ought to say more about SPAR, but I'm not sure  
25 we should argue we should say less.

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1 MEMBER BONACA: I agree with that.

2 MEMBER APOSTOLAKIS: Look at the first  
3 sentence. "The NRC risk assessment codes and models  
4 continue to undergo development, and the vision of  
5 this code" --

6 CHAIRMAN SHACK: These codes and models.

7 MEMBER KRESS: I think it's --

8 MEMBER APOSTOLAKIS: I think it dilutes  
9 it. I think it really is the SAPPHIRE thing that  
10 needs the review.

11 MEMBER KRESS: Do you want to take us --

12 MEMBER APOSTOLAKIS: I mean, we're asking  
13 them to do a peer review of a SPAR model?

14 CHAIRMAN SHACK: No. No, no. All we're  
15 saying is they should continue the development, and  
16 we'd just like a little better, more organized picture  
17 of what they really intend to get to with the SPAR  
18 models. How good do they need to be? How good are  
19 they? How good --

20 MEMBER APOSTOLAKIS: Where does it say  
21 that? It doesn't say that?

22 CHAIRMAN SHACK: Well, it's -- if we say  
23 an agency -- you have to define the kinds of risk  
24 assessment tools needed to support regulatory process  
25 -- might well provide the agency with a more scrutable

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1 strategy for the development of these models and  
2 codes.

3 MEMBER KRESS: Yes, I wouldn't be against  
4 that.

5 CHAIRMAN SHACK: You know, changing the  
6 words a little bit.

7 MEMBER APOSTOLAKIS: Sometimes asking for  
8 too much means you are getting nothing back. I think  
9 if you have a specific recommendation, take this code  
10 and peer review it. It's very hard to say, "There are  
11 ways around it." Developing better models, yes, we  
12 are development better models. What do you want? I  
13 think it dilutes the message. The message is breaks  
14 of power are so important to have some sort of peer  
15 review to -- I don't care about the --

16 MEMBER KRESS: Let's take the -- the  
17 proposal is to remove the word "SPAR" from here and  
18 just have this paragraph focus specifically on  
19 SAPPHIRE. Those in favor of that, please raise your  
20 right hand. Those opposed? So it passed three to two  
21 to -- so we're going to remove that "and SPAR," and  
22 this paragraph is just going to --

23 MEMBER APOSTOLAKIS: Now, what are we  
24 going to do about line 241? The necessary features of  
25 probabilistic risk assessment support -- are you still

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1 leaving that there? I think it's okay to leave it.  
2 I mean --

3 MEMBER WALLIS: Let's leave it.

4 MEMBER APOSTOLAKIS: -- it's sort of a  
5 model for --

6 MEMBER KRESS: Let's leave it. Let's  
7 leave it.

8 MEMBER APOSTOLAKIS: Okay.

9 MEMBER BONACA: It's mentioned as part of  
10 the -- from your report?

11 CHAIRMAN SHACK: I believe so.

12 MR. EL-ZEFTAWY: So it's even from line  
13 237.

14 MEMBER APOSTOLAKIS: Yes, the SAPPHIRE  
15 code.

16 MR. EL-ZEFTAWY: Okay.

17 MEMBER APOSTOLAKIS: Right.

18 MEMBER KRESS: Okay. That takes care of  
19 that problem. Now, where should we go? Let's see  
20 what's on page 25. Let's look at 15. That's the next  
21 one. That's the next contentious issue. That's the  
22 quantification of uncertainties.

23 MEMBER APOSTOLAKIS: I was the one getting  
24 kind of --

25 MEMBER WALLIS: No, it's very important

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1       that we do that.

2                   MEMBER APOSTOLAKIS: Well, my point was  
3       that this is also too dilute. Let's --

4                   MEMBER WALLIS: Be stronger about it?

5                   MEMBER APOSTOLAKIS: We worry about  
6       uncertainty, and so on. I think our message is that  
7       in the context of these new thermal-hydraulic codes,  
8       we'd like to see statement of model uncertainty.

9                   MEMBER KRESS: This had to do with PRA.

10                  MEMBER WALLIS: We'd like uncertainty  
11       evaluated everywhere, including PRA, as a separate --

12                  MEMBER APOSTOLAKIS: Well, I mean, if you  
13       do that there, that's PRA.

14                  MEMBER WALLIS: Yes, well, this is a PRA.  
15       We're talking about PRA.

16                  MEMBER APOSTOLAKIS: And what they say in  
17       the PRA context, "Please address the issue of  
18       uncertainties and quantify them," again, is a  
19       motherhood statement. Because PRA is supposed to do  
20       that. If you don't do an uncertainty calculation, you  
21       are not doing a PRA. So I thought the message was  
22       clearer in the other sections.

23                  MEMBER KRESS: Yes. But what this makes  
24       a point is that the uncertainty development in PRAs is  
25       mostly epistemic and they don't deal with the

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1 aleatory --

2 MEMBER APOSTOLAKIS: And they don't know  
3 that?

4 MEMBER KRESS: Well, we're saying here the  
5 only place you have both of those combined is in the  
6 NUREG 1150. And you need to somehow separate the two  
7 out and use some generic measure of the aleatory and  
8 let the codes go ahead and develop the epistemic. But  
9 at the end you add the two together some way.

10 You have to deal with both uncertainties  
11 some way in your development. Either -- either you do  
12 it in your -- how you make your decision using the  
13 results, or you make an assessment of them some way.  
14 But it says you need to deal better with  
15 uncertainties.

16 And it also makes an interesting point  
17 that -- to be careful somewhat with the Bayesian  
18 process because it knocks off details. And that's an  
19 important message, too.

20 MEMBER APOSTOLAKIS: I wrote that.

21 MEMBER KRESS: You wrote that?

22 MEMBER APOSTOLAKIS: But I'm proposing to  
23 eliminate it, because I think it's --

24 MEMBER KRESS: No, no, it's an important  
25 message.

1 MEMBER WALLIS: George, it's not as if  
2 they don't know it. If they know it, we're simply  
3 reinforcing it. And the fact that we wrote it in our  
4 report will help them. So --

5 MEMBER KRESS: The staff probably knows  
6 99 percent of everything that --

7 MEMBER APOSTOLAKIS: Can we get -- well,  
8 it's not a matter of that. Well, one thing we don't  
9 do right now is send the reader to other sections  
10 where similar things are discussed. Like here I think  
11 it would be very appropriate on line 301 if we  
12 actually send them to the thermal-hydraulic section.

13 MEMBER WALLIS: That would be fine. That  
14 would be fine.

15 MEMBER APOSTOLAKIS: That would make me  
16 happy.

17 MEMBER WALLIS: That would be fine.

18 MEMBER KRESS: I wouldn't be opposed to  
19 that.

20 MEMBER APOSTOLAKIS: Yes. I mean, this  
21 thing about -- as you know, we sent many e-mails to  
22 Dana back and forth. When I discussed this issue of  
23 updating the distributions it was in a very different  
24 context.

25 MEMBER KRESS: Yes.

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1 MEMBER APOSTOLAKIS: So I thought it was  
2 a little bit out of the blue. But it's okay. I mean  
3 --

4 MEMBER KRESS: Well, it fits you. I guess  
5 the word fits. So we'll retain this, and maybe add a  
6 sentence at the end that refers to the thermal-  
7 hydraulic section that deals with this same issue.

8 MEMBER APOSTOLAKIS: Now, if we retain it,  
9 look at 294. "Uncertainness in the models used for  
10 the analysis are seldom discussed." Is that correct?  
11 I don't think it's correct.

12 MEMBER KRESS: That one we might want to  
13 change.

14 MEMBER APOSTOLAKIS: They may not be  
15 quantified.

16 MEMBER WALLIS: We should take that out.

17 MEMBER APOSTOLAKIS: But they are  
18 certainly discussed. So let's take that out.

19 MEMBER KRESS: I thought we could deal  
20 with those kinds of things later. Well --

21 MEMBER APOSTOLAKIS: Also, on 293, of  
22 propagating parameter uncertainties, we don't need the  
23 word "epistemic" there.

24 MEMBER KRESS: 293? Yes, you're right.  
25 It's redundant.



1 MEMBER APOSTOLAKIS: Now --

2 MEMBER KRESS: Besides, anywhere I can  
3 mark out the words "epistemic" and "aleatory" I am  
4 willing to do --

5 (Laughter.)

6 MEMBER APOSTOLAKIS: 291. Yet careful  
7 quantification of the -- it's not -- there's a typo  
8 there.

9 MEMBER KRESS: Yes, there are a couple of  
10 typos.

11 MEMBER APOSTOLAKIS: Yes. Of  
12 uncertainties seldom appears in risk-informed  
13 regulatory discussions. Do we all agree with that?

14 MEMBER KRESS: Well --

15 MEMBER APOSTOLAKIS: Quantification. Yes,  
16 probably right. Quantification is correct. The  
17 discussion was incorrect.

18 Okay. So just make sure that at the end  
19 we put "see also Section 6." Go to the end of the  
20 paragraph, and --

21 MEMBER WALLIS: Is it only in Section 6  
22 that we want to --

23 MEMBER APOSTOLAKIS: Well, that's where  
24 the thermal-hydraulic is. Is there another place? I  
25 think that's the main place.

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1 MEMBER KRESS: I think that's the main  
2 place it's in here.

3 MEMBER APOSTOLAKIS: See Section Roman  
4 II.6. Thank you. Okay. Let's keep it.

5 MEMBER KRESS: Good. Let's go to page 25.  
6 That's another simple one. Oh. The suggestion was to  
7 delete that -- what should be the -- at the end of  
8 that. I oppose that suggestion because --

9 MEMBER APOSTOLAKIS: Well, isn't the  
10 second bullet -- sub-bullet -- where is it? Oh.  
11 Asking the same thing? When is human performance at  
12 the nuclear plant good enough? In fact, I prefer that  
13 than what it should be, and that was what dictating --  
14 the human error contribution should be 30 percent. So  
15 that's why I proposed to take it out. Personally --

16 MEMBER KRESS: I think you're right,  
17 George.

18 MEMBER BONACA: I think so.

19 MEMBER KRESS: I think you're right.  
20 Let's zap that.

21 MEMBER APOSTOLAKIS: You win a few, you  
22 lose a few.

23 MEMBER KRESS: Yes.

24 MEMBER APOSTOLAKIS: You lose a lot, you  
25 win a few.

1 (Laughter.)

2 No, no. No. Delete, "What should they  
3 be?" The red.

4 MEMBER KRESS: Okay.

5 MEMBER APOSTOLAKIS: Then, you want us to  
6 go to 33?

7 MEMBER KRESS: Yes, we might as well go  
8 right down the line here. Then we'll get back to six,  
9 eight, and nine.

10 MEMBER APOSTOLAKIS: So this is alternate  
11 now to what again?

12 CHAIRMAN SHACK: Hold on a second.

13 MEMBER APOSTOLAKIS: To all the bullets?

14 CHAIRMAN SHACK: Yes. Yes.

15 MR. EL-ZEFTAWY: Yes. It's all the --

16 MEMBER KRESS: The suggestion was to zap  
17 out all of --

18 MR. EL-ZEFTAWY: Actually, it's line 631.

19 MEMBER KRESS: Yes, and replace it with  
20 this tiny little sentence. Yes. And I think Bill  
21 Shack could -- could discuss why he thinks this is a  
22 good idea maybe.

23 CHAIRMAN SHACK: Okay. I just felt that  
24 basically you had better -- there were better points  
25 made in the discussion of the specific topics than

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1 there were here. I mean, these bullets didn't really  
2 -- couldn't even make the case. You know, whether the  
3 model is -- doesn't have the technical sophistication  
4 that you have at NIST is not really the question. The  
5 question is, is it good enough?

6 I don't know that it's, you know,  
7 specialized activities that can't be done by the  
8 regional staff and require -- you know, it does --  
9 this didn't strike me as very forceful arguments for  
10 why I needed research. I had much more forceful  
11 statements I thought in the discussion of the specific  
12 tools. And so I thought it actually strengthened the  
13 argument to get on with it.

14 MEMBER KRESS: And my feeling was that  
15 these are relatively true statements, all of them --  
16 the bullets. So it didn't hurt much to leave them in  
17 to set in -- give a context for the -- it didn't hurt  
18 to leave them in. And Dana -- they were close to  
19 Dana's heart, and so my feeling was it -- if it didn't  
20 hurt to leave them in, why not just leave them in?

21 CHAIRMAN SHACK: Well, for example, in  
22 631, this is what -- you know, we argue about when  
23 the staff should be doing things and when the industry  
24 should be doing things. It's not at all clear to me  
25 that this is a -- you know, that it's something that

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1 shouldn't be done by the industry, for example.

2 MEMBER KRESS: Well, if you're going to  
3 risk-inform it -- the process, then it's something  
4 that the agency ought to do.

5 CHAIRMAN SHACK: I think the industry  
6 should be -- you know, required to analyze  
7 consequences of the accidents.

8 MEMBER KRESS: Maybe what you -- how you  
9 risk-perform it is --

10 CHAIRMAN SHACK: Well, to facilitate the  
11 circuit analysis sounds to me like a licensee --

12 MEMBER BONACA: You know, I don't think,  
13 though, the bullets here are created equal. I think  
14 we should look one by one, because some of them, for  
15 example, I agree to retain. That first one -- it's an  
16 important observation. I think the fact that, you  
17 know, the NRC to have the technical sophistication of  
18 -- developed by -- it's an observation of --

19 MEMBER KRESS: I think we've used up our  
20 hour. Should we defer this to --

21 CHAIRMAN SHACK: No, we've got until 9:30.  
22 We've got half an hour.

23 MEMBER KRESS: Oh, do we?

24 MEMBER BONACA: Yes.

25 MEMBER KRESS: Okay. Thank you.

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1 CHAIRMAN SHACK: We're doing good.

2 MEMBER BONACA: Yes. The second bullet,  
3 for example, I could do without. I mean, so what's  
4 the problem? If you need to obtain a specialist for  
5 the important stuff, I mean --

6 MEMBER KRESS: I wouldn't want to be  
7 without that second bullet.

8 MEMBER BONACA: What?

9 MEMBER KRESS: I wouldn't want to be  
10 without that second bullet. Neither would Dana.

11 MEMBER SIEBER: Neither would I.

12 MEMBER KRESS: I've got two votes. If I  
13 raise my left hand, it's Dana. If I raise my right  
14 hand, it's --

15 MEMBER BONACA: No. I mean, I think we  
16 should walk through the bullets now and discuss --

17 MEMBER KRESS: Yes.

18 MEMBER BONACA: -- them all. I think some  
19 of them I agree with and some of them I don't agree  
20 with.

21 MEMBER KRESS: Well, I certainly wouldn't  
22 want to get rid of bullet number three. I might be  
23 willing to get rid of bullet number four.

24 CHAIRMAN SHACK: Okay.

25 MEMBER KRESS: And five. I would like to

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1 retain the first three bullets and get rid of --

2 MEMBER BONACA: I can go with that.

3 MEMBER APOSTOLAKIS: How many?

4 MEMBER KRESS: The first three.

5 MEMBER APOSTOLAKIS: The first two?

6 MEMBER KRESS: The first three.

7 MEMBER APOSTOLAKIS: And replace them by  
8 the alternate or just --

9 MEMBER KRESS: Well, the alternate might  
10 be something we'd want to replace them with. No, no,  
11 the alternate would -- we said that to some extent in  
12 the --

13 MEMBER APOSTOLAKIS: Right. So eliminate  
14 the first three bullets.

15 MEMBER KRESS: Yes. No, the last two.

16 (Laughter.)

17 MEMBER APOSTOLAKIS: Wait a minute. Wait  
18 a minute. You are eliminating --

19 CHAIRMAN SHACK: The last two.

20 MEMBER APOSTOLAKIS: The significance of  
21 the termination process?

22 MEMBER KRESS: Yes. But read the whole  
23 thing, George. I mean, what -- I mean, I don't think  
24 that's very helpful to the --

25 MEMBER APOSTOLAKIS: Right, right, right.

1 MEMBER KRESS: You know, the important --

2 MEMBER APOSTOLAKIS: I would say it is  
3 based on evaluations that are not at all transparent  
4 to the public.

5 MEMBER KRESS: Well, I would probably  
6 agree with leaving it in if you --

7 MEMBER APOSTOLAKIS: Yes.

8 CHAIRMAN SHACK: Transparency to the  
9 public is --

10 MEMBER APOSTOLAKIS: Or transparent,  
11 period.

12 CHAIRMAN SHACK: Until we've gone through  
13 the STP, I'm -- you know, that's sort of my thing, is  
14 that we --

15 MEMBER KRESS: We haven't really reviewed  
16 the --

17 CHAIRMAN SHACK: -- we haven't reviewed  
18 this.

19 MEMBER APOSTOLAKIS: Well, but in that  
20 spirit, have you really reviewed the NIST code? And  
21 do you know that it's much better than --

22 CHAIRMAN SHACK: Hey, I voted for  
23 eliminating all of the bullets myself.

24 (Laughter.)

25 MEMBER APOSTOLAKIS: I think something



1 about the STP is important. I mean, you can say they  
2 are not at all transparent, but, you know --

3 CHAIRMAN SHACK: It would be helpful if I  
4 had read it and I knew what it was.

5 MEMBER APOSTOLAKIS: It would have been  
6 helpful, yes.

7 MEMBER WALLIS: I think Dana has read it.

8 CHAIRMAN SHACK: Yes. But my comment was  
9 that I think Dana may be the only one that has read  
10 it. And, you know, this is a committee position.

11 MEMBER BONACA: This could be a true  
12 statement and transparent -- and much of the  
13 regulations are transparent to the public.

14 CHAIRMAN SHACK: right.

15 MEMBER APOSTOLAKIS: So why would we say  
16 "not at all transparent to the public"? But it  
17 doesn't matter? Because the other regulations are the  
18 same way.

19 MEMBER KRESS: Yes, that's my point. I  
20 don't think it has to be transparent.

21 MEMBER WALLIS: Well, I'd be happy to  
22 remove it. We don't really seem to be certain that we  
23 want to say --

24 MEMBER KRESS: Let's zap those two.

25 MEMBER APOSTOLAKIS: Yes.

1 MEMBER KRESS: Yes.

2 MEMBER APOSTOLAKIS: I'm not sure about  
3 the first bullet.

4 MEMBER KRESS: Okay. Let's go back to --

5 MEMBER APOSTOLAKIS: Is it the case of the  
6 grass being greener on the other side?

7 MEMBER KRESS: Well, I think it's a case  
8 of --

9 CHAIRMAN SHACK: But even if it's not, it  
10 doesn't -- you know, I'm sure there are lots more  
11 technical sophisticated ways to do lots of things.  
12 The question is, you know, is it good enough?

13 MEMBER APOSTOLAKIS: And I'll submit the  
14 overall fire risk assessment methodology that is used  
15 by the fire community is not as sophisticated as ours.  
16 Maybe individual tools are a little better.

17 MEMBER BONACA: But given the significance  
18 of fire risk, okay, given the significance of fire  
19 risk, I think that, you know, that's a statement that  
20 says we have expectations that the NRC had the better  
21 -- had these available, acknowledge that it's not  
22 being used right now.

23 MEMBER APOSTOLAKIS: Well, really, the  
24 message should be that the technical sophistication of  
25 our tools is behind that of the state of the art.

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1 That is more accurate I think.

2 MEMBER KRESS: Yes, why don't we say that.

3 MEMBER APOSTOLAKIS: But to compare now  
4 with NIST and --

5 MEMBER KRESS: Yes, I think you're right,  
6 George. Let's do it that way.

7 MEMBER APOSTOLAKIS: Okay.

8 MEMBER KRESS: Give her the --

9 MEMBER APOSTOLAKIS: Huh?

10 MEMBER KRESS: Give her what that --

11 CHAIRMAN SHACK: We'll work on it later,  
12 and we'll -- just move on.

13 MEMBER APOSTOLAKIS: The technical  
14 sophistication of models that appear in the  
15 literature --

16 MEMBER KRESS: I think we're going to zap  
17 the red part of it.

18 MEMBER APOSTOLAKIS: We're zapping what?

19 MEMBER KRESS: This.

20 MEMBER BONACA: The alternate?

21 MEMBER APOSTOLAKIS: Oh, the alternate.  
22 Yes, that goes.

23 MEMBER KRESS: Okay. We will work on that  
24 bullet.

25 MEMBER APOSTOLAKIS: Okay. And we're

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1 keeping everything else? What?

2 CHAIRMAN SHACK: Did you take out -- the  
3 last two bullets went.

4 MEMBER APOSTOLAKIS: Oh, the  
5 significance --

6 CHAIRMAN SHACK: The significance of  
7 termination and --

8 MEMBER SIEBER: And the first one gets  
9 rewritten.

10 MR. DURAISWAMY: Hey, Tom, excuse me. You  
11 just took out the last two bullets? The last one,  
12 too?

13 MEMBER KRESS: Yes.

14 MR. DURAISWAMY: But the last one I think,  
15 you know, they've got some problems between the  
16 industry and the staff.

17 MEMBER KRESS: But that's why --

18 MR. DURAISWAMY: I don't think you should  
19 take it out.

20 MEMBER APOSTOLAKIS: No. But I agree with  
21 Bill here. It's not obvious to me that there are  
22 computational methods that could be developed to  
23 facilitate it. Have we ever investigated that? Is it  
24 obvious to everybody else?

25 MR. DURAISWAMY: Well, that's why I think

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1 we've got to set up a subcommittee to --

2 MEMBER APOSTOLAKIS: Yes.

3 MR. DURAISWAMY: -- talk about that and --

4 MEMBER APOSTOLAKIS: I cannot say right  
5 now that obvious computational methods could be --

6 CHAIRMAN SHACK: The "obvious" has to go,  
7 if nothing else goes.

8 MEMBER WALLIS: If you're going to say  
9 this, I would have a period after "fires," and cut out  
10 this and simply start, "Computational methods should  
11 be developed to" --

12 MEMBER APOSTOLAKIS: That makes me much  
13 happier.

14 MEMBER KRESS: Well, do we want to put --

15 MEMBER APOSTOLAKIS: Take out "when  
16 obvious." And capitalize "computational."

17 MEMBER WALLIS: But a period here, too.

18 MEMBER APOSTOLAKIS: Where are you now?

19 MEMBER WALLIS: No, no, no.

20 MEMBER APOSTOLAKIS: We zapped it.

21 MEMBER KRESS: Let's put it back in.

22 MR. EL-ZEFTAWY: So you're just taking out  
23 one "obvious"? Is that the only thing you're going to  
24 take out?

25 MEMBER WALLIS: "Computational methods

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1 should be developed." Should instead of could.

2 MR. EL-ZEFTAWY: And there's a period  
3 after "developed."

4 MEMBER WALLIS: To facilitate the --  
5 analysis, risk-inform the--

6 MR. EL-ZEFTAWY: Okay.

7 MEMBER KRESS: I would put a statement  
8 when --

9 MEMBER APOSTOLAKIS: Is it really a  
10 controversy with the licensees?

11 MEMBER WALLIS: Yes, I think you might  
12 want to change that, too. I would say something --  
13 "Staff finds itself disagreeing with licensees" or  
14 something like that.

15 MEMBER APOSTOLAKIS: Yes.

16 MEMBER WALLIS: Or in disagreement with --

17 MEMBER APOSTOLAKIS: Yes, finds itself in  
18 disagreement.

19 MEMBER WALLIS: Or it simply disagrees.  
20 Do we need to "find itself in disagreement"?

21 MEMBER APOSTOLAKIS: Disagrees. That's --

22 MEMBER KRESS: Get rid of "finds" in that  
23 sentence.

24 MEMBER APOSTOLAKIS: So you go to fires,  
25 put a period, on the second line?

1 MEMBER KRESS: Yes.

2 MEMBER APOSTOLAKIS: Delete "when obvious"  
3 and capitalize C.

4 MEMBER WALLIS: And then have "should"  
5 instead of "could."

6 CHAIRMAN SHACK: And we'll leave it to the  
7 highly paid arbitrator to straighten out the  
8 constructions of the other bullets.

9 MEMBER KRESS: Yes, Sam can do that.

10 MR. DURAISWAMY: Not highly paid, but --  
11 (Laughter.)

12 MEMBER KRESS: Let's go to 36. This is  
13 a --

14 MEMBER APOSTOLAKIS: Oh, you're going to  
15 another page? Oh, I had a question on line 640.

16 MEMBER KRESS: 640?

17 MEMBER APOSTOLAKIS: Yes. The ACRS has  
18 reviewed the plan and the concurs with the research  
19 program -- that the plan sets forth. When did --

20 MEMBER KRESS: Oh, we did that. Yes, that  
21 was -- we did that a couple of weeks -- months ago.  
22 That was --

23 MEMBER APOSTOLAKIS: A couple of months  
24 ago we wrote a letter?

25 MEMBER KRESS: Steve Arntz.

1 MEMBER APOSTOLAKIS: The fire protection  
2 --  
3 MEMBER KRESS: No, it wasn't.  
4 MEMBER APOSTOLAKIS: Yes, that was --  
5 MEMBER WALLIS: Wasn't this a Jack Sieber  
6 thing or --  
7 MEMBER KRESS: Yes, that was --  
8 MEMBER SIEBER: We all got copies of  
9 the --  
10 MEMBER WALLIS: Did we actually agree on  
11 it. There's a huge fat thing that came out and --  
12 MEMBER SIEBER: Yes, three-eighths of an  
13 inch thick.  
14 MR. DURAISWAMY: Did you write a letter,  
15 Jack?  
16 MEMBER SIEBER: Pardon?  
17 MR. DURAISWAMY: Did you write a letter?  
18 MEMBER SIEBER: No.  
19 MR. DURAISWAMY: So then you can't say  
20 ACRS completed the --  
21 MEMBER SIEBER: We never got it  
22 officially.  
23 MEMBER APOSTOLAKIS: Okay. Why don't we  
24 delete the sentence?  
25 MEMBER KRESS: Just zap the last sentence.

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1 Thank you, Sam.

2 MEMBER APOSTOLAKIS: Keep going. Keep  
3 going. Is it longer or shorter now?

4 MEMBER KRESS: Keep going to the -- whoa.

5 MEMBER APOSTOLAKIS: Wait. No, no, no,  
6 no. We are in the next section now. Go back. Well,  
7 it's not 640 anymore. Go back more.

8 MEMBER KRESS: Okay. There it is. 641.  
9 No, it's --

10 MEMBER APOSTOLAKIS: Go back some more.

11 MEMBER KRESS: Okay. Thank you.

12 Now, let's look at page 136. George, I  
13 think this is a debate between you and Mario.

14 MEMBER BONACA: Yes. I would say that the  
15 statement we had before that says "would surely" is  
16 too strong. I agree with that. The words I had  
17 originally was "is likely to."

18 MEMBER APOSTOLAKIS: Sorry? What were the  
19 words?

20 MEMBER BONACA: "Is likely to." It might.  
21 So I would change "would surely" to "is likely to" and  
22 Bill is proposing "could." I just wanted to make sure  
23 it wouldn't be too --

24 MEMBER APOSTOLAKIS: I would say "could"  
25 is more neutral, isn't it?

1 MEMBER KRESS: Yes. "Is likely to" means  
2 it is likely to. "Could" means there's --

3 MEMBER BONACA: That's my judgment. At  
4 this stage it's a judgment. Certainly, if it is just  
5 a might --

6 MEMBER APOSTOLAKIS: No, the "might" I  
7 think is too weak.

8 CHAIRMAN SHACK: "Could" is stronger than  
9 "might" and weaker than "is likely to."

10 MEMBER KRESS: "Could" is so weak that it  
11 always applies. "Could" is about as weak as you can  
12 get.

13 MEMBER APOSTOLAKIS: Replace "might" by  
14 "could."

15 MEMBER BONACA: I don't know.

16 MEMBER APOSTOLAKIS: No?

17 MEMBER BONACA: Are you sure? You don't  
18 think about "is likely to"? I understand that we're  
19 implementing a regulation and that affects --  
20 therefore, you know, PRA, you may have --

21 MEMBER WALLIS: Well, I sort of support  
22 Mario that this is old, and surely something has  
23 changed.

24 MEMBER BONACA: If you make it too weak,  
25 the whole section becomes into question. Why have a

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1 full section proposing something if you're really  
2 making a statement that is so weak that says "so  
3 what?" I mean, if really aging is not an issue, and  
4 you can have this plant at 600 years of age, I mean,  
5 why propose --

6 MEMBER KRESS: Well, we could say results  
7 could show increases in risk metrics. That's almost  
8 certain. I don't think they're going to go down.

9 MEMBER WALLIS: It implies that we think  
10 it's likely.

11 MEMBER KRESS: Yes. But even if it's  
12 likely, this doesn't address the question of whether  
13 George's statement that it's already so low that an  
14 increase doesn't make much difference gets lost in the  
15 noise. I think that's a significant statement.

16 MEMBER BONACA: I think George was  
17 focusing mostly on main components for the vessel  
18 rather -- I'm thinking about total -- I'm thinking  
19 about those nozzles that we saw cracked, and the UT  
20 failed to detect it.

21 MEMBER WALLIS: Well, I suggest no word at  
22 all. PRA that could account for aging of structures,  
23 systems, and components. Oh, I see. I'm sorry. I  
24 screwed up on that.

25 MEMBER BONACA: I agree that, you know,

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1 the statement "would surely" was too strong. But I  
2 think that -- I think I believe it's likely to show  
3 some -- I think it surely would --

4 MEMBER APOSTOLAKIS: The end part program  
5 of several years ago did not find any significant  
6 failures due to aging. It found partial degradation,  
7 things like that, but, hence, to see the impact of  
8 aging on failure rates have reached no conclusions.  
9 There is no evidence that the failure rates increase.

10 When we did the small study at MIT, again,  
11 we were hard pressed to really find a significant  
12 change in probabilities of core damage, and so on.  
13 That's why I'm reluctant to be very positive that,  
14 yes, we will find an impact. On the other hand, I'm  
15 not ready to say, no, there will be no impact. So, I  
16 mean, what --

17 MEMBER BONACA: So this is -- I've been  
18 thinking about the experience we had from industrial  
19 facilities other than LOCA, is that when it reaches  
20 end of life, even with the proper maintenance it  
21 becomes so troublesome that they get shut down just  
22 for economic reasons.

23 Now, here the implication is that those  
24 kinds of, you know, compounding failures you see more  
25 leaks here and there, some problems, are not going to

1 create a problem from a safety standpoint. It will  
2 only create a problem from an economic standpoint, so  
3 the plants would be retired. That's really the  
4 conclusions we are reaching.

5 Well, I think it's a stretch to reach just  
6 a conclusion. There is complexity that says, you  
7 know, common sense is telling me that it could affect  
8 those there. If I use "might" -- a section of this  
9 size, it would be --

10 MEMBER APOSTOLAKIS: I am with you on the  
11 "might," but do you disagree on using "could"? Is  
12 that too weak?

13 MEMBER BONACA: "Could" is a little weak.  
14 I mean, I -- you know, I thought that -- I really  
15 believe it is likely to show, but I have never made it  
16 -- we are assuming that --

17 CHAIRMAN SHACK: But you have Tom's  
18 problem -- is that surely there are increases. The  
19 question is whether they're significant or not.

20 MEMBER BONACA: Yes, I understand. Well,  
21 whatever it says, we believe in fact that they are not  
22 insignificant because of the --

23 MEMBER WALLIS: I have a different way of  
24 putting it. A PRA that could account for aging of  
25 structures would provide measures of increases in --

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1 MEMBER BONACA: That's not the meaning of  
2 this. What we intended to say is that we would see  
3 some increase due to the fact that you have increased  
4 failure rates of some type, and then the discussion of  
5 how you would contribute to those increases.

6 MEMBER WALLIS: But I think your  
7 colleagues object to the distinction that there are  
8 going to be increases.

9 CHAIRMAN SHACK: Graham gets us around  
10 that problem. I think his says --

11 MEMBER WALLIS: Yes, I had a time where  
12 there's going to be increases or not.

13 MEMBER BONACA: Could you repeat your --

14 MEMBER WALLIS: I said -- well, take what  
15 we've got. A PRA that could account for aging  
16 structures, systems, and components, would provide  
17 measures of increases in risk metrics, such as core  
18 damage frequency. We don't even need to say  
19 "increase."

20 MEMBER APOSTOLAKIS: It's a neutral  
21 statement.

22 MEMBER BONACA: I agree.

23 MEMBER APOSTOLAKIS: It's more neutral.

24 MEMBER BONACA: I agree.

25 MEMBER APOSTOLAKIS: It says we want to

1 know.

2 MEMBER BONACA: Right. I agree. And  
3 that's important for the --

4 MEMBER WALLIS: Without trying to guess if  
5 it's going to be --

6 MEMBER BONACA: I agree with that.

7 MEMBER APOSTOLAKIS: All right. So will  
8 you tell Sheri what to do there?

9 MEMBER WALLIS: Where are we? Take out  
10 all the red. Take out the "might." Take out the red  
11 stuff. Okay. And then take out "show." Would  
12 provide measures of --

13 MEMBER APOSTOLAKIS: No, "would surely"  
14 goes.

15 MEMBER WALLIS: Would provide -- instead  
16 of "increases," which occur -- okay. Take that out.  
17 Okay. Would provide measures of -- a long sentence.  
18 Increases in -- has aged.

19 MEMBER APOSTOLAKIS: And I would put a  
20 period there and say, "These increases are due to" --

21 CHAIRMAN SHACK: Yes, the sentence is too  
22 long.

23 MEMBER APOSTOLAKIS: Go back. Not right  
24 there. You want to put it after "operations" comma.  
25 As aged from 40 years to 60 years of operation. And

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1 then this increase would be expected due to increases  
2 -- there are too many "expecteds."

3 MEMBER WALLIS: Just take out the second  
4 "expected."

5 MEMBER APOSTOLAKIS: Yes.

6 MEMBER WALLIS: The second "expected."  
7 Well, due to a higher failure probability.

8 CHAIRMAN SHACK: An increase in failure  
9 probability along with components. Good enough.  
10 That's okay. Is that --

11 MEMBER WALLIS: Should we leave up to the  
12 "highly" --

13 CHAIRMAN SHACK: Yes.

14 MEMBER APOSTOLAKIS: So, essentially, what  
15 we're saying is that even though the plants meet the  
16 requirements of the license renewal rule, the risk  
17 will increase as they're allowed to operate from 40 to  
18 60 years.

19 MEMBER WALLIS: And we want to know. And  
20 we want to -- they should find out.

21 CHAIRMAN SHACK: But George has a comment  
22 on page 37 about some -- you know, the -- we didn't  
23 say anything that, you know, people are trying to  
24 manage this.

25 MEMBER BONACA: But the statement before

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1 says the risk increase is found to be small because of  
2 the implementation of requirements which are --

3 MEMBER APOSTOLAKIS: Where is that?

4 MEMBER BONACA: The statement right before  
5 that. It gives credit to -- like 137. I mean -- has  
6 extensive modeling programs in place. That's implicit  
7 in that statement that --

8 MEMBER APOSTOLAKIS: Where is that  
9 sentence that it says --

10 CHAIRMAN SHACK: 137.

11 MEMBER APOSTOLAKIS: I know the page, the  
12 line.

13 CHAIRMAN SHACK: The line is 2536 on your  
14 printed copy.

15 MEMBER KRESS: 538.

16 MEMBER APOSTOLAKIS: The risk increase is  
17 small because implementation reserves regulatory  
18 margins. Where does it say about --

19 CHAIRMAN SHACK: Well, I was going to  
20 change that line to read, "The risk increase may well  
21 be found to be -- may well be found small because the  
22 license renewal process is intended to provide  
23 insurance that aging management programs preserve  
24 regulatory margins," duh, duh, duh, duh, duh, duh,  
25 duh.

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1 MEMBER APOSTOLAKIS: Good. That's what --  
2 sounds good. That's good.

3 MEMBER BONACA: So give it to Sheri?

4 CHAIRMAN SHACK: I'll just give it --  
5 while we're on that page, too, I thought Tom -- we  
6 focus on the other metrics for power uprates. That  
7 sentence on 137 that starts at 2544, I was going to  
8 suggest changing to, "Assessments of the increases in  
9 risk associated with license and renewal and power  
10 uprates may need to consider risk metrics other than  
11 CDF and LERF."

12 MEMBER KRESS: Oh, great. I love that.

13 MEMBER BONACA: What is the line?

14 CHAIRMAN SHACK: It's this line. We just  
15 focused it purely on power uprates, and I think Tom  
16 would say that you really need to look at that in a  
17 broader sense.

18 MR. EL-ZEFTAWY: If we were to leave the  
19 last one -- if you look at page 139, line 2579, can  
20 you tell me if you agree on that change?

21 MEMBER APOSTOLAKIS: Where?

22 MR. EL-ZEFTAWY: Page 139.

23 MEMBER APOSTOLAKIS: Yes, it was approved,  
24 I thought.

25 MEMBER KRESS: Yes.

1 MR. EL-ZEFTAWY: So that's approved?

2 MEMBER APOSTOLAKIS: Yes.

3 MR. EL-ZEFTAWY: The e-mail exchange. All  
4 right.

5 MEMBER APOSTOLAKIS: Yes, I have no  
6 problem with that.

7 MEMBER KRESS: Okay. Now, I suggest we  
8 look at --

9 MEMBER APOSTOLAKIS: Any corrections?

10 MEMBER KRESS: No, not yet. We'll save  
11 that to last. But look on pages 8 and 9, and let's  
12 deal with those. I think Bill's suggestion was to  
13 move some of this around and delete some of it. He  
14 wanted to delete the lines highlighted in 140 and 141  
15 and move lines 152, 153, and 154 up to replace them --  
16 I think was the suggestion, wasn't it, Bill?

17 MEMBER WALLIS: What we have is actually  
18 the new 140/141. That's an addition to -- the  
19 highlighted 140/141 is an addition. It comes from  
20 152, which has been --

21 MEMBER KRESS: That's just -- you're  
22 right. And my suggestion was to not do that.

23 MEMBER WALLIS: Okay.

24 MEMBER KRESS: Is to -- is to delete that  
25 line 140/141 and retain 152 and --

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1 CHAIRMAN SHACK: Right. Yes. I wanted to  
2 insert that line up there, but I didn't know where to  
3 put it is all.

4 MEMBER KRESS: Yes. My feeling was that  
5 that sentence doesn't belong up there, because it's an  
6 entirely different subject matter than the rest of the  
7 paragraph.

8 CHAIRMAN SHACK: Yes, but read the  
9 sentence before that, starting on 137, and then look  
10 at the sentence that starts on 152. "One would expect  
11 that the Commission would -- would have available  
12 comprehensive state-of-the-art assessment tools. One  
13 would expect that site-specific risk information would  
14 be readily available to line organizations  
15 implementing risk assessment process." To me they're  
16 saying exactly the same thing.

17 MEMBER WALLIS: Yes, it is. I think  
18 you're right. I thought this was okay, sort of a  
19 compression of the idea.

20 MEMBER KRESS: Yes, but I would want to --  
21 I'd still want to get rid of that statement that risk  
22 assessment remains an activity that --

23 MEMBER WALLIS: Do you want to remove it  
24 all together?

25 MEMBER KRESS: Yes, that part of it I'd

1 like to get rid of.

2 CHAIRMAN SHACK: But would you then retain  
3 any part of 152 and 154, or that just all goes?

4 MEMBER KRESS: I would get rid of all of  
5 it, yes.

6 CHAIRMAN SHACK: Less is more.

7 MEMBER KRESS: Yes. Now, on page 9, Bill  
8 had added in the shaded part, and I suggested that we  
9 not add it in. And his reasoning I think was that  
10 this is something we're leaving out of the statement  
11 that's of use, but I -- my feeling was that these  
12 limited numbers of shutdowns are not useful at all to  
13 shutdown risk. I don't even want to refer to them,  
14 because I think they're useless.

15 CHAIRMAN SHACK: For your purposes,  
16 they're useless. You know, if you're looking for  
17 insight, I think they are useful. You know, they  
18 don't allow you to compute the average lifetime risk.

19 MEMBER KRESS: I think they're -- I think  
20 the statement that they're -- I mean, I think it's  
21 overly strong to say that you've got scoping  
22 assessments of shutdown risk at two representative  
23 plants. Period.

24 MEMBER WALLIS: I think they need more  
25 than that. They used more information than that.

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1 CHAIRMAN SHACK: That, to me, is just, you  
2 know, a -- we didn't do it; therefore, we ain't going  
3 to look at it.

4 MEMBER KRESS: Well, I'm not strong about  
5 -- you're right. I can go along with leaving it in.  
6 It doesn't hurt to say this.

7 MEMBER WALLIS: It's not a lie, is it?

8 MEMBER KRESS: No. Well, it's a very  
9 limited --

10 CHAIRMAN SHACK: Put in a very --

11 MEMBER APOSTOLAKIS: Let's leave it in.

12 MEMBER WALLIS: They did use this  
13 information. I mean, it --

14 MEMBER KRESS: Yes, let's leave it in.

15 Okay. Now, I didn't have a chance to send  
16 everybody the suggestions that Graham Wallis had on  
17 what to do with the --

18 MEMBER WALLIS: I sent them to all of the  
19 ACRS --

20 MEMBER KRESS: So you got some suggestions  
21 from Graham on what to do with the -- with some things  
22 that may be wrong with the introduction. And what I  
23 did was you have before you something that looks like  
24 this.

25 MEMBER APOSTOLAKIS: Oh, this is Graham's?

1 MEMBER KRESS: No. This is my response to  
2 Graham's suggestions.

3 MEMBER APOSTOLAKIS: Oh.

4 MEMBER KRESS: Before you look at it, I  
5 want to make one correction. Under two on page 2,  
6 there's supposed to be an introductory sentence that  
7 says the examinations of the research programs by the  
8 ACRS then did not focus on the initial need for the  
9 research results. Instead, the exemptions focused on  
10 the questions. And then --

11 MEMBER APOSTOLAKIS: Right. That's fine.

12 MEMBER KRESS: That's supposed to be --

13 MEMBER APOSTOLAKIS: That's fine.

14 MEMBER KRESS: But this is my -- what I've  
15 done is just rearranged things.

16 CHAIRMAN SHACK: Well, you've wiped out  
17 the whole user needs stuff.

18 MEMBER KRESS: No, it's supposed to be in  
19 there.

20 CHAIRMAN SHACK: Did it move somewhere?

21 MEMBER WALLIS: It wasn't supposed to.

22 MEMBER KRESS: It just moved.

23 MEMBER WALLIS: It should be removed  
24 because --

25 MEMBER KRESS: Well --

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1 MEMBER WALLIS: -- as it was.

2 MEMBER SIEBER: Well, I just moved it  
3 because I wanted you to look at this and see how it  
4 read and then make a decision whether to black out the  
5 --

6 MEMBER WALLIS: Well, you put it in now  
7 with your added sentence under two. You said we  
8 didn't refer to the user needs. We used these other  
9 criteria, and that clarifies it. I don't think we  
10 need to talk about user needs again, do we? Because  
11 we sort of take a swipe at them which isn't justified.

12 MEMBER KRESS: Where is the user needs  
13 part in here?

14 MEMBER WALLIS: On page 5. Nevertheless,  
15 motivation -- did not -- we could remove that because  
16 we've already said that.

17 MEMBER KRESS: Yes, that's the question.  
18 Do we want to leave that in or --

19 MEMBER WALLIS: Let's take that out  
20 because it sort of takes a swipe at something we never  
21 expand upon in any way.

22 MR. EL-ZEFTAWY: You're talking page 5,  
23 line -- the paragraph at the top?

24 MEMBER KRESS: Paragraph in the middle on  
25 page 5.



1 MR. EL-ZEFTAWY: Yes.

2 MEMBER WALLIS: Actually, we're talking  
3 about concerns about using the process at the top of  
4 page 5.

5 CHAIRMAN SHACK: Right. It's the first  
6 paragraph 5.

7 MEMBER WALLIS: I would like to remove  
8 both of those paragraphs.

9 CHAIRMAN SHACK: Yes, I don't think it  
10 helps.

11 MEMBER WALLIS: It says -- it sort of says  
12 the user needs process is in place, but we've ignored  
13 it completely because we think it's pretty lousy. I  
14 don't think that's what we want to say.

15 CHAIRMAN SHACK: I'm sure that's what Dana  
16 wants to say.

17 MEMBER WALLIS: Is it? But I'm not sure  
18 that's what we want to say, is it?

19 MR. LARKINS: I think Dana's point was  
20 that, you know, all of the research shouldn't be  
21 driven by the user need requests, that it should be  
22 some portion or percentage of the work that's done  
23 outside of this process, research on its own.

24 MEMBER KRESS: I suspect everybody would  
25 agree with this statement. So I don't know why we

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1 don't --

2 CHAIRMAN SHACK: But I thought it was  
3 cryptic enough as it was written.

4 MEMBER KRESS: Yes, it is pretty cryptic,  
5 isn't it?

6 CHAIRMAN SHACK: I mean, I had a rewrite  
7 of the paragraph that says, "As now constituted, the  
8 user needs process may lead to an overemphasis on  
9 short-term work to support immediate needs and not  
10 result in adequate support for research needed to  
11 improve line organization capabilities."

12 MEMBER KRESS: Is that a rewrite of the  
13 first paragraph?

14 CHAIRMAN SHACK: Yes, that's a rewrite of  
15 that first paragraph.

16 MEMBER WALLIS: You need something like  
17 that.

18 MEMBER KRESS: Yes, that sounds pretty  
19 good.

20 MEMBER WALLIS: I would support that and  
21 keep the first paragraph. I'd support that. And then  
22 the second paragraph I'm not sure we need that because  
23 they've already said that in the sentence that you  
24 added earlier.

25 MEMBER KRESS: I would go along with both

1 of those suggestions, Bill's rewrite of the first  
2 paragraph and --

3 MEMBER WALLIS: And removing the second  
4 one on page 5?

5 MEMBER KRESS: Yes.

6 MEMBER WALLIS: Okay. So, Bill, are you  
7 going to --

8 CHAIRMAN SHACK: I'll give you some words,  
9 and you can figure out how to work them in.

10 MEMBER APOSTOLAKIS: So you all agree with  
11 the third bullet here on this page, too?

12 MEMBER KRESS: Oh, yes, that's another  
13 question.

14 MEMBER APOSTOLAKIS: That was the ACRS  
15 approach?

16 CHAIRMAN SHACK: Well, I think we did try  
17 to consider that.

18 MEMBER APOSTOLAKIS: Some place.

19 CHAIRMAN SHACK: Some place.

20 MEMBER APOSTOLAKIS: Not really -- it was  
21 not a uniform --

22 CHAIRMAN SHACK: Nothing is ever uniform.  
23 We have no criteria, George, no process. We --

24 MEMBER KRESS: No privatization.

25 CHAIRMAN SHACK: In fact, I had a

1 paragraph if you'll look on the back of that, that  
2 says we -- can you give me that thing back?

3 MEMBER KRESS: No.

4 (Laughter.)

5 CHAIRMAN SHACK: I was going to put --  
6 following the three bullets, I was going to add  
7 something like, "In previous reports, we have argued  
8 that processes and criteria need to be developed to  
9 address such questions. These have not been  
10 developed, and our current assessment is based on our  
11 own intuitive judgments."

12 (Laughter.)

13 Get into the Jocelyn-Graham job there.

14 MEMBER WALLIS: I'd like to remove the  
15 "intuitive."

16 MEMBER APOSTOLAKIS: Isn't it true that  
17 the whole risk-informed revision of the regulations  
18 really should be done by the licensees? Who is  
19 benefitting from all of that? Why do we have to do  
20 it?

21 MEMBER KRESS: What did you say?

22 MEMBER APOSTOLAKIS: Yes. Why do we have  
23 to do it? Why do we have to develop performance  
24 indicators?

25 MEMBER KRESS: That's the job of the

1 agency.

2 MEMBER APOSTOLAKIS: Why? Who is  
3 benefitting from it? I would argue that the licensees  
4 are benefitting and we --

5 CHAIRMAN SHACK: We all benefit, George.  
6 Benefit is not -- benefit is not the criteria. That  
7 may be one of the elements of the thing.

8 MEMBER APOSTOLAKIS: I don't know. Is  
9 this work that needs to be done independently by the  
10 NRC? Why is the revised oversight process something  
11 that we need to do? They should propose all -- we  
12 review and approve.

13 CHAIRMAN SHACK: That's why we need  
14 criteria and judgment for doing that.

15 MEMBER APOSTOLAKIS: But that's not what  
16 it says. It says that we actually use this.

17 CHAIRMAN SHACK: We tried to think our way  
18 through that based on our own judgment of when things  
19 needed to be done independently, and when we could  
20 just review the license --

21 MEMBER APOSTOLAKIS: I think it was done  
22 in a very awkward way.

23 CHAIRMAN SHACK: Of course. Of course it  
24 was.

25 MEMBER APOSTOLAKIS: We could put it front

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1 up here that -- I mean, I understand the first two  
2 bullets. I mean, that we really did.

3 MEMBER KRESS: I think we've exceeded our  
4 one hour now. So we can put it on the agenda --

5 MEMBER WALLIS: Well, I do want to make  
6 some resolution about this question of by what  
7 criteria is this decided.

8 MEMBER APOSTOLAKIS: Yes. And that is  
9 something that bothers me, too. I mean, the only  
10 thing we didn't put are those little angels around the  
11 --

12 MEMBER KRESS: Well, I think we would just  
13 indent it and not bold it.

14 MEMBER APOSTOLAKIS: Huh?

15 MEMBER KRESS: I think we would just  
16 indent it and not bold it and --

17 CHAIRMAN SHACK: We already have it as one  
18 of the three bullets. Why repeat it again? Is sort  
19 of my theory. You know, it's the same as this -- this  
20 work that needs to be done independently by the NRC  
21 rather than depending on information supplied by the  
22 licensee. We've said it once. We don't have to say  
23 it again.

24 MEMBER WALLIS: Well, it's said again in  
25 response to this tension and competition. I want to

1 --

2 CHAIRMAN SHACK: Well, it's mentioned in

3 --

4 MEMBER WALLIS: Why don't we black that  
5 whole thing about tension and competition?

6 MEMBER APOSTOLAKIS: Although the  
7 identification? This paragraph? This paragraph?

8 MEMBER KRESS: I might be in favor of  
9 that, particularly because there is something in the  
10 wind and we may want to add some more to this in --

11 MEMBER APOSTOLAKIS: You're talking about  
12 the paragraph that starts, "Although there are" --

13 MEMBER KRESS: Yes.

14 MEMBER APOSTOLAKIS: Oh, that would make  
15 me very happy to take that out.

16 MEMBER WALLIS: That until the end or the  
17 whole thing?

18 MEMBER APOSTOLAKIS: Until the end, the  
19 present end.

20 MEMBER WALLIS: The present.

21 MEMBER APOSTOLAKIS: There would be  
22 another end.

23 MEMBER WALLIS: There would be another  
24 end?

25 MEMBER APOSTOLAKIS: Yes.

1 MEMBER WALLIS: You're rewriting the end  
2 of the story?

3 MEMBER APOSTOLAKIS: Shall we move on now  
4 and --

5 CHAIRMAN SHACK: We have to move on now.  
6 We have --

7 MEMBER APOSTOLAKIS: I think we have to  
8 take action here and vote. But the thought occurred  
9 to us earlier that perhaps we should add a few  
10 paragraphs to this as to where the agency -- what are  
11 the challenges in the future, in particular with new  
12 reactors. We have some of that in Roman 3, but we  
13 should move it up maybe from last year.

14 So what I would propose is that Tom and  
15 Dana -- Dana will be back on Monday -- add a few  
16 paragraphs and circulate them by e-mail, but we take  
17 a vote today, subject to that condition.

18 Tom, is that correct?

19 MEMBER KRESS: Yes. I was under --

20 MEMBER WALLIS: I think it would be very  
21 appropriate if we can do it well. I think it should  
22 be in this report. We're not going to --

23 MEMBER APOSTOLAKIS: Okay. So that's why  
24 we are assigning Tom to do it.

25 MEMBER KRESS: It says I have to do it

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1 well.

2 MEMBER APOSTOLAKIS: Yes.

3 MEMBER KRESS: I didn't agree to that.

4 (Laughter.)

5 MEMBER APOSTOLAKIS: I move that this  
6 report be accepted by the committee, subject to this  
7 condition that Dr. Kress will supply a few paragraphs  
8 to be added to the introduction regarding future  
9 challenges.

10 MEMBER BONACA: And the last paragraph?  
11 The introduction is scratched?

12 MEMBER APOSTOLAKIS: That has been a --

13 MEMBER KRESS: And I also met something  
14 that -- if you'll let me raise this with --

15 MEMBER APOSTOLAKIS: That's part of the  
16 motion.

17 CHAIRMAN SHACK: Yes. Dr. Kress has full  
18 power to do the cleanup work.

19 MEMBER KRESS: Okay. Good.

20 CHAIRMAN SHACK: He's the cleanup man.

21 MEMBER APOSTOLAKIS: Yes.

22 CHAIRMAN SHACK: Second.

23 MEMBER APOSTOLAKIS: So there is a motion  
24 on the table and it has been seconded. Any  
25 discussion? Hearing none, those in favor of the

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1 motion raise your hand, please. The research report  
2 is approved.

3 CHAIRMAN SHACK: We're running a little  
4 bit late. I think I still want to take a five-minute  
5 break.

6 MEMBER APOSTOLAKIS: Yes. Maybe we can  
7 shorten the lunch break. Okay? So we will be back  
8 when, at quarter of?

9 CHAIRMAN SHACK: Quarter of.

10 (Whereupon, the proceedings in the  
11 foregoing matter went off the record at  
12 9:36 a.m. and went back on the record at  
13 9:45 a.m.)

14 CHAIRMAN SHACK: We'd like to come to  
15 order now and begin our discussion of the 50.46. And  
16 I believe we'll start with the industry presentation  
17 by Mr. Heymer, assorted support from a wide variety of  
18 people.

19 MR. HEYMER: Good morning. My name is  
20 Adrian Heymer. I'm a project manager at NEI dealing  
21 with risk-informed regulation under Tony Petrangelo,  
22 who's our director, and I've been following the option  
23 three as well as some of the option two activities.

24 This morning what we're going to talk to  
25 you about is 50.46, and specifically what we believe

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1 the most important element to look at in 50.46. And  
2 the one with the highest priority from a safety  
3 enhancement as well as a resource benefit is  
4 redefining the large break LOCA.

5 And I have with me here Lewis Ward from  
6 Southern Nuclear; Bob Osterrieder, Westinghouse Owners  
7 Group; Dave Bajumpaa, Millstone and the CEOG; and  
8 Terry Rieck from Excelon and representing the BWR  
9 Owners Groups.

10 We did have another representative from  
11 the B&W Owners Group, but something happened and he  
12 couldn't make it this morning. Otherwise, we would  
13 have had the complete spectrum of the owners groups  
14 here.

15 And I think one of the messages we want to  
16 provide today, that this is an industry-wide activity.  
17 The owners groups are on board, and I'm going to go  
18 over some of those issues and the industry structure  
19 and background as we move forward with this  
20 presentation.

21 So what we are really focusing on today is  
22 redefining the large break LOCA. I will go over some  
23 background information how we got here and the general  
24 approach that the industry sees to improving this  
25 aspect of the regulation. Then, the Westinghouse

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1 Owners Group will talk about a specific approach and  
2 some of their activities.

3 And then we'll have an example from the  
4 CEOG of what we call an application, what flows from  
5 redefining the large break LOCA to give you an idea of  
6 where the benefits are, and then Terry Rieck will say  
7 a few words on behalf of the BWR Owners Group.

8 I guess where we started off on risk-  
9 inform in the regulations was several years ago with  
10 SECY98-300, and at that time we were using this slide  
11 of what we believe is the important aspect of risk-  
12 informing NRC technical requirements, which was the  
13 improved efficiency and effectiveness of the NRC  
14 regulatory regime, to provide an increased focus on  
15 those issues that are safety significant while  
16 reducing unnecessary burden.

17 And that's the sort of fundamental element  
18 that we've looked at as we've moved forward. And,  
19 obviously, to do that, you've got to look just not at  
20 the regulations but also at the guidance documents and  
21 at the industry codes and standards activities.

22 MEMBER WALLIS: Well, there's another one  
23 of their objectives which is maintain safety.

24 MR. HEYMER: Well, yes, but I --

25 MEMBER WALLIS: Remember, that's one of

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1 the constraints.

2 MR. HEYMER: Yes. Yes. I mean,  
3 increasing the focus on safety-significant issues  
4 should -- we believe should enhance safety.

5 And I guess as we went through this,  
6 following the Commission's SRM on 98-300, we went  
7 through and we looked at the technical requirements  
8 and we came up with a list, and there was an NRC  
9 workshop and we discussed some of those things with  
10 the NRC. And we went out to the industry with a  
11 survey, and we included the list of regulations but we  
12 said, "What do you, the industry, think that we should  
13 focus on to improve our focus, focus on the safety-  
14 significant issues, and provide some benefit?"

15 And we got a list back from the industry,  
16 and we provided that list to -- the results of that  
17 survey to the Commission in January of 2000. And in  
18 that, there were three specific areas. One was -- the  
19 first priority was focus your activities on finishing  
20 what you've already started, which was things like the  
21 oversight process, fire protection, and the technical  
22 specifications, and then look at 50.46 and 50.44.

23 And the reason why they put 50.44 up there  
24 was that they felt with the amount of work that had  
25 gone on on 50.44 that was something that we could move

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1 forward fairly expeditiously. But on 50.46, there was  
2 a number of issues why we came up with 50.46, and it  
3 just wasn't really associated with financial issues.

4 The initial 50.46, it has a large number  
5 of tentacles that go out. Throughout the regulations,  
6 there's a number of issues that are linked to 50.46,  
7 and it was felt that if we could identify some of the  
8 items that perhaps don't have the same degree -- high  
9 degree of safety significance and where we perhaps  
10 could better focus our activities, we could make  
11 improvements both in safety and in -- and in the  
12 financial profile of the plant by looking at 50.46.

13 MEMBER WALLIS: Are you going to enhance  
14 safety as well as try to reduce burden by removing the  
15 focus on low-risk significant events, but you can  
16 actually also look at the other side of the coin, that  
17 there are other things that are more important where  
18 you can enhance safety?

19 MR. HEYMER: Other things that are more  
20 important that we should place greater emphasis and  
21 resources --

22 MEMBER WALLIS: There's going to be a  
23 tradeoff. It's not going to be all just reducing  
24 burden. It's going to be actually --

25 MR. HEYMER: Well, as has been said on

1 many occasions, there's two sides to this equation,  
2 and we accept that. And if there's things that come  
3 up that are required for safety --

4 MEMBER WALLIS: I think for public  
5 reassurance, there's sort of -- there's a big drama  
6 associated with the large break LOCA. And if you sort  
7 of want to -- not that the agency should back off on  
8 that. There's going to be some good arguments that  
9 your -- because now your attention is focused on  
10 something else, you are actually improving safety.  
11 Otherwise, it looks as if you're -- the agency is just  
12 backing off. I don't think that's very good for  
13 public confidence.

14 MR. HEYMER: No. And I think that's the  
15 reason why we're couching it the way we do. And I  
16 think if you look at the -- the large break LOCA, if  
17 you just look at some of the studies that have been  
18 done out there, it is a relatively low probability  
19 event.

20 And if you take that on as, we believe,  
21 negligible public risk, and -- and but we're not  
22 intending to sort of just throw everything away  
23 associated with that. I think we've developed,  
24 through risk-informed ISI, a much better process of  
25 looking at what inspections we need to do on those

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1 activities. We still have detection. We're still  
2 going to carry out inspections in that regard.

3 Now, as I said, the effect from a safety  
4 perspective associated with redefining the large break  
5 LOCA is -- we think is very significant. As I said,  
6 it's an essential element in the regulatory structure.  
7 And if you can redefine what the break size is, then  
8 the follow-on activities and your resources can be  
9 adjusted to focus on the more probable activities and  
10 those matters that are of safety significance.

11 And you'll see as we go through the  
12 presentations here today some of the activities that  
13 we get involved in link specifically to the large  
14 break LOCA, which if you take a more realistic  
15 approach to it we wouldn't have to be expending  
16 resources in that area. So we hope to --

17 MEMBER WALLIS: The fact that it is a  
18 central and controlling element, the way you've  
19 identified it here, means that in the past it was  
20 assessed as being important enough to have this role  
21 of being a central and important controlling element.

22 MR. HEYMER: That is true. But I think as  
23 -- and as we started out the regulations, there was a  
24 very conservative approach to say it's the double-  
25 ended guillotine break of the largest pipe. And

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1 that's why we're emphasizing it's the redefining.  
2 It's not the elimination of the large break LOCA.  
3 We're redefining it.

4 MEMBER WALLIS: So it's not, though, as if  
5 you're asking to simply redefine something of low-risk  
6 significance. You're asking to redefine something  
7 which is a central and controlling element. It's a  
8 major step.

9 MR. HEYMER: It is a significant step.  
10 But on the other hand, it has, we believe, significant  
11 benefit, both in terms of safety and finance. Having  
12 determined it was 50.46 and perhaps it should be  
13 redefining large break LOCA, Westinghouse Owners Group  
14 already had an activity underway and have already done  
15 some extensive evaluations of redefining the large  
16 break.

17 And through those activities, we pulled  
18 the other owners groups together, and I think we've  
19 developed over the past 18 months sort of an industry  
20 approach, which I'll go into and which we've described  
21 in several meetings and workshops with the NRC staff  
22 as we've moved through and discussed the options of  
23 what to look at first, because 50.46 is a very large  
24 and complex regulation. And we think if you're going  
25 to look at 50.46 you need to focus on what is really

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1 going to provide the benefit, and to us that is  
2 redefining the large break LOCA.

3 We've listed some of the -- some of the  
4 safety enhancements that we see from here. I think on  
5 a number of unnecessary plant transients it gets back  
6 into how many times you can sort of begin to run up  
7 against the limits in the technical specifications  
8 that are linked back to the large break LOCA. And so  
9 if you don't have to have a power train, you shouldn't  
10 be imposing one, not only from a financial  
11 perspective, but also from a plant safety perspective.

12 MEMBER WALLIS: Can you explain that a bit  
13 more? You say "unnecessary plant transients." You  
14 mean deliberate transients. You have to run the plant  
15 through some transient under the regulations.

16 MR. HEYMER: Because of the regulation.

17 MEMBER WALLIS: It means you have to test  
18 things or something?

19 MR. HEYMER: On a testings or come down in  
20 power or shut down or come to a halt -- shut down  
21 while you fix something, or even go to a cold  
22 shutdown. So the number of times you exercise -- move  
23 through those -- those plant states --

24 MEMBER WALLIS: Is all motivated because  
25 of the large break LOCA?

1 MR. HEYMER: Or linked to requirements and  
2 technical specifications or other -- that are linked  
3 into the large break LOCA.

4 MEMBER WALLIS: It would be nice if you  
5 could have some numbers associated with that, and let  
6 us know what's the number and the cost or something.

7 MR. HEYMER: Yes, we can get back in  
8 subsequent presentations on that.

9 MR. OSTERRIEDER: We do have a couple of  
10 examples later in the presentation.

11 MR. HEYMER: Yes. We'll speak to that.

12 We speak here about improved worker safety  
13 profile, and I guess the potential to rebalance the  
14 ECCS system so that we -- we focus on more probable  
15 events, such as the small break LOCA or the breaks of  
16 a smaller size, intermediate and small, I think that  
17 once you come up with whatever the new break size  
18 would be and you start running that through the PRA,  
19 your safety assessments and your PRA assessments  
20 become even more meaningful and just improves the  
21 general process. So --

22 MEMBER WALLIS: So you're claiming that  
23 because of the focus on large break LOCA we have some  
24 requirements for ECCS that may actually be detrimental  
25 in the case of other kinds of LOCA?

1 MR. WARD: Yes, sir.

2 MEMBER WALLIS: Yes?

3 MR. WARD: The particular example that  
4 we've discussed several times is the balancing of the  
5 ECCS system so that when you have a large break LOCA  
6 all of the water does not go to the broken loop, that  
7 there is a certain amount of it that goes into the  
8 intact loops and then goes to the core. And those --  
9 we put orifices in typically to do that and balance  
10 them to prevent runout on the pumps in that condition.

11 But what that does is if we had, for  
12 example, a smaller loss of coolant accident or a small  
13 leak, that -- those orifices are still in place and it  
14 throttles back the amount of water that would be  
15 delivered to the loops in that condition.

16 If we were designed to some intermediate-  
17 sized break, then you could decide -- you could open  
18 up the orifices, provide more flow to the core for the  
19 small break than we do now, because you would not have  
20 the pump runout concerns on the high end. That's one  
21 example that we thought about.

22 MR. HEYMER: Our overall approach for  
23 redefining the large break LOCA takes into account  
24 that we have varying designs out there and varying  
25 designs -- we have boilers, we have pressurized water

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1 reactors, we have CEABB plants, we have Westinghouse  
2 plants, we have B&W plants.

3 And, therefore, what our approach is is a  
4 relatively straightforward rule change. At the  
5 moment, the regulations say that you will analyze with  
6 the double-ended guillotine break of the largest pipe.  
7 And we think the add-on would be you would just add a  
8 phrase "or alternative break sites as approved by the  
9 Commission."

10 And to the extent of the rule change,  
11 there would be some other conforming changes where in  
12 other parts of the regulations, perhaps the general  
13 design criteria, you'd define what a loss of coolant  
14 accident is, so that there would be some conforming  
15 changes there.

16 And having done that, and having started  
17 to progress with the rulemaking, each owners group  
18 would develop and submit what they believe would be  
19 the justification for redefining the break size for  
20 their particular designs. And that would be an owners  
21 group specific activity.

22 But just redefining the break size alone  
23 doesn't really get you there, and so you start looking  
24 at applications. And so once there is a good  
25 understanding on what the break size would be as we

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1 begin to focus down and reach an understanding with  
2 the staff on what the break size would be, you can  
3 then start looking at the specific applications, be it  
4 diesel generator start times, balancing ECCS that we  
5 spoke about.

6 And they would be done, again, on an  
7 owners group basis, generic as much as we could for  
8 each owners group, so that when the licensee came  
9 along they could just submit a license amendment based  
10 on the topical reports that have already been approved  
11 by the staff. And we think that would be the most  
12 efficient use of resources of moving through this.

13 So it's really simple that the initial  
14 step is -- is to move forward with a rule change that  
15 would say -- as I've said, allow an alternative break  
16 site as approved by the Commission, but don't define  
17 that break size and leave that from the -- for the  
18 technical interactions between the owners group and  
19 the staff to come to some conclusion on what that  
20 break size is.

21 MEMBER WALLIS: Wouldn't you still have to  
22 analyze the large break LOCA anyway in order to show  
23 that it's not significant? You have to do something  
24 with it. You can't just ignore it.

25 MR. HEYMER: Well, no, you just don't

1 ignore it. That's some of the issues that we're going  
2 to be --

3 MEMBER WALLIS: But you'd still have to do  
4 an analysis and convince the Commission that this  
5 break is not important or something.

6 MR. HEYMER: Well, as we --

7 MEMBER WALLIS: Wouldn't that just be a  
8 risk analysis? Or would that be a technical analysis?

9 MR. HEYMER: Well, we will continue --

10 MEMBER APOSTOLAKIS: Mechanistic, you  
11 mean.

12 MR. OSTERRIEDER: We would continue with  
13 large break LOCA in the risk models for the plants.  
14 But, you know, so that -- it wouldn't be taken out, so  
15 --

16 MEMBER WALLIS: So it would still be in  
17 the risk models, but it wouldn't be in the sort of  
18 technical requirements.

19 MR. OSTERRIEDER: Right. It's like other  
20 things in the risk models that aren't necessarily part  
21 of your design basis.

22 MEMBER WALLIS: Yes. But in order to do  
23 the risk model, you have to do a thermal-hydraulic  
24 type analysis and everything. You have to look at  
25 consequences and all that.

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1 MR. OSTERRIEDER: Right. You need to do  
2 appropriate success criteria analysis.

3 MEMBER WALLIS: So it wouldn't go away.  
4 You'd have --

5 MR. OSTERRIEDER: That's correct.

6 MEMBER SIEBER: Well, it's an interesting  
7 thing. If you enlarge the size of the orifice, which  
8 you said was going to be an advantage to having a  
9 smaller break size, then if you actually did have the  
10 large break the pumps would run out, and the outcome  
11 would be different than you currently have now. So  
12 the risk numbers and consequences would go up. Is  
13 that not true?

14 MR. OSTERRIEDER: Right. Yes, they  
15 would --

16 MEMBER SIEBER: In other words, you could  
17 not handle the --

18 MR. OSTERRIEDER: Right. The risk of that  
19 occurring would be assessed into the plant's risk  
20 model, since it --

21 MEMBER SIEBER: That's right. But if it  
22 did occur, whatever the probability, the ECCS couldn't  
23 handle it.

24 MR. OSTERRIEDER: That's right.

25 MEMBER SIEBER: Under those circumstances.



1 MR. OSTERRIEDER: Well, we'd assess with  
2 the success criteria -- certainly more likely less  
3 success probability, certainly.

4 MR. HEYMER: And as we get into the  
5 discussions here, I think you'll also hear that our  
6 emphasis isn't necessarily doing extensive  
7 modifications based on this, but allowing for  
8 operational margin to -- for us to operate with that  
9 margin so you don't have to get involved in some of  
10 these evaluations and activities that Dave here will  
11 talk about from the CE perspective -- so perhaps  
12 ultimately the sink calculations, containment, heat  
13 removal.

14 So we're not talking about ripping out  
15 pumps and replacing pumps. What we're talking about  
16 is, okay, we don't have to -- perhaps the engineering  
17 specification is going to be the same, but the actual  
18 licensing and technical specification may be a little  
19 bit different.

20 MEMBER KRESS: Why shouldn't I view this  
21 from the perspective of Reg. Guide 1.174 and say  
22 here's a suggested change in the licensing basis for  
23 lots of plants, not just one. That will result in  
24 these changes to specific plants, the listed changes.  
25 I suspect you have those. And then that will change

1 the risk status of each of these plants by this much,  
2 and looking at the guides in 1.174 say whether that's  
3 acceptable or not. Why isn't -- I don't see a  
4 perspective -- well, it seems like we're viewing this  
5 strictly from the design basis accident space and not  
6 --

7 MR. HEYMER: Well, I mean, the initial  
8 step coming out of this isn't to say, well, we want to  
9 redefine the large break LOCA because we want to have  
10 a different pump size there. But on the other hand,  
11 if somebody then wanted to go and implement a  
12 modification, they would then use the 1.174 as the  
13 guideline. And the guideline and the baseline for the  
14 plant would be adjusted based on whatever the new  
15 break size came out to be.

16 So, I mean, I think what you're saying is  
17 that, yes, okay, once you've redefined it, you may  
18 some stage down the road want to perform a  
19 modification, and, yes, you would use 1.174.

20 MEMBER KRESS: I see. So that would come  
21 in at the point where the plant decided -- a specific  
22 plant decided that --

23 MR. HEYMER: Yes.

24 MEMBER KRESS: -- take advantage of the  
25 new definition and make some changes.

1 MR. HEYMER: That's right. Within the  
2 confines of 1.174 and the new rule and the guidelines  
3 and the technical documents, but not as a direct --

4 MEMBER KRESS: Why couldn't they do that  
5 already?

6 MR. OSTERRIEDER: I think it's more simple  
7 than that. We are planning to use the 1.174 framework  
8 and assess the risk significance of large break LOCA.  
9 So I think the answer is simply, yes, we are intending  
10 to do what you're suggesting that we should be doing.

11 MEMBER KRESS: Yes.

12 MR. OSTERRIEDER: As you'll see it in my  
13 summary of what we've been able to do. I think we're  
14 doing that.

15 MEMBER KRESS: Maybe I should wait until  
16 we hear that.

17 MR. OSTERRIEDER: Or tell me if we're not  
18 answering the question, certainly.

19 MEMBER WALLIS: Adrian, you talk about  
20 alternative break size. This is really in the old  
21 deterministic world where you have sort of specified  
22 things you have to consider. But in a risk-informed  
23 world, you really ought to look at all break sizes,  
24 including large break LOCA.

25 MR. OSTERRIEDER: We do. And we will --

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1 MEMBER WALLIS: Make an assessment --

2 MR. OSTERRIEDER: Yes, we do.

3 MEMBER WALLIS: -- and if you change your  
4 orificing, then your consequences change and your risk  
5 assessment changes for all of them.

6 MR. OSTERRIEDER: That's correct.

7 MEMBER WALLIS: And you don't -- there's  
8 no real change. You have to look at the complete  
9 spectrum of breaks.

10 MEMBER KRESS: There's only a change if  
11 they make modifications to the plans and procedures.

12 MEMBER WALLIS: Right.

13 MEMBER KRESS: I think that's what you  
14 have to look at.

15 MEMBER BONACA: Probably to do that I  
16 think they only leave -- they can assign a very low  
17 probability to that event. So, no, that -- so they  
18 are going to consider that.

19 MEMBER KRESS: Well, that's almost  
20 irrelevant. I think what the relevant thing is is  
21 what modifications and what changes will result from  
22 the change in the definition.

23 MEMBER BONACA: Yes.

24 MEMBER KRESS: It doesn't matter how low  
25 the probability is. It's what --

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1 MEMBER BONACA: What I'm saying is that  
2 they're not going to eliminate the possibility.  
3 They're going to consider it still. They're only  
4 saying that the likelihood of the large break LOCA,  
5 the way he's --

6 MEMBER KRESS: It may still not contribute  
7 much to risk --

8 MEMBER BONACA: That's right. They're  
9 saying --

10 MEMBER KRESS: -- for that sequence, but  
11 the changes to the plant that result from the change  
12 -- you see, the tentacles of design basis accident go  
13 beyond a specific sequence you look at or --

14 MEMBER BONACA: That's obvious. But I'm  
15 saying that -- that they are not neglecting that.  
16 That's all I'm saying. I'm only saying that since it  
17 is assuming low probability most likely, then it  
18 should not be the design basis event you are designing  
19 it for. And then there are tentacles we have to look  
20 at. I agree with that.

21 MR. HEYMER: And, in fact, what we're  
22 getting into here is some of the more detailed  
23 discussions, and I think it's a good point at which we  
24 can hand over to the Westinghouse group to get into  
25 some of the more specifics of the technical approach.

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1 And I'll ask Lewis Ward to lead off on that.

2 MR. WARD: Yes. I'm Lewis Ward with the  
3 Southern Nuclear Operating Company of Bogle, Farley  
4 and Hatch. I'm the Chairman of the Westinghouse Large  
5 Break LOCA working group.

6 This project started off within the  
7 Westinghouse Owners Group a little over two years ago.  
8 We had an invitation from Commissioner Diaz to each  
9 identify the most single important program that we  
10 could work on that would help our fleet of plants.  
11 And the WOG identified large break LOCA elimination,  
12 I believe is the way it was phrased at that time.

13 Shortly after that we put together a  
14 steering committee to start through the process of  
15 following up with that letter to Commissioner Diaz,  
16 and really deciding what approach we would take on  
17 going about a rule change. We looked at the rules  
18 themselves as very simple. There's about three places  
19 in Appendix K and Appendix -- in 50.46 and Appendix A  
20 that, you know, we need one sentence basically.

21 But as we realized right off, there is  
22 much, much more to it than that. There are numerous  
23 Reg. Guides and other documents below that that spin  
24 off from that. So we internally worked for about a  
25 year to try to put together a framework within our

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1 owners group on how we would get our owners to fund  
2 such a program, realizing it was going to take a big  
3 commitment of resources on our part to even launch off  
4 into that.

5 About a year ago we also got all three of  
6 the other owners group involved with us, and NEI  
7 started doing a coordination role with us. And right  
8 now, all four of the owners groups representing all of  
9 the plants in this country are on board with us on  
10 this project.

11 What we have done is tried to think  
12 through many of the questions that you're asking and  
13 -- and put some thought behind how we would go about  
14 addressing those issues.

15 One of the program approaches that we've  
16 put together in our framework is that we really need  
17 an implementation plan that would be exactly what  
18 you're asking about, so that, you know, once we get a  
19 rule change, what do we -- what do I as a licensee --  
20 how do I go about implementing a particular change on  
21 a particular system or component or design basis with  
22 my plant?

23 And the approach that we are looking at is  
24 to come up with an implementation guideline that is an  
25 industry-wide guideline. Each of our owners groups

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1 feels like, you know, we would put together a  
2 guideline, have it reviewed and agreed to by the  
3 staff, and possibly endorsed by a Reg. Guide, and  
4 probably have a predefined list of the things that we  
5 could go about doing once we got the rule change.

6 Now, there may be many, many other things  
7 that we did not think about as we went through that  
8 we'd then follow up with the normal licensing process,  
9 either under 1.174 tech spec submittals and that kind  
10 of thing.

11 That's the general approach we've been  
12 working on. Over the last year, we have had numerous  
13 internal meetings with all of the owners groups to get  
14 this plan more or less laid out. We've started  
15 gathering data to support the specific analysis for  
16 the Westinghouse fleet. And we have proceeded  
17 forward, and we -- we've kept the staff fully  
18 informed.

19 I believe we've met six times with the  
20 staff over the period of the last year or two, to lay  
21 out our game plan and to get staff's feedback.

22 The safety benefits -- I'll go over part  
23 of this and Bob will go over part of it. The safety  
24 benefit -- I think all of us recognize that safety has  
25 to be our first priority. We, as owners, investors,



1 and operators, and citizens who live next door to  
2 nuclear power plants, do not -- did not want to go  
3 down any path that we did not feel like was right from  
4 safety. And so that has been our first focus.

5 We believe that doing this process will  
6 allow us to put our limited resources on other  
7 activities that have greater risk significance. Right  
8 now, we spend a lot of engineering time, we spend our  
9 highest level of engineering expertise on areas such  
10 as large break LOCA. Our training staff spent a lot  
11 of time on large break LOCA. If you're a licensed  
12 operator, which I had an SRO license at Farley, you  
13 can expect a large break LOCA on one of your regual  
14 drills on the simulator.

15 As we've seen an event within the last  
16 year not having to do with LOCA, there are more subtle  
17 accidents that are more realistic that the operators  
18 need to learn to deal with more than the "here's the  
19 big one," "I know how to deal with this one," and we  
20 go on.

21 Surveillance testing -- we do a tremendous  
22 amount of surveillance testing for tech spec  
23 surveillance requirements that are directly hinged to  
24 large break LOCA, such things as accumulator level  
25 transmitters in containment, very, very tight

1 tolerance bands, extremely time-consuming dose  
2 activities that would go away or be extensively  
3 broadened.

4 There's a considerable amount of  
5 maintenance. We do fast starts on diesel generators  
6 every month or more often. It puts wear and tear on  
7 diesel generators; we have to tear them down, overhaul  
8 them, and keep them in shape so they will pass the  
9 surveillance over and over again in the event that  
10 they are needed for the LOCA with a station blackout.

11 There are design issues that we have to  
12 resolve. We work on design issues every day. There's  
13 a current issue on containment sumps that all of you  
14 are aware of. There are other issues that we have to  
15 deal with on a design basis every day in the plants to  
16 try to get resolved for this very unlikely event.

17 MEMBER KRESS: Now, if I had two  
18 categories and one of them was safety benefits and  
19 burden reduction, it seems to me like most of those  
20 things you just talked about would fall under burden  
21 reduction.

22 MR. WARD: They are burden reductions  
23 which, recognizing we have limited resources in terms  
24 of technical expertise --

25 MEMBER KRESS: Is this a zero-sum

1 activity? So those resources -- the money and  
2 activities actually go into other things?

3 MR. WARD: Yes.

4 MEMBER KRESS: You save money that way.

5 MR. WARD: No. We don't -- I don't  
6 envision any of us laying any people off. I think it  
7 would allow the people that are doing these activities  
8 to focus on something else.

9 MEMBER WALLIS: I think he's saying that  
10 the operators would be better trained if they were  
11 trained to face up to real events and not have so much  
12 emphasis on LOCAs. Actually, the plant would be  
13 better. It's not just reducing burden. It's better  
14 use of people and resources.

15 MEMBER KRESS: I'm not so sure that  
16 redefining the large break LOCA has anything to do  
17 with the training process.

18 MEMBER WALLIS: Well, I think that's what  
19 you're saying is you have a lot of people spending  
20 time on something which is just very unlikely to  
21 happen.

22 MR. WARD: Yes, that's correct. And that  
23 was my point.

24 MEMBER KRESS: You shouldn't do that. I  
25 mean, I don't see that that has anything to do with

1 this definition.

2 MEMBER BONACA: But isn't the bigger issue  
3 that -- from what I've seen is that the requirements  
4 of the large break LOCA on equipment are forcing a  
5 very tight margin on equipment. I mean, simply there  
6 isn't time on diesels to wait. You have to start them  
7 and you have to test them cold. And so that's because  
8 you have such a strict requirement coming from the  
9 largest demand, which is the LOCA.

10 That's true of HVAC systems. They would  
11 have to be reconfigured in -- with them in, like the  
12 clock or -- isn't that issue of marginality of the  
13 equipment that is really the bigger driving issue?  
14 You're bumping limits, you're bumping the tech specs,  
15 you have to find out because you are so marginal in  
16 that your -- the demand is maximum for this, isn't it?

17 MR. WARD: Yes, that's correct. So when  
18 we hit one of those limits, the -- our expertise works  
19 on that problem, not something else. And that's the  
20 -- it's a zero net sum, I think, but it's -- where do  
21 you want to put the focus? On something that's most  
22 likely never going to happen or something that is  
23 likely to happen.

24 MEMBER BONACA: Yes. From my experience,  
25 I mean, the problem is always that the plant is just

1       barely making those requirements of the LOCA.  
2       Therefore, it's easy to bump into, you know -- the  
3       diesel start is 10 and a half seconds, and the diesel  
4       is not starting in -- it starts in 10.6 seconds. And  
5       that one-tenth of a second is just killing you if you  
6       have to do all kinds of jumping around to show that  
7       you can come out. That's really where I see a  
8       significant impact. I mean, from the requirement you  
9       are making. Okay? Just the equipment barely makes it  
10      today.

11               MEMBER KRESS: So that's one change. And  
12      there must be a list of these changes. And the  
13      question I have is: do those particular changes have  
14      any significance in maintaining the risk profile of  
15      plants to an acceptable level? Somehow I haven't seen  
16      that case made yet, but I --

17               MEMBER BONACA: I agree totally with you.  
18      That's my thought process, too. I would like to see  
19      at some point in all these presentations the list of  
20      the benefits and what they mean.

21               MEMBER KRESS: Yes. You know, I --

22               MEMBER BONACA: And then I could decide --

23               MEMBER KRESS: Well, it's clear that there  
24      would be some benefits with this. And it's not  
25      exactly as clear that the -- that this thing doesn't

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1 have safety significance. But, you know, it looks --  
2 I mean, the implications is that it doesn't, but I  
3 haven't really seen the case made yet. I've seen, you  
4 know, assertions to it.

5 MR. WARD: There is a list of benefits on  
6 toward the back of the page that we'll get to in a  
7 little while, and there are many that are -- that's  
8 just a partial list. But I think what we wrestled  
9 with for the qual was the -- it's going to take quite  
10 a bit of effort on all of our parts to work through  
11 this program to develop the list of benefits and the  
12 approach on how we could benefit or how we can achieve  
13 those benefits with the rule change.

14 And that's why we've been working real  
15 closely with the staff on a -- you know, before we go  
16 commit all of our resources and put together a 100  
17 percent complete package, and then no assurance that  
18 -- that anybody is going to listen to it, you know,  
19 that's why we've been having a continuing dialogue  
20 with the hopes of moving forward on that basis.

21 But we do have a list, and Bob will go  
22 over them a little while later.

23 Another point is the consistency within  
24 the regulations. Right now, leak before break is an  
25 approved methodology for certain actions --

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1 elimination of whip restraints, baffle -- reactor  
2 vessel internal -- it's a baffle bolt issue. So it's  
3 been recognized by the Commission for 15 years that  
4 this is approved technology for certain uses.

5 And it presents us a problem by having one  
6 set of requirements for one application and a  
7 different set of requirements for different  
8 applications. And what we are proposing is something  
9 that would clean up that inconsistency within the  
10 regulations.

11 Okay. Bob, I'm going to turn it over at  
12 this point to Bob Osterrieder with Westinghouse, who  
13 is our lead manager.

14 MR. OSTERRIEDER: Okay. What I'm going to  
15 do is try to briefly summarize what our approach is in  
16 redefining the large break LOCA, and then we'll move  
17 on, after I talk about that a little bit, to some of  
18 the example applications that you're asking about.

19 Essentially, you know, we view this as a  
20 risk-informed initiative based on SECY98-300, Option  
21 3, and as part of that we're envisioning this to be an  
22 optional implementation where you could return your  
23 current licensing basis in regard to large break LOCA.

24 Adrian already mentioned that there is  
25 essentially three key places where the definition of

1 LOCA is in the regulations, that it has to be a  
2 double-ended -- if they analyze up to a double-ended  
3 rupture of the largest primary piping, and we're  
4 envisioning changing that in these three places --  
5 Appendix K, Appendix A, and 50.46.

6 What we intend to do is redefine the  
7 maximum size and the attendant consequences while  
8 maintaining an acceptable margin of safety.

9 MEMBER APOSTOLAKIS: But let me understand  
10 here -- the issue -- the question was asked earlier  
11 regarding 1.174, and now we have Option 3. I mean,  
12 how do these things play against each other?

13 Tom, you raised the question of 1.174. I  
14 mean -- yes, go ahead. I'm sorry.

15 MR. OSTERRIEDER: I was going to say,  
16 we're going to be -- you'll see on the next slide  
17 we're actually looking at 1.174. That's just part of  
18 the Option 3 approach. I think they're all --

19 MEMBER APOSTOLAKIS: Okay. Well, if you  
20 come to it later, we'll wait until then.

21 MEMBER KRESS: One of the places where the  
22 double-ended rupture shows up is in the general -- in  
23 the design basis accident, the containment. You know,  
24 that doesn't affect -- hey, guys, you're going to go  
25 in and weaken your containment just because of this

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1 change in rule.

2 But it might affect future plants if we  
3 did something like this. You know, a future plant  
4 could have a new -- are we going to exempt  
5 containment, or are we going to keep that -- give the  
6 -- make a new design basis for containment? Is that  
7 --

8 MR. OSTERRIEDER: Well, what we've  
9 discussed to date is, as you indicated, not changing  
10 the actual physical containment but allowing some  
11 operational flexibility. You know, you may be able to  
12 change some --

13 MEMBER KRESS: You can change your leak  
14 range measurement --

15 MR. OSTERRIEDER: Yes. And --

16 MEMBER KRESS: -- for one thing. I see  
17 where that --

18 MR. OSTERRIEDER: Right.

19 MR. HEYMER: The CE Owners Group is going  
20 to -- the specific application where they talk about  
21 containment -- and I think that they will be able to  
22 really get into that situation. With regard to new  
23 plants, we think that Option 3 should be kept separate  
24 from new plants. And if you're going to go forward  
25 with new plant regulations and thinking about a

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1 framework for the regulatory regime --

2 MEMBER KRESS: Try to do --

3 MR. HEYMER: -- you need --

4 MEMBER KRESS: -- another -- Option 4  
5 maybe or --

6 MR. HEYMER: You'll have a totally  
7 framework and you're going to start off with a clean  
8 sheet of paper and really -- really go through it.

9 MEMBER KRESS: I agree with that. An  
10 Option 4 type thing.

11 MR. HEYMER: Yes.

12 MEMBER KRESS: Okay.

13 MR. OSTERRIEDER: Again, the approach  
14 we're looking at is on the technical justification  
15 slide. We will be using risk-informed technology to  
16 show the low-risk significance of the large break  
17 LOCA. Utilizing Reg. Guide 1.174, we're going to be  
18 assessing the likelihood and the consequences of large  
19 break LOCAs to demonstrate that they're of low-risk  
20 significance and that these --

21 MEMBER APOSTOLAKIS: And, again, 1.174  
22 utilizes the current CDF and LERF, right? I mean, and  
23 the delta CDF and delta LERF. Are you going to do  
24 this in a generic way? And if you do, what kind of  
25 CDF are you going to use?

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1 MR. OSTERRIEDER: We're doing some generic  
2 work. Each of the owners groups is looking at the  
3 risk significance of large LOCA. We, in fact, have  
4 calculated some new initiating event frequencies for  
5 large LOCA, but even if we hadn't what we are  
6 intending to do in assessing the risk significance is  
7 look at all of the plants, the importance of large  
8 break LOCA, and --

9 MEMBER APOSTOLAKIS: For each plant.

10 MR. OSTERRIEDER: For each plant.

11 MEMBER APOSTOLAKIS: Oh.

12 MR. OSTERRIEDER: And we're containing  
13 that in a -- at least for the Westinghouse Owners  
14 Group, we're going to put that into one risk  
15 significance document that's going to explain how risk  
16 significant is large break LOCA in terms of core  
17 damage frequency and large early release frequency,  
18 and then addressing the -- the five principles of  
19 1.174. That's what our plan is, and we intend to  
20 submit that for review.

21 MEMBER KRESS: Well, let me ask you a  
22 question about that. I could envision that -- that  
23 this change would allow you to go to a higher leak  
24 rate from the containment, possibly, because, you  
25 know, you're holding the pressure down lower. And so

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1 for you applying this -- the source term that you have  
2 to apply, you could end up with a lower leak rate.

3 That implies to me that for other  
4 accidents, other sequences, that it's possible, then,  
5 that in the -- if you shift now to the PRA, that the  
6 frequency which you exceed certain releases of  
7 activity in the low level for -- you don't break  
8 containment. You don't have a LERF. But you still  
9 have core damage of some sort.

10 Those frequencies are going to increase,  
11 although you wouldn't see that at all in CDF, and you  
12 wouldn't see it in LERF. And it seems to me that  
13 those things are of interest at least. They are to  
14 me. And how would that be dealt with in a 1.174  
15 sense?

16 MR. OSTERRIEDER: Well, I'm not sure about  
17 in the 1.174 sense, but we will be looking at the  
18 effects of any plant changes. If we do do a change to  
19 the leak rate parameters, then we need to assess does  
20 that affect the calculated dose rates for other events  
21 that use those parameters in the analysis.

22 MEMBER KRESS: Yes. But that would be in  
23 the deterministic space, in the Chapter 15 space.

24 MR. OSTERRIEDER: Right. It would --

25 MEMBER KRESS: Which doesn't, you know --

1 you have to meet those surely, but -- but it doesn't  
2 show up in 1.174 anywhere, which wouldn't -- you know,  
3 the only place it shows up in 1.174 is a little  
4 sentence that says, "You will also meet the rest of  
5 the requirements, the rest of the regulation."

6 But I'm worried that CDF and LERF doesn't  
7 capture small releases and doesn't capture late  
8 releases and doesn't deal with things like injuries to  
9 workers and injuries to the population, that there are  
10 less deaths. I worry about those things that it seems  
11 to me like 1.174 doesn't properly capture.

12 MEMBER SIEBER: Well, there's other  
13 requirements besides 1.174. You have 50.2 that has a  
14 dose-limited defense line, and 50.35, and other  
15 general design criteria which you have to meet anyway.  
16 And that's in a deterministic and absolute sense.

17 MR. HEYMER: Yes. I mean, at the moment,  
18 we're just focusing on 50.46 and redefining the large  
19 break LOCA. And I agree that those -- those  
20 requirements are still in place, and we would still  
21 have to show that we meet those requirements.

22 MEMBER SIEBER: That's right.

23 MR. HEYMER: And the same for OSHA and  
24 other worker safety requirements that -- that are  
25 there. We have to meet those. So we're not looking

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1 at changing those, and so that's what we would still  
2 be governed by, regardless of what you might be --

3 MEMBER KRESS: Yes. The problem I have is  
4 those other requirements are not necessarily risk-  
5 informed. And we're trying now to go to a risk-  
6 informed process.

7 MR. OSTERRIEDER: Okay.

8 MEMBER KRESS: But, anyway, that's a  
9 personal problem I have. I don't want to --

10 MR. OSTERRIEDER: One other --

11 MEMBER KRESS: -- dwell on it.

12 MR. OSTERRIEDER: One other point.  
13 There's no guarantee that you can reduce your leak  
14 rate testing because a lot of plants are governed by  
15 steam line break pressures for --

16 MEMBER KRESS: Yes, that's right.

17 MR. OSTERRIEDER: You know, so if you have  
18 to look at the entire picture for your plant and  
19 decide --

20 MEMBER KRESS: So it'll be plant-specific.

21 MR. OSTERRIEDER: Sure. You need to  
22 holistically evaluate any potential plant changes.

23 Okay. The second part of -- after we  
24 evaluate the risk significance, and demonstrate how  
25 risk significant the event is, then we'll also be

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1 relying on a deterministic piece of looking at leak  
2 before break analysis to justify the break size that  
3 we'll be submitting to the staff for approval as the  
4 new maximum break size.

5 And then we'd have to do further analysis  
6 to evaluate real plant changes as a result of the rule  
7 change.

8 MEMBER KRESS: That's what I want to see.

9 MR. OSTERRIEDER: And just to kind of  
10 follow up on what we mentioned before, we're already  
11 allowed to use leak before break and not analyze  
12 certain aspects of the plant for the full double-ended  
13 guillotine break. And that is, GDC4 allows for  
14 application of leak before break to high energy piping  
15 to -- involved with the evaluation of the dynamic  
16 effects.

17 And a number of plants have applied this  
18 for main coolant piping, pressurizer surge line, and  
19 a few other examples here.

20 MEMBER KRESS: Has leak before break been  
21 approved for the big-sized pipes that we're talking  
22 about?

23 MR. OSTERRIEDER: We've had leak before  
24 break approved for certain applications down to and  
25 including I believe we even have a six-inch approved

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1 for the plants.

2 MEMBER SIEBER: But that's just for  
3 Westinghouse, the combustion plants, right, and B&W?  
4 But not for --

5 MR. OSTERRIEDER: Well, it's not a generic  
6 approval. Each plant may have different --

7 MEMBER SIEBER: Right. Gets it on its  
8 own, right.

9 MR. OSTERRIEDER: Right. And submitted  
10 their own, you know, work and gotten it approved for  
11 that particular plant.

12 Okay. What we intend to do is take the  
13 existing leak before break work that's already been  
14 accepted for certain applications and extend that to  
15 other applications beyond the dynamic effects. And  
16 what we have envisioned was using the same methodology  
17 that was used in those cases.

18 And then what we would do, depending on  
19 the maximum size that the -- that you're looking to  
20 put as the largest LOCA size you must analyze, we'd  
21 perform -- potentially perform leak before break on  
22 additional lines, if you hadn't already covered those  
23 lines with your existing leak before break work.

24 And we're intending to consolidate and  
25 make more efficient the review by justifying one

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1 maximum size, at least for the owners -- Westinghouse  
2 Owners Group, and each owners group is going to  
3 decide, you know, how do they want to approach that.

4 MEMBER KRESS: I guess implied in that  
5 approach, then, is if you can just -- if you can  
6 invoke leak before break, that that renders the  
7 frequency of failure of those pipes that you invoke it  
8 for to a low enough value that they wouldn't show up  
9 significantly in the risk profile? Is that the

10 MR. OSTERRIEDER: Not -- I believe it's  
11 slightly different than that. I believe it's more the  
12 -- the leak before break is a -- a demonstration that  
13 you will detect this before you get large LOCAs, and  
14 the large LOCA may never --

15 MEMBER KRESS: Plus, you reduce the  
16 frequency way down, because you're going to detect it  
17 in the --

18 MR. OSTERRIEDER: Well, because it's based  
19 on frequencies and propagation of cracks and to  
20 potential leaks, and then the leak detection  
21 capabilities of the plant. But the frequency itself  
22 that you would use in your PRA, we have recalculated  
23 frequencies using fracture mechanics. But you  
24 wouldn't have to do that.

25 I mean, the main purpose of the leak

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1 before break analysis is to support the idea that we  
2 show that large LOCAs are not risk significant, and  
3 then we show that we have some mechanism to evaluate  
4 the actual plant and that we will not have a large  
5 break before you would detect it.

6 It sounds like I'm not answering your  
7 question.

8 MEMBER KRESS: Well, it sounds like you  
9 answered it -- yes, to what I said, but I guess --

10 CHAIRMAN SHACK: But I think you will end  
11 up essentially calculating a frequency of rupture as  
12 a function of pipe -- that will -- that will go into  
13 your PRA evaluations of delta CDF and delta LERF.

14 MEMBER KRESS: My question is if that  
15 number is below, say,  $10^{-6}$ , then you say, "Well, we  
16 won't worry about that pipe." If it gets above --  
17 around  $10^{-6}$ , we'll say, "Okay. That may be the size  
18 we're dealing with for large break LOCA." I was  
19 wondering if that was the rationale.

20 MR. OSTERRIEDER: Well, that's part of the  
21 approach that we've done in the Westinghouse Owners  
22 Group and we're going to be submitting is looking at  
23 the probability of all these different pipes in the  
24 plant leaking above a certain amount, which, you know,  
25 that will define the size. And we're looking at all

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1 the pipes and, yes, that's exactly what we're doing.

2 MEMBER KRESS: Okay. That was the nature  
3 of my question.

4 MR. OSTERRIEDER: Okay. Again, one aspect  
5 that, you know, we've talked about, if -- if you  
6 change your maximum LOCA break size, the question has  
7 come up, "Do we need to identify other events that we  
8 possibly don't analyze now?" And we believe that you  
9 should currently be analyzing all of the significant  
10 events for different plant systems, but we do need to  
11 make sure if we lower the maximum size that we haven't  
12 in the past said we don't need to analyze a certain  
13 event because it's bounded by this.

14 We need to make sure that we don't now  
15 have that resurface, and then we -- you know, so we  
16 may end up having to do additional analysis. That  
17 we're looking to do that as part of our comprehensive  
18 program.

19 Adrian already mentioned that following  
20 the rule change plant-specific changes to the maximum  
21 size would require a submittal and approval of the  
22 NRC. So you'd start with the rule change, allowing  
23 you to change the maximum, and then you would have to  
24 get approval from the NRC to --

25 MEMBER KRESS: So the rule wouldn't

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1 specify the size.

2 MR. OSTERRIEDER: That's correct. We're  
3 envisioning a broad rule, and each owners group would  
4 need to decide on what size is appropriate based on  
5 their designs.

6 MEMBER KRESS: So this could be a plant-  
7 specific size, depending on --

8 MR. OSTERRIEDER: Yes. We'd envision each  
9 plant submitting with a certain size, and we would  
10 envision a lot of plants may submit with the same  
11 size. But it depends on the plant design and the --

12 MR. WARD: Really, we're looking at fleet  
13 size, the Westinghouse fleet. We would -- we are  
14 doing a scoping study now, just have one size for the  
15 whole Westinghouse fleet.

16 MEMBER KRESS: One size fits all  
17 Westinghouse.

18 MR. WARD: Yes. And that is --

19 MEMBER KRESS: One size for --

20 MEMBER WALLIS: Can we talk about what you  
21 mean by "size" now? If you say -- say, a six-inch  
22 break, do you mean a six-inch pipe break, or do you  
23 mean a break of an area in a bigger pipe, or what kind  
24 of thing are you thinking of?

25 MR. OSTERRIEDER: We are envisioning a --

1 we pick a certain break flow rate, and then we would  
2 analyze any leaks in any piping sizes to begin --

3 MEMBER WALLIS: It ought to say that  
4 you've sort of got a six-inch pipe breaking and  
5 snapping off or something. It's the same thing as the  
6 equivalent area somehow opening up mysteriously in an  
7 18-inch pipe or whatever, 30-something-inch pipe or --

8 MEMBER KRESS: It seems --

9 MEMBER WALLIS: They seem to be completely  
10 different beasts.

11 MEMBER KRESS: Well, it seems like the --  
12 the concept ought to be leak -- how fast you leak.

13 MEMBER SIEBER: Yes.

14 MR. OSTERRIEDER: Right. And I think I  
15 was trying to say that. We're looking at how much  
16 your leakage rate is. In fact, if you look at double-  
17 ended guillotine ruptures, the risk significance is  
18 really low, really low, for the double-ended ruptures  
19 of any -- the initiating event frequencies are orders  
20 of magnitude lower.

21 When you look at the leakage rates, at a  
22 certain leakage rate for all of the different sizes,  
23 then it does raise the frequency up. So that's what  
24 we're looking at -- that, not just the double-ended  
25 rupture of all of this piping.

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1 MEMBER KRESS: Yes. It seems to me like  
2 you ought to get away from that concept, and the rule  
3 ought to specify a limiting leak rate, or something  
4 like that.

5 MR. OSTERRIEDER: Right. Although we  
6 think the rule should specify that you're allowed to  
7 justify and determine what the leak rate is based on  
8 your design.

9 MEMBER KRESS: Based on the design. Yes,  
10 that's --

11 MR. OSTERRIEDER: I mean, we really  
12 wouldn't want to have the leak rate in the rule  
13 directly.

14 MEMBER KRESS: Yes, that's what I had in  
15 mind.

16 MEMBER WALLIS: It matters where the leak  
17 is.

18 MEMBER KRESS: Well, it certainly would,  
19 yes. But that would be part of the rule, too.  
20 Somehow that would be captured as --

21 CHAIRMAN SHACK: It's part of their  
22 justification for the size that they pick, yes.

23 MR. OSTERRIEDER: That's correct. Where  
24 we think the breaks are, and so forth. That's  
25 correct.

1 MEMBER KRESS: Your justification would  
2 have to be in terms of risk some way.

3 MR. OSTERRIEDER: Well, we're doing a  
4 justification based on the risk, and then we're  
5 supporting it with the leak before break deterministic  
6 work.

7 Okay. Once you would have a specific size  
8 approved for your plant, the licensee then -- any  
9 additional plant changes or benefits they would go to,  
10 and we're going to give a few examples here in a  
11 minute, would follow the appropriate plant change  
12 control processes, because we've had a discussion, you  
13 know, do the plants -- do the licensees need to submit  
14 future changes? And we believe that the processes in  
15 place should dictate that.

16 And if you're falling -- say you want to  
17 change something in the technical specification,  
18 certainly you need to submit that or a current  
19 guideline. So you may be able to allow the change in  
20 technical specification, and I'll show -- well, we  
21 might as well just go to the examples on the following  
22 page.

23 Many of these are technical specification  
24 numbers. So approving the rule change and even  
25 accepting the new break size for that plant does not

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1 mean the plant can go in and just make these changes.  
2 They still have to follow all of the rules.

3 And we've talked about increased diesel  
4 generator start time. You know, that's typically in  
5 the tech specs, and this would allow you --

6 MEMBER KRESS: Explain to me, once again,  
7 why they can't already do that.

8 MR. OSTERRIEDER: Because there's a limit.  
9 They have to show that they're meeting the design  
10 basis requirements, which includes large break LOCA,  
11 which that's the event driving the quick diesel start  
12 time.

13 MEMBER KRESS: I mean, could it -- when  
14 they come in for a change to the licensing basis,  
15 couldn't they -- couldn't that be part of the change  
16 request?

17 MR. OSTERRIEDER: It could if they had a  
18 basis. But if you have to analyze large break LOCA,  
19 depending on which methodology you're using, you may  
20 not be able to justify much longer start times.

21 MR. WARD: Right. And I have to get flow  
22 to the core in 40 seconds, or whatever, to meet a  
23 large break LOCA, which means diesel has got to start  
24 at 10, the pump has got to sequence on in the next  
25 five, come up --



1 MEMBER KRESS: And what I was saying, you  
2 come in for -- request to increase that start time,  
3 and your justification is not that it meets the  
4 requirements, the justification is I don't need it  
5 because of these risk considerations. And 1.174 plus  
6 the other --

7 MR. OSTERRIEDER: Well --

8 MEMBER KRESS: -- it seems like that's a  
9 perfectly legitimate thing to do under the --

10 MR. OSTERRIEDER: Well, we felt in  
11 assessing the different options that the rule change  
12 was a more holistic approach that would also  
13 consolidate review times, etcetera. We could come in  
14 with a bunch of exemption requests.

15 MEMBER KRESS: Okay. Now that, to me, is  
16 a different reason and probably a valid one. It gives  
17 everybody a start on the same page.

18 MR. OSTERRIEDER: Right.

19 MEMBER KRESS: So that's --

20 MR. OSTERRIEDER: Right.

21 MEMBER KRESS: Okay.

22 MR. OSTERRIEDER: Again, I'll just --

23 MEMBER APOSTOLAKIS: Didn't we just say,  
24 though, that they would still get to come back and  
25 request changes on individual units?

1 MEMBER KRESS: Yes. But at least it gives  
2 them all sort of a systematic and consistent approach  
3 to it, I think.

4 MR. WARD: I would have to come in and get  
5 an application for my unit to apply the new rule as my  
6 design basis. Now, as part of that, if -- if I could  
7 change my diesel start time, and if it was in the tech  
8 spec, I would have to have that in as the tech spec  
9 submittal.

10 If I had already taken that specific  
11 number out because I had adopted the approved tech  
12 spec, and the specific number is not in the tech spec  
13 but it's in the bases, then I would not have to come  
14 in for that specific approval after I got the design  
15 basis approval. That's how we envision it.

16 MEMBER APOSTOLAKIS: And I guess a lot of  
17 the generic technical work will be done by the owners  
18 group rather than individual --

19 MR. WARD: Yes.

20 MEMBER APOSTOLAKIS: -- licensees. That's  
21 really a great benefit.

22 MR. WARD: Right.

23 MEMBER APOSTOLAKIS: I mean, in principle,  
24 one could use 1.174 to come and request all of these  
25 changes. But then each application would have to go

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1 through a reevaluation of the large break LOCA  
2 essentially. That's what you're saying.

3 MR. OSTERRIEDER: Right. That's right.  
4 And there is justification, and I'm not sure if you'd  
5 need an exemption request each time or not. You  
6 would. You would, I guess, versus allowing you in the  
7 rule.

8 MEMBER SIEBER: You would need a very  
9 extensive exemption request because of all these other  
10 deterministic rules that are out there as part of your  
11 license conditions or, you know, if you have a --  
12 well, a 104-type license, you have that, and so that  
13 would not be a simple thing.

14 MR. OSTERRIEDER: I really -- I'll just  
15 point to a couple of examples here. I guess in the  
16 interest of time I won't go through them all unless  
17 you have specific questions.

18 The third item on here -- we've talked  
19 about the second item, which is flow balancing. We've  
20 talked about -- you know, this list of some of the  
21 things that we were looking at that plants may do or  
22 desire to do after this rule changes.

23 And in the area of accumulators, for  
24 instance, we're looking at potentially some relaxation  
25 in the tech specs where now if you're outside of a

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1 spec on boron concentration or -- or water volume, you  
2 may have to shut the plant down and do a plant  
3 transient, whereas it's not a risk-significant event.  
4 These are essentially relied on for the large break  
5 LOCA.

6 So we're looking at some, again,  
7 relaxation of operating parameters to avoid  
8 potentially plant shutdowns, which -- obvious economic  
9 benefit, but we believe there's a safety benefit of --  
10 of the thermal cycling on the plant when -- when it's  
11 not a risk-significant reason to be shutting down.

12 MEMBER SIEBER: Is that a real phenomenon?  
13 I can't ever remember a plant shutting down because  
14 accumulators were out of spec.

15 MR. WARD: The shut down is not such a big  
16 risk as the startup.

17 MEMBER SIEBER: Well, you have to fiddle  
18 -- you have to fiddle on startup to get it right.

19 MR. WARD: On one of my units we had a  
20 two-day delay on startup last year with one  
21 transmitter, trying to get it within a quarter of an  
22 inch.

23 MEMBER SIEBER: Yes, it's pretty tough.  
24 On the other hand, I can't remember a plant being shut  
25 down because of that. Of course, I don't -- I don't

1 know every event that has happened in the last 30 or  
2 40 years either.

3 MR. OSTERRIEDER: But even if they don't  
4 shut down, there may be a lot of work spent at the  
5 plant if they're on the edge as far as, you know, the  
6 volume spec. You know, you certainly need to meet  
7 their specs, but they may be doing -- spending effort  
8 in dealing with the idea that they're close.

9 MEMBER SIEBER: My point is your slide is  
10 sort of misleading to me.

11 MR. OSTERRIEDER: Well, the intent of the  
12 slide really is just to give you some idea of the  
13 things we're looking at. These -- you know, we need  
14 to assess these down the road, and I agree with you.  
15 I don't want to mislead you, but I don't want to  
16 mislead you and not put something like an accumulator  
17 spec change and then have you come back later and say,  
18 "Geez, if he was thinking about that, we should have  
19 put it on the list."

20 So we just -- we're trying to get it on  
21 here to give you some examples. And, really, I guess  
22 I wasn't planning on talking any specifics on this  
23 anymore unless you have a specific example you'd like  
24 us to talk about because I think we're going to get  
25 into some more examples.

1 MEMBER WALLIS: But if the large break  
2 LOCA went away, would the fan cooler water hammer  
3 problem go away?

4 MR. OSTERRIEDER: We would have to assess  
5 the fan cooler water hammer problem. We would have to  
6 assess what's driving some of these issues and whether  
7 or not they're prudent --

8 MEMBER WALLIS: You haven't gotten that  
9 far yet to reach a conclusion?

10 MR. WARD: I think there's a high  
11 likelihood that one may go away or get -- get better  
12 anyway. We've added a number of relief valves on  
13 containment penetrations for that reason. That could  
14 have been avoided.

15 MEMBER KRESS: When the agency was  
16 redefining the source term for use with the design  
17 basis accidents, what they did was speculated on what  
18 possible changes might result if a plant opted for the  
19 new source survey. And then they took those changes  
20 and calculated the risk impact of those, and then made  
21 the decision whether or not that risk impact was  
22 significant enough to do or allow a new source survey.  
23 This sounds like it's very similar to that.

24 MR. OSTERRIEDER: It's the same thing.  
25 What you don't see here is part of our activities

1 throughout this program is to identify and assess,  
2 from a risk perspective and from a deterministic  
3 perspective, some of these changes that we have on  
4 this list. We fully intend to do that as part of our  
5 demonstration analysis, but we --

6 MEMBER KRESS: That's down the road some.

7 MR. OSTERRIEDER: Well, we need to get  
8 endorsement that we think that the -- that the  
9 philosophy of the rule change makes sense. We believe  
10 it fully does, and we're hoping to get endorsement so  
11 that we could go ahead and proceed with that work.  
12 But, you know, we have to evaluate the risk, but  
13 that's what is currently planned in our activities.

14 MR. HEYMER: I'd also like to point out,  
15 as Bob said before, that there are specific control  
16 requirements imposed on licensees for making changes  
17 today, and that if you move forward with the large  
18 break LOCA, then want to go and do a change, you have  
19 to meet those control requirements which may or may  
20 not require you to go to the NRC staff to seek prior  
21 review and approval.

22 And under the current process, you've got  
23 1.174 from the plant-specific basis that would govern  
24 that, so --

25 MEMBER KRESS: And we've got 50.59, of

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1 course, so --

2 MR. HEYMER: So I think you're covered as  
3 regards, can you overstep demand?

4 MR. OSTERRIEDER: Right. And just to kind  
5 of try to bring this to closure here, our part, the  
6 safety margin area, we've talked about most of these  
7 items. As part of the risk-informed approach, 1.174  
8 Reg. Guide, I mean, you're assessing defense in depth.  
9 So that's going to maintain defense in depth.

10 And what we're doing, we've already  
11 mentioned that, you know, we're going to be looking at  
12 the CDF, the LERF, the effects on the health and  
13 safety of the public. From that perspective, we're  
14 not eliminating LOCA from these designs; we're looking  
15 at, you know, retaining LOCA, just defining what the  
16 maximum size is allowable.

17 And we believe that other design basis  
18 accidents continue to maintain adequate margin. You  
19 know, the idea of, do we need to look for additional  
20 accidents? I mean, these accidents should already be  
21 on the table, and that's what we're going back to look  
22 at and make sure that we're not increasing the  
23 importance of some event that we said was bounded  
24 before.

25 And, again, we feel this focuses our

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1 resources on greater risk-significant activities.

2 MR. WARD: So just to quickly wrap up our  
3 part of it, we believe that this approach will  
4 maintain the typical margins of safety. We do believe  
5 this will bring consistency within the regulations.  
6 It will help -- if we can follow this approach, it  
7 will help reduce the amount of resources that the  
8 staff and us have to spend on Option 3. And that  
9 helps our efficiency, our manpower efficiency, and  
10 effectiveness of the regulatory process.

11 We believe large break LOCA redefinition  
12 is the preferred industry approach on Option 3. We  
13 have looked at the other options that have been  
14 floated around, and large break LOCA is the only one  
15 that really makes sense to us to approve. And we do  
16 have industry consensus on this one, on this one.  
17 This is one we would like to move forward with.

18 But like Bob said, we need some assurance  
19 that before we do another two years of work and invest  
20 a tremendous amount of money in it that we're going to  
21 have a success path to get there.

22 MEMBER WALLIS: Well, it seems to me you  
23 read some -- I mean, this sounds reasonable, but then  
24 I haven't seen the numbers. And it may be that some  
25 of the gains may turn out to be small, other ones may

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1 be bigger than you thought, and so on. Until we  
2 really get an evaluation of them, it's hard to make  
3 the decision.

4 MR. WARD: They put so many tentacles into  
5 everything that I don't think any of us can envision  
6 what all it may impact down the road. We'd like to  
7 lay out a framework on how to use it.

8 MR. OSTERRIEDER: But we are doing the  
9 quantitative work regarding risk significance. This,  
10 in the near term -- we're currently scheduled for a  
11 July submittal of the risk-significant arguments, at  
12 least from the Westinghouse Owners Group.

13 MR. HEYMER: Okay. With that, we get on  
14 to a presentation from the Combustion Engineering  
15 Owners Group. Dave Bajumpaa from Millstone will go  
16 over some of the --

17 MEMBER APOSTOLAKIS: Adrian, just a  
18 second. Are we going to go until 12:00 with the  
19 meeting with industry?

20 CHAIRMAN SHACK: Yes.

21 MEMBER APOSTOLAKIS: I thought maybe we  
22 should take a break, then.

23 CHAIRMAN SHACK: Yes. I think there seems  
24 to be a groundswell for a five-minute break here -- a  
25 10-minute break.

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1 (Whereupon, the proceedings in the  
2 foregoing matter went off the record at  
3 10:56 a.m. and went back on the record at  
4 11:06 a.m.)

5 MR. BAJUMPAA: Good morning. I'm Dave  
6 Bajumpaa. I'm a Senior Engineer in the Nuclear Fuel  
7 and Safety Analysis Group at Northeast Nuclear Energy  
8 Company, Millstone Nuclear Power Station.

9 I'm here this morning to -- actually, I  
10 work in the deterministic thermal-hydraulic analysis  
11 area, which includes the FSAR Chapters 14 and 15  
12 accident analyses. I'm here this morning to present  
13 the CEOG position on large break LOCA definition.

14 And as we talked about earlier, large  
15 break LOCA -- by "large break LOCA" redefinition we  
16 mean to -- we mean the use of leak before break  
17 technology to really define a maximum mechanistic  
18 break size that we need to analyze in a design basis  
19 space, and then continue to analyze the spectrum of  
20 LOCAs up to and including that maximum break size.

21 As we've talked about already this  
22 morning, and as you well know, GDC4 currently allows  
23 for the application of leak before break analyses to  
24 eliminate dynamic effects associated with the large  
25 break LOCA. And as part of risk-informing 10 CFR Part

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1 50, we would -- we endorse extending this science to  
2 the remainder of the 10 CFR Part 50 regulations.

3 As we talked, GDC4 doesn't specify a  
4 specific break size. It generically -- essentially  
5 allows a -- it's a generic statement to the effect of  
6 essentially having the individual licensees justify  
7 a maximum break size that needs to be analyzed.

8 We at the CEOG support the consistent  
9 application of this large break LOCA redefinition  
10 through both the Appendix K and the containment-  
11 related analyses.

12 Adrian, Lewis, and Bob talked this morning  
13 about -- identified I think some of the safety  
14 benefits and the programmatic approach for the large  
15 break LOCA redefinition. The CEOG approach that we  
16 would take would be very similar to what -- the WOG  
17 approach as has been discussed previously already. We  
18 would continue to use risk-informed technology to show  
19 the low risk of large break LOCA, use leak before  
20 break analysis to justify a maximum break size, and  
21 then continue to analyze the spectrum of LOCAs up to  
22 this maximum break size.

23 The next slide, please.

24 There's, again, two major areas where we  
25 see extending the application in this redefinition of

1 large break LOCA to 10 CFR 50.46, the ECCS performance  
2 analysis, and then to the containment-related analyses  
3 that offshoot from the 10 CFR Part 50 regulations.

4 And this morning I'd like to just present  
5 -- for the remainder of my presentation, I'd like to  
6 just discuss -- focus a little more on the containment  
7 area, as those areas tend at times to be a little more  
8 subtle.

9 Next slide, please.

10 I think the first two bullets on this  
11 slide are pretty obvious to -- the most obvious here  
12 is that we look at containment-related LOCA design  
13 limits. We're looking from the perspective of peak  
14 containment pressure and inside containment EQ  
15 temperature profiles.

16 The next few bullets there are dealing  
17 with the -- a more subtle analysis that we have to do.  
18 We analyze -- as for peak containment pressure, we'll  
19 analyze to maximize containment pressure and  
20 temperature. But we also have to perform an analysis,  
21 a separate LOCA analysis, that looks to maximize the  
22 close cooling water system temperatures.

23 It's a similar kind of containment LOCA  
24 analysis, except that we'll -- instead of using a  
25 fouled set of CAR coolers to maximize the containment

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1 temperature and pressure consequences, we'll actually  
2 use clean CAR coolers to put as much energy into our  
3 closed cooling water systems as possible. And you  
4 continue to use a fouled heat exchanger on our closed  
5 cooling water to service water; that's our ultimate  
6 heat sink.

7           So we do two distinctly different large  
8 break LOCA containment-related analyses. The analyses  
9 that we do to maximize the RBCCW -- I'm sorry, I use  
10 RBCCW because that's reactor-building, closed cooling  
11 water system. That's what I call it in my plant, so  
12 I apologize if I stumble through that.

13           Some of the key parameters we analyzed,  
14 design limits we analyzed for peak RBCCW temperature-  
15 related effects are the -- our containment -- our  
16 safeguards rooms, our ECCS and containment spray pump  
17 temperature profiles. They're for the room  
18 temperature profiles that are in a building, and  
19 that's going to affect the EQ of our HPSI/LPSI  
20 containment spray pumps -- safety injection and  
21 containment spray pumps.

22           Other design limits that we have to  
23 analyze with this peak -- related to this peak RBCCW  
24 analysis are closed cooling water inlet and outlet  
25 temperatures at the different components in the closed

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1 cooling water system at the containment air recirc  
2 coolers, the shutdown cooling heat exchangers, and the  
3 spent fuel pool cooling heat exchangers.

4 Again, it was brought up a little earlier,  
5 the generic -- other issues related to containment  
6 design limits, issues related to the Generic Letter  
7 96-06, potential water hammer loads associated with  
8 the LOCA with the concurrent LMP, and the potential  
9 for voiding in the car coolers. And then, once you  
10 resequence your closed cooling water pumps on, you  
11 will get some significant hydrodynamic loads in the  
12 CAR coolers.

13 Some of the other components -- the  
14 subcompartment pressurization analysis. That's a  
15 traditional design basis analysis where we looked at  
16 the double-ended guillotine, and we looked to apply  
17 this large break LOCA redefinition effort in order to  
18 -- to limit the maximum break size we analyze.

19 Another issue -- the last bullet on that  
20 slide is I've got a relatively significant issue  
21 that's still out in the Generic -- I guess it's  
22 Generic Safety Issue 191 dealing with debris  
23 generation in the transport over to the -- with  
24 regards to the containment sump screens and our  
25 containment sump design verification.

1 We believe that the application of large  
2 break LOCA redefinition is appropriate in this arena  
3 as well as the rest of the containment design areas  
4 and 50.46.

5 Looking at the next slide, the -- if we're  
6 looking at the containment-related design limits, we  
7 typically have very little analytical margins of these  
8 design limits. What I will calculate for a peak RBCCW  
9 temperature, say at the outlet of my CAR cooler, is  
10 the actual limit that our CAR cooler piping can  
11 handle.

12 I don't have any margin in many of the --  
13 related to many of these design limits. Changing  
14 these design limits is costly. For example, the CAR  
15 cooler outlet temperature, if I have to increase that  
16 containment temperature, I have many, many, many  
17 calculations of structural supports and many stress-  
18 related calculations that have to be redundant.

19 It's very expensive to us, so it's --  
20 analytic margin is a very good thing to have. So if  
21 we have increase analytic margin, we can accommodate  
22 some unforeseen plant problems that we run into on a  
23 day-to-day basis at our plants.

24 And looking at -- you know, trying to  
25 quantify some of the margin, you know, if we look at

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1 the containment pressure design limit, the containment  
2 pressure, we'd expect a reduction if we're allowed to  
3 limit our -- apply -- redefine our large break LOCA.  
4 We'd expect about a 10 percent increase or a 10  
5 percent reduction in containment pressure, which would  
6 increase our analytic margin by that 10 percent.

7 We wouldn't look to change any of the  
8 design -- containment design, you know, thicknesses or  
9 any kind of structural integrity of the containment.  
10 But we'd use it for -- use it to get that and  
11 establish the analytic margin.

12 Next slide.

13 I'd like to look at a little more detail  
14 on containment design pressure here, just to show you  
15 what typically is out there. This is actually related  
16 to my plant at Millstone. These specific numbers are  
17 related to my plant at Millstone but are very similar  
18 to the rest of the CEOG fleet.

19 The containment design pressure I have is  
20 a 54-pound containment design. My peak calculated  
21 containment pressure falling in my LOCA is 52.9 psi.  
22 Peak calculated pressure falling in the main steam  
23 line break is 53.8. So I'm actually steam line break  
24 limited at Millstone, at this point -- Millstone II at  
25 this point.

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1                   So redefinition of large break LOCA is not  
2 going to directly gain the --

3                   MEMBER KRESS: Do you consider those two  
4 numbers significantly different?

5                   MR. BAJUMPAA: No, I do not.

6                   MEMBER KRESS: Okay. So both of them  
7 limit the --

8                   MR. BAJUMPAA: Right. Right. But we  
9 would certainly advocate the redefinition of large  
10 break LOCA to get more margin for the LOCA. If we can  
11 get that extra 10 percent or so margin, it would  
12 certainly simplify our design change process to -- to  
13 perhaps allow us to do -- right now, if I had proposed  
14 a design change, because I'm so close to the limits,  
15 I have to look at both accidents. If I had more  
16 analytic -- and I have to look at both accidents  
17 quantitatively.

18                   If I was able to get a little more margin,  
19 analytic margin for my LOCA, perhaps I could look at  
20 that one qualitatively. But I would still have to  
21 look quantitatively at the steam line break.

22                   So there's not a different benefit on  
23 containment pressure here, but it is certainly -- it  
24 does simplify my life in the -- maintaining my plant's  
25 configuration and our design change process.

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1 Some of the other -- next slide, please.

2 Some of the other areas -- the inside  
3 containment EQ profile. Again, increased analytic  
4 margin between the post-accident calculated  
5 temperature profile and the EQ temperature envelope of  
6 equipment inside containment, that's -- again, we're  
7 going to get some increased analytic margin here if we  
8 are allowed to redefine the large break LOCA.

9 Similarly, the ECCS room temperature  
10 profiles, if I have a -- if I am able to limit my  
11 break size, for example, to something as large as  
12 branch line break, up to something like that, that  
13 would get me some additional temperature margin, so  
14 that I could -- so it's just an increase in margin  
15 there as well.

16 And the same thing between the CCW  
17 temperature when it might have increased analytic  
18 margin between what I calculate post-LOCA with clean  
19 CAR coolers versus my coolant CCW temperature when  
20 it's in my design limits right now.

21 MEMBER SIEBER: With respect to the EQ  
22 limits on electrical equipment, how does that benefit  
23 you since you already have the equipment qualified to  
24 the original profile? Is it in replacement parts or  
25 aging life, or how does that come up in -- in some

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1 cases, you may be able to recall.

2 MR. BAJUMPAA: Yes, there is some  
3 equipment that actually has -- I have in my plant  
4 right now that -- it's definitely an aging issue.

5 MEMBER SIEBER: Okay.

6 MR. BAJUMPAA: It also comes from the  
7 perspective of showing the long-term LOCA profile  
8 compared to the test profile and actually analytically  
9 proving that the test profile that the equipment is  
10 tested to bounds the actual predicted LOCA profiles.

11 I actually have some equipment that is  
12 very marginal that we have to do a pretty  
13 sophisticated analysis internally to demonstrate that  
14 with the double-ended guillotine LOCA that our  
15 equipment would survive that for the 30-day time of  
16 the accident and including them in a four-year life.  
17 So there would be some equipment potentially that we  
18 could avoid having to replace.

19 MEMBER SIEBER: I think I'll ask no more  
20 questions about that.

21 MR. BAJUMPAA: Okay.

22 MEMBER SIEBER: Thank you.

23 MR. BAJUMPAA: Sure. So I've sort of  
24 established to this point, hopefully, that what we're  
25 trying to do here is increase the analytic margins to

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1 our design limits. Now, what would we do with that  
2 analytic margin? And this next slide sort of leads  
3 into some of the areas in the containment-related  
4 design benefits that we would get here.

5 One area, we would look to relax perhaps  
6 the CCW flow limits through our CAR coolers. Right  
7 now at my plant I have a very, very small window in  
8 which I can set my CAR cooler flow outlet valves to  
9 get the proper flows. I have to make sure that I have  
10 enough minimum flow through the CAR coolers, so that  
11 I am assured to pull off enough heat removal so that  
12 I don't exceed my containment design pressure when I'm  
13 looking to maximize my containment design pressure.

14 But I also to make sure that I don't have  
15 too much CCW flow going through my CAR coolers. If I  
16 start having too much flow, I might -- with a clean  
17 CAR cooler, then I might actually increase my peak  
18 calculated RBCCW temperature following the LOCA. And  
19 so I actually have a very tight constraint right now  
20 that I have at my plant to maintain a minimum flow  
21 that ensures the containment pressure is met and a  
22 maximum flow that ensures that I don't exceed the peak  
23 CCW temperature limits.

24 MEMBER SIEBER: Do you have service water  
25 temperature limits?

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1 MR. BAJUMPAA: Yes. We do have service  
2 water temperature limits. Primarily, with the  
3 containment-related analysis, that comes in from the  
4 ultimate heat sink, the --

5 MEMBER SIEBER: Okay.

6 MR. BAJUMPAA: -- sound temperatures, yes.

7 MEMBER SIEBER: And do you also have RWST  
8 temperature limits?

9 MR. BAJUMPAA: That is correct.

10 MEMBER SIEBER: Which often is hard to  
11 meet in the summertime?

12 MR. BAJUMPAA: That is -- yes, that is  
13 correct.

14 MEMBER SIEBER: Okay. And those would be  
15 relaxed if you had a smaller break size?

16 MR. BAJUMPAA: That would -- it would  
17 certainly -- it would help.

18 MEMBER SIEBER: Okay.

19 MR. BAJUMPAA: I'm not sure on the RB we  
20 have to look, you know, in an integrated fashion  
21 through all of the -- but, yes, that would certainly  
22 help the containment.

23 MEMBER SIEBER: I know that Farley had  
24 those problems, correct?

25 MR. BAJUMPAA: Right.

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1 MEMBER SIEBER: Okay.

2 MR. BAJUMPAA: Right. So I should have a  
3 bigger window as far as CCW temperature to flow -- to  
4 set a bigger window in my plant right now. I think  
5 I've only got a 25 gpm target window to set through a  
6 CAR cooler, so that I don't have a minimum flow. When  
7 I take the minimum flow, I also have to drop off to  
8 account for pump degradation and instrument  
9 uncertainty.

10 So I have a very tight window. It's only  
11 like 25, 30 gpm that I can set my CAR cooler outlet  
12 valves within, which is a bit of a challenge and we do  
13 have to fiddle with the valves from time to time to  
14 make those -- to maintain our configuration  
15 management.

16 MEMBER WALLIS: Fiddling with the valves,  
17 is that done remotely?

18 MR. BAJUMPAA: No. These are actually  
19 manual.

20 MEMBER WALLIS: Someone has to go in there  
21 and turn them?

22 MR. BAJUMPAA: Yes. Somebody would go in  
23 there and turn them, not during an accident, but  
24 during the refueling outages and stuff when -- or  
25 whenever we do anything that might change the

1 configuration of our CCW system we'd have to go back  
2 and do a flow balance.

3 MEMBER SIEBER: Well, you end up having a  
4 range of adjustments because as you operate the plant  
5 the CAR coolers become fouled and flow goes down.

6 MR. BAJUMPAA: Yes. We typically --

7 MEMBER SIEBER: To some extent.

8 MR. BAJUMPAA: To some extent, that is  
9 true I guess perhaps for some plants. But on our  
10 plant we currently do cool our CAR coolers with a  
11 closed cooling water system and maintain pretty decent  
12 chemistry there.

13 MEMBER SIEBER: So you're better off.

14 MR. BAJUMPAA: We typically don't have  
15 issues with car cooling, fouling.

16 MEMBER SIEBER: Okay.

17 MR. BAJUMPAA: Yes. Other potential  
18 applications that we use for this increased analytic  
19 margin we'd get with our potential large break LOCA  
20 redefinition here, I might be able to increase my tube  
21 plugging limits that I have to maintain in my  
22 configuration right now on my CCW to service water  
23 heat exchangers, my shutdown cooling heat exchangers,  
24 and the CAR coolers.

25 The service water areas, being a raw water



1 system, that's probably the area where I'd be most  
2 sensitive about tube plugging. Other areas -- as  
3 alluded to a little earlier, I have actually made  
4 submittals on our docket, and we just received a  
5 license amendment regarding the increase in our  
6 ultimate heat sink temperature limits. Actually, it's  
7 more of an issue there that I just went through on my  
8 plant.

9 Another potential area of use for this  
10 increased margin would be to accommodate any future  
11 potential power upgrades. Because I'm so close right  
12 now with the LOCA on containment pressure, increasing  
13 the power, that event turns out to -- that may  
14 actually put the LOCA containment calculated pressures  
15 higher than the design pressure containment.

16 If I were to do a power upgrade in the  
17 future with a double-ended guillotine steam line break  
18 there, even though it's up there right up and close,  
19 that's actually limited by my zero power case by the  
20 additional water inventory and the steam generators.

21 I guess the next slide -- this next slide  
22 really is a summary of actually when Millstone was  
23 going through its 54(F) configuration management  
24 related outages, this is a listing of the areas where  
25 we had analytic problems that we had to straighten out

1 our configuration. And that resulted in us having to  
2 reanalyze our containment pressurization analysis  
3 associated with the large break LOCA.

4 We had increased safety injection. We had  
5 to increase our safety injection pump flows. We had  
6 to increase the spent fuel pool cooling heat loads  
7 that were assumed in the analysis. We had increased  
8 containment spray header fill times when we looked at  
9 in more detail.

10 Small -- very, very small issue here  
11 obviously, the containment paint thickness, but that  
12 does play into -- I have to -- I have a maximum paint  
13 thickness that I have to assume on my passive heat  
14 structures inside containment. And during the 54(F)  
15 outage we identified that the paint micrometer was  
16 thicker than what we had assumed in the analysis.

17 So that was another contributor to making  
18 us reanalyze that event and in the increased refueling  
19 water storage tank temperature. That's -- those are  
20 things that we had to deal with during our 54(F)  
21 outage, and now we have a solid configuration in our  
22 running well.

23 Another area where we just wanted to make  
24 one point with this slide, that we really feel -- the  
25 CEOG feels that we should consistently redefine the

1 large break LOCA across the entire spectrum of the 10  
2 CFR Part 50 requirements. We think that is the way to  
3 go. It's currently acceptable to use LOCA  
4 redefinition for GDC4, and to extend that application  
5 through both the 50.46 and the containment-related  
6 areas, we think that will allow us to take advantage  
7 of some of the potential safety benefits.

8 I throw up as an example on this slide the  
9 emergency diesel generator start times to -- to try to  
10 enhance the diesel reliability. But that diesel  
11 generator start time is driven by a lot of things.  
12 It's driven by the 10 CFR 50.46 ECCS performance  
13 analysis, where we are looking at getting our high  
14 head and low head safety injection pumps up to speed  
15 in the adequate time to combat the double-ended  
16 guillotine LOCA.

17 But I also have to have my CAR fans start  
18 my closed cooling water pumps for the containment-  
19 related areas. They need to sequence on the diesel  
20 generator and start to accommodate these double-ended  
21 guillotine LOCAs.

22 If I am going to increase this diesel  
23 start time, it's a major effort on behalf of my plant  
24 from a design change perspective. I have to look to  
25 make sure that my steam line break containment

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1 performance does not now become more limiting than the  
2 LOCA with regards to maximizing the water hammer loads  
3 on the CAR coolers, the RB temperatures, and things  
4 like that.

5           So it's -- to -- to -- right now, on  
6 Millstone, my diesel start is tied in right now to --  
7 in order to prevent too many -- too large hydrodynamic  
8 loads on my CAR coolers, I need to start my diesel in  
9 the same -- I can't relax that directly right now  
10 unless I get -- unless I'm able to redefine the LOCA.  
11 Then I will not be able to increase my start time, if  
12 I just apply it to the -- if I apply LOCA redefinition  
13 to the 50.46 area only.

14           So it's got to be an integrated overlook,  
15 and I've got to look at not only the containment-  
16 related LOCA analysis, I've got to look at the ECCS  
17 analysis, and I've got to look at all the rest of the  
18 Chapter 14/Chapter 15 accident analyses to make sure  
19 I'm not affecting aux feedwater start times for my  
20 loss of normal feed analysis in Chapter 14. So it's  
21 got to be a big integrated look to get this increased  
22 diesel start time and yet still maintain the proper  
23 configuration at my plant.

24           And I guess the last slide is just a  
25 summary that the CEOG -- as I have indicated and

1 alluded to in earlier slides, the CEOG does support  
2 the consistent application of the large break LOCA  
3 redefinition throughout the entire 10 CFR Part 50  
4 regulation.

5 CHAIRMAN SHACK: Let me catch up one thing  
6 back to Mr. Ward. Something slipped through that I'd  
7 sort of like to understand. Although we're doing this  
8 under Option 3, is your selection of the maximum pipe  
9 size going to be basically a deterministic argument  
10 based on the 1061 kind of arguments, that you're going  
11 to have some margin to leak and then some margin on  
12 crack size? Or are you going to go through and look  
13 at the risk significance of various leak sizes?

14 MR. OSTERRIEDER: It's a combination.  
15 We're considering the risk significance and the  
16 deterministic piece.

17 CHAIRMAN SHACK: Okay.

18 MR. WARD: Yes. And, historically, we had  
19 started this before Option 3 became a program. We  
20 wanted to get into redefining the LOCA. So I guess we  
21 have been doing this in conjunction or in support of  
22 the staff's effort to come up with some options under  
23 Option 3.

24 MR. HEYMER: Terry Rieck from Excelon will  
25 talk to you about the BWR perspective. He's

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1 representing the BWR Owners Group.

2 Terry?

3 MR. RIECK: Good morning. For those of  
4 you who don't know who Excelon is, we're now in the  
5 merged organization of Con Ed and PECO, so -- I know  
6 a lot of you don't know how much we're changing out  
7 there in the industry.

8 But I'm here representing the BWR Owners  
9 Group. Excelon does own 10 BWR units, and so we are  
10 a big part of that owners group.

11 We formed a committee recently, a  
12 technical committee, to look into Option 3 risk-  
13 informing Part 50, the technical requirements.  
14 Frankly, we were behind on where the PWRs were, PWRs  
15 having started a year and a half ago or so to look  
16 into this. We are behind because we saw we had some  
17 margin in large break LOCA, and we saw where the PWRs  
18 were going and -- and didn't jump in right away.

19 But within the last few months, we felt we  
20 needed to get more involved to see where the benefits  
21 might be for us. And we formed this technical  
22 committee. We've now met a couple of times, and we  
23 started talking about the same things that the PWRs  
24 were doing.

25 Very quickly, we got into determining that

1 redefining the large break LOCA should be our highest  
2 priority. As I said, we kind of dismissed that a year  
3 ago or so, but once we started talking about it we saw  
4 that it met the criteria, the framework, that the  
5 Commission was talking about in terms of Option 3.  
6 That is, there was some significant safety  
7 enhancements that could be made on our plants, but  
8 also have a burden reduction for us, and there was  
9 some cost that we had to incur to get there.

10 So when you looked at it, when we looked  
11 at it in terms of the PWR approach, we saw the same  
12 safety enhancements that the PWR saw. We talked about  
13 diesel generators starting in 30 seconds instead of 15  
14 seconds, and what would that mean to the reliability  
15 of the diesels to the reliability of the electrical  
16 system.

17 And we saw that our CDF for our large  
18 break LOCA was way down in the weeds, very low, and  
19 our small break LOCA was higher and other -- other  
20 actions that relied on loss of -- relied on offsite  
21 power were higher, and, thus, the diesels are very  
22 important.

23 So we ended up with the same safety  
24 benefits and felt we didn't meet the safety of the  
25 plant significantly. And, you know, as we talked more

1 and more about it, the members of our committee from  
2 the various utilities said, "Well, of course, you  
3 know, the setting up of valves in certain ways and the  
4 ECCS pumps would all enhance the small break LOCA."  
5 And the large break LOCA was so low in CDF, you know,  
6 it might, as mentioned here, increase its CDF. But it  
7 was so low it was an insignificant increase.

8 We very quickly said, "Yes, we can gain  
9 the safety benefit, and the burden reduction could  
10 also be significant." The same thing is talked about  
11 on the PWR side.

12 As I mentioned, we do have more margin in  
13 the large break LOCA, so it kept us from getting in as  
14 quickly. And we realized also that we haven't delved  
15 in as much into fracture mechanics probability and  
16 leak before break like the PWRs, so our cost might be  
17 more to get into this than the PWRs.

18 But what that meant is we would incur a  
19 larger cost for the burden reduction, but it might  
20 also mean an alternate break size, as we may not be  
21 able to justify as small of a break size as the PWRs.  
22 And as each of the owners groups talked about here  
23 today, that's part of our industry proposal is that  
24 each vendor would have to propose their own break size  
25 based on what they could justify. So we realize we

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1 may not be able to get the same break size.

2           So, again, just to summarize, we felt the  
3 -- that large break LOCA redefinition was our most  
4 beneficial path to go down. But we did make this a  
5 committee that looked at other options, because the  
6 other owners groups had already done that. But we  
7 hadn't had the chance to look and see what might be  
8 our highest priority, and, thus, we did look at other  
9 options and came up with half a dozen other options  
10 that we ought to pursue. So we are looking other  
11 places.

12           So we see large break LOCA as a high  
13 priority. We see a benefit for that as well as  
14 working with the Commission and the owners groups in  
15 terms of -- of the framework and how it might be  
16 further development through this process in the large  
17 break LOCA.

18           So our follow-on activities on the second  
19 slide here are to continue in the large break LOCA  
20 arena, better define the safety benefits as well as  
21 our burden reduction, essentially do the cost-benefit  
22 analysis, but also assess the various approaches on  
23 fracture mechanics and leak before break.

24           So we've got a lot of work ahead of us to  
25 catch up to where the PWR is. But, again, I want to

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1 emphasize that is our top priority in the working  
2 group, but we are also looking at other options. And  
3 we're playing in -- or we're working in this arena to  
4 get more experience in that and know where our cost  
5 benefit might be for other options down the road.

6 CHAIRMAN SHACK: Would you be looking at  
7 changes in GDC4 on the requirements that you can't  
8 apply leak before break, for example, to piping within  
9 a granular stress corrosion cracking?

10 MR. RIECK: We have -- the BWRs have had  
11 IGSCC problems, and we have also done some mitigation  
12 to those problems over the years. And so, in our  
13 discussions, we felt that we'd have to do a lot of  
14 justification to show that we have improved on the BWR  
15 pipes. And the smaller pipe size may not be  
16 justified, but the larger pipe size, where we may not  
17 have seen that, we might be able to justify that. So  
18 that's the path that we have taken.

19 That's all I have to present. I'd be  
20 repeating a lot of what the PWR said, but I made the  
21 points. We are moving down this path.

22 MR. HEYMER: The B&W Owners Group couldn't  
23 be here today, but they have a similar program  
24 underway. They are supporting this activity. They  
25 support this approach, and they believe, looking at

1 50.46, that redefining the large break LOCA is the  
2 priority that we should be looking at in this  
3 activity.

4 And so I guess, in summary, what we've  
5 tried to do today is explain to you -- give you some  
6 background of how we reached our conclusions on 50.46  
7 and redefining the large break LOCA. All owners  
8 groups have evaluated this and have continued to look  
9 at it as we've interacted with the staff over the last  
10 15 months or so and explained our positions and  
11 thoughts to the staff on where we think the emphasis  
12 needs to be placed in improving 50.46.

13 You heard today some discussion on the  
14 benefits as regards to margin, the operational margin,  
15 scheduling of work activities, the priority of work  
16 activities, and consistency in the regulation. And we  
17 believe that by going down this path of redefining the  
18 large break LOCA we can more effectively focus our  
19 resources on those issues that are safety significant  
20 which will ultimately enhance the overall safety  
21 profile of the plants.

22 So that's what we came with today. We're  
23 looking to go to the next step, and you heard  
24 Westinghouse talk about evaluations that are underway.  
25 As I said, owners groups have provided funding because

1 we saw recognition that if we're not going to go down  
2 the large break LOCA path that we need to hear about  
3 that, because we do really believe that it is the  
4 priority and the one that we should be looking at to  
5 get the maximum benefit, both from a resource and a  
6 safety perspective.

7 And before these folks go off and spend a  
8 lot more money, I think we've got to come to a  
9 resolution of the direction in which we're going.

10 MEMBER WALLIS: So what are you hoping for  
11 from the ACRS at this point?

12 MR. HEYMER: Well, we understand that this  
13 was really a familiarization discussion with you to  
14 explain our position, and we look forward to hearing  
15 what the staff is going to say on the matter. And we  
16 understand that there are some papers going up to the  
17 Commission, because as you rightly said this is --  
18 this is a significant step and they want Commission  
19 involvement.

20 And we hope that it's -- it's the decision  
21 that supports what we've explained to you this  
22 morning, because we think that is the right thing to  
23 do.

24 MEMBER WALLIS: We have to listen to the  
25 staff and then -- I don't know what the staff will

1 say. If the staff agrees with you, then it would seem  
2 we don't have much to do. If the staff disagrees with  
3 you, maybe we need to get involved and --

4 MR. HEYMER: Well, I mean --

5 MEMBER WALLIS: -- try to sort things out.

6 MEMBER KRESS: I think it's a question of  
7 whether we agree or not, not whether the staff does.

8 MEMBER WALLIS: Yes, but we haven't seen  
9 that much. And we've seen sort of the perspective of  
10 you're about to go down this path, and there may be  
11 some nice country to discover if you take the path.  
12 But we haven't really seen much in the way of numbers  
13 or technical analysis or -- I mean, there's hopes that  
14 if you did this you might be able to get something  
15 here. I think we need something a little more  
16 substantial in order to give a solid yes or no or  
17 evaluation.

18 MR. HEYMER: And I think that what we're  
19 looking for from an industry side is the fact that,  
20 yes, okay, it's worth progressing, and, yes, we can  
21 continue to go down this path, and we will do the  
22 analysis. And we can come back once we've done those  
23 detailed analyses and provide you a further -- a much  
24 more detailed description of what we're finding and  
25 where we're going.

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1 But we feel we should be confident that we  
2 can do that, and we can achieve --

3 MEMBER WALLIS: Before you plan the  
4 expedition to climb this mountain, you want to know if  
5 there's going to be some taboo or something that says  
6 you can't go there anyway.

7 MR. HEYMER: Well, yes. And if someone  
8 says that whether you -- you can do what you want but  
9 you're wasting your time, and, you know --

10 MEMBER WALLIS: Right.

11 MR. HEYMER: -- then we're going to have  
12 to take a look at doing risk-informed, and are we  
13 actually risk-informing the regulation, because we  
14 think this is a central element and it -- it does send  
15 a very clear signal that this is what we want to move  
16 towards, improving the process.

17 MR. OSTERRIEDER: Right. In all the  
18 discussions we've had to date, we haven't heard of any  
19 issues brought up that we didn't feel were -- that  
20 were insurmountable. We thought that all of the  
21 issues that were identified to us thus far are issues  
22 we can deal with. And this continues to make sense  
23 and the most sense, but, you know, we just need to  
24 understand if there are issues there and get them on  
25 the table and move forward.

1 CHAIRMAN SHACK: Well, I think perhaps  
2 this -- we really do need to hear from the staff.  
3 That's the next step. And we'll be doing that at  
4 12:30. We'd like to take a break for lunch now. Come  
5 back at 12:30.

6 (Whereupon, at 11:42 a.m., the  
7 proceedings in the foregoing matter went  
8 off the record for a lunch break.)  
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A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

(12:32 p.m.)

CHAIRMAN SHACK: We're ready to restart the meeting, and we'll have the staff presentation. I guess we're going to have an overview from Tom King, Mary Drouin, and Mike Mayfield, among others -- the usual suspects.

MR. KING: My name is Tom King. I'm with NRC's Office of Research. With me at the table is Mike Mayfield, Division Director, Division of Engineering Technology and Research; Mary Drouin from the PRA Branch; and Alan Kuritzky from the PRA Branch.

If I could have the second slide.

What we want to talk about today is give you a status report on where we stand on looking at 50.46. We haven't sent you anything in advance. We're not asking for a letter. This is work in progress, but I think we've reached a point where it's worthwhile having some interactions, and at least informally getting your reactions, your feedback. And we'll get to a schedule slide later on, and we will be back several times before this is all done.

This is sort of an initial overview of what we've done, sort of some general conclusions we've reached, and some additional work things,



1 follow-up things we're still working on. And like I  
2 said, we'll be back later to talk about further  
3 progress in this area.

4 I'm going to give a little introduction  
5 and overview of where we stand. Mike is going to talk  
6 about in more detail redefining the large break LOCA.  
7 And then Alan Kuritzky is going to talk about where we  
8 stand in terms of some near-term conclusions or  
9 recommendations that we're thinking of proceeding with  
10 and the longer term aspects of 50.46. If I could have  
11 the third slide, please.

12 As you recall, this is work being done  
13 under what we call Option 3, and Option 3 was  
14 basically an effort to go in and look at the  
15 regulations, technical aspects of the regulations, try  
16 and identify what the -- from a technical standpoint  
17 what things were candidates to be changed based upon  
18 risk insights. And those changes could go either way.  
19 They could fill gaps in the current regulations that  
20 risk insights say need to be filled, or they could  
21 remove some unnecessary burden that risk insights say  
22 are not very risk significant.

23 Our plan in Option 3 is to do what we call  
24 a feasibility study. That is, go to the Commission,  
25 do enough work to go to the Commission and say, "Hey,

1 here are some things that are feasible to change."  
2 Not give them a rulemaking, but get them to buy in up  
3 front that, yes, we've done enough work to establish  
4 certain changes are feasible, and then the rulemaking  
5 would actually get into the details and the exact  
6 wording of the changes, and go through the normal  
7 process which is usually about a two-year process.

8 The rulemaking process involves a lot of  
9 public interaction, but we've also tried to have with  
10 -- to work under Option 3 public interaction as well.  
11 And you heard this morning we've had a number of  
12 meetings with the owners groups, and they've all been  
13 public meetings. We had a workshop to try and get as  
14 broad input as we could on this activity, and we'll  
15 continue to do that as we proceed.

16 MEMBER WALLIS: Are you getting what I  
17 would call real public input?

18 MR. KING: We have not gotten much from  
19 outside the industry, no. We've invited people, and  
20 some of them attended, but we haven't gotten much in  
21 terms of feedback.

22 MEMBER WALLIS: I think this is an issue  
23 where, you know, I would really be interested in what  
24 the sensible, informed public would think of about  
25 this sort of change, and not people who have something

1 to gain by it one way or another but those who -- you  
2 know, whose interests you are trying to protect.

3 MR. KING: I'd like that feedback as well.  
4 I'm not sure exactly how to get it other than you keep  
5 asking for it and hope it comes in.

6 MS. DROUIN: We have had at the public  
7 meetings real public. They have come to some of the  
8 meetings.

9 MR. KING: Yes, but they haven't said  
10 much.

11 MS. DROUIN: They haven't said much.

12 MEMBER APOSTOLAKIS: I don't understand  
13 why they are part of -- they use different names,  
14 means --

15 (Laughter.)

16 MR. KING: Non-industry.

17 MEMBER APOSTOLAKIS: Okay. Non-industry.  
18 Much more factual. In fact, to protect the sort of  
19 public that's sitting in front of us. Let's not  
20 forget that. The public has safety.

21 MR. KING: We're following in all of these  
22 Option 3 activities what we call this framework  
23 document, which we've discussed with the committee  
24 before. It sort of lays out the ground rules as how  
25 we go through and look at regulations and what the

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1 guidelines are for making judgments on whether we'd  
2 make a change or not make a change, and it involves  
3 defense in depth, safety margins considerations, as  
4 well as some risk guidelines.

5 And the question came up this morning,  
6 well, why not use Reg. Guide 1.174? In theory, any  
7 licensee today could come in with 1.174 and propose a  
8 change to the large break LOCA for their plant, go  
9 through all the analysis it would require as to staff  
10 review and approval.

11 Option 3 is really trying to make some  
12 generic changes, not require plant-specific stuff in  
13 every case. And that's why the framework in Option 3  
14 is a little different than what's in 1.174. 1.174 is  
15 delta CDFs, delta LERFs. You're making changes from  
16 the current plant risk profile.

17 MEMBER APOSTOLAKIS: Let me understand  
18 that a little better, Tom, because it's something I  
19 have on my mind. When you change a rule, you can  
20 still use the idea of delta CDF and delta LERF to  
21 evaluate the change you're about to make. In other  
22 words, you are using the idea behind the 1.174, even  
23 though you are not changing the licensing basis of a  
24 specific unit.

25 MR. KING: When you change a rule,

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1 particularly when it's mandatory on everybody, and you  
2 go through the backfit analysis, you have to show that  
3 the incremental improvement in safety is substantial.  
4 And there are guidelines in the reg. analysis  
5 guidelines, delta CDF, for example, that's used to do  
6 that.

7 MEMBER APOSTOLAKIS: But in addition to  
8 those, though, shouldn't delta CDF be small? Or do  
9 you think that's covered already by the regulatory  
10 analysis?

11 MR. KING: If we're imposing a new  
12 requirement, we want to make sure that the improvement  
13 in safety is not minuscule, that it has some  
14 substantial improvement in safety. So there's a delta  
15 CDF guideline in the reg. analysis guidelines.

16 MEMBER APOSTOLAKIS: I guess now I'm a bit  
17 more -- when you are imposing a requirement, that  
18 means that the delta CDF is negative, is it not? And  
19 that's why the regulatory analysis applies.

20 MR. KING: But the change is an  
21 improvement in CDF, and CDF goes down.

22 MEMBER APOSTOLAKIS: Okay.

23 MR. KING: Yes.

24 MEMBER APOSTOLAKIS: If, on the other  
25 hand, you change a rule in a way that, really, there

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1 is only relief, then I would expect a positive delta  
2 CDF. So there shouldn't be a question of regulatory  
3 analysis. But there should be a question of whether  
4 the delta CDF, which is not positive, is acceptable.

5 MR. KING: Yes.

6 MEMBER APOSTOLAKIS: Which brings into  
7 this 1.174 what I feel the idea is behind 1.174.

8 MR. KING: Right. Right.

9 MEMBER APOSTOLAKIS: So that would be one  
10 where you're doing it. But then, this morning --  
11 again, I'm trying to understand how this works -- we  
12 said that, yes, even if you change the rule, then each  
13 licensee will have to come to you with a request to  
14 actually be allowed to change it for their facility.  
15 And that's not clear to me.

16 MR. KING: Well --

17 MEMBER APOSTOLAKIS: Why do they have to  
18 do that?

19 MR. KING: It depends on the rule change  
20 that's made. I guess in an ideal situation, you'd  
21 make a generic rule change, specify a new break size,  
22 and maybe people now would have to submit on their  
23 reload analysis to conform to that new break size.  
24 But they wouldn't have to come in and justify that  
25 break size.

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1 I think what we've kicked around is there  
2 is -- you know, it's not clear we can define a generic  
3 break size for everybody -- a new one.

4 MEMBER APOSTOLAKIS: Okay.

5 MR. KING: Perhaps its class of plant-  
6 specific or vendor-specific -- or perhaps it's plant-  
7 specific, in which case you -- I think you heard this  
8 morning that if it's plant-specific, maybe each  
9 licensee -- what the rule change would do, it would  
10 open the door for each licensee to come in and propose  
11 for his plant the new break size that makes sense  
12 based upon his risk assessment, his plant design.  
13 That's one option.

14 And what this rule change would do,  
15 basically, then, would eliminate having to have an  
16 exemption to the current regulation to do that.

17 MEMBER APOSTOLAKIS: So they wouldn't need  
18 to concern themselves with Regulatory Guide 1.174 at  
19 all, because that's in the rule.

20 MR. KING: What we would have to do in  
21 that case is put out a new Reg. Guide that says, okay,  
22 if you're going to come in under this new rule that  
23 opens the door, here's the analysis we'd want to see  
24 and here's the acceptance criteria.

25 MEMBER APOSTOLAKIS: So you might repeat

1 some of the requirements of 1.174 --

2 MR. KING: Yes.

3 MEMBER APOSTOLAKIS: -- if it is  
4 appropriate.

5 MR. KING: If people -- right, exactly.

6 MEMBER APOSTOLAKIS: In other words, you  
7 may request a risk assessment, an evaluation of delta  
8 CDF.

9 MR. KING: But today, if somebody wants to  
10 come in under 1.174, in this particular case, they're  
11 going to have to ask for an exemption to 50.46. And,  
12 you know, the Commission has told us in pretty clear  
13 terms that if -- if you're starting to make a lot of  
14 exemptions in a certain area, you ought to start  
15 thinking about a rule change. And that's one reason  
16 for not just saying, "Go use 1.174" on something  
17 generically.

18 MEMBER KRESS: That's the best reason --  
19 explanation that I've heard so far. That's helpful.

20 MR. KING: Okay. Next, side 4.

21 Where we stand -- within the past four or  
22 five months, we've pretty much been in an information-  
23 gathering mode, gathering information from the  
24 industry, from the owners groups you heard this  
25 morning, in terms of what their thoughts are, what

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1 work they've done looking at this issue, and we've  
2 been doing our own work in-house looking at various  
3 options and the technical basis for those options,  
4 using our framework and looking at the risk  
5 information associated with those options and how it  
6 stacks up against the framework.

7 And we're now at the point where we've  
8 gathered enough information where I think we're  
9 settling in on some at least preliminary conclusions  
10 and preliminary approaches, and that's what we're  
11 going to talk about today.

12 We're going to talk about what we consider  
13 is feasible to go forward with in the short term. By  
14 the "short term" I mean with a paper to the Commission  
15 in June, and then some things that we think are  
16 potential longer term improvements, but we need some  
17 more time to work on those. So you'll hear about both  
18 of those.

19 If I can have the next slide we'll talk  
20 schedule a minute.

21 This is sort of the first time we've come  
22 forward in a public setting and talked about what  
23 these preliminary conclusions are and what we want to  
24 pursue. So we think, clearly, we want to have at  
25 least another public meeting before June to talk about

1 these in more detail and get some feedback from others  
2 besides this committee. So that is factored into our  
3 schedule.

4 I think we want to come back to the  
5 committee after that and, you know, tell you where we  
6 stand, having factored in input from that public  
7 meeting and additional work we're doing. We would  
8 intend to get you a draft Commission paper to look at  
9 in mid-May, and then we would want to come back to the  
10 committee at your June full committee and ask for a  
11 letter on this before we actually send the paper to  
12 the Commission the end of June.

13 MEMBER APOSTOLAKIS: So the subcommittee  
14 meeting will follow the SECY paper. We'll have an  
15 opportunity to read the SECY paper before the meeting,  
16 right? Or is that after?

17 MR. KING: We are proposing another  
18 subcommittee before you actually get the paper, and  
19 then give you the draft paper before the June full  
20 committee.

21 MEMBER APOSTOLAKIS: The reason being?

22 MR. KING: The reason being that I thought  
23 it might be useful before we actually take the time to  
24 write this stuff down in a SECY paper to have some  
25 more discussion. If, you know, the committee has

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1 different views and you want to adjust that schedule,  
2 we're certainly open to discussing it. So we can come  
3 back to that maybe at the end of the day today.

4 MEMBER APOSTOLAKIS: But isn't it  
5 typically too short a time? If the subcommittee makes  
6 comments, I mean, May -- mid-May sounds like too short  
7 a time for any real changes in the document. Should  
8 the subcommittee meeting be perhaps late April or --  
9 my feeling is with you guys that two weeks means  
10 nothing.

11 (Laughter.)

12 And I'm learning from --

13 MR. KING: Is that a compliment or is that  
14 a --

15 (Laughter.)

16 MEMBER APOSTOLAKIS: I'm not saying that,  
17 you know, blaming you for anything. But I realize  
18 that, you know, there are reviews to be made and  
19 various offices to concur, and all that. And two  
20 weeks is not enough.

21 MR. KING: I don't think it's worth  
22 getting back together until we have our next public  
23 meeting. I think after that would be the right time  
24 to get together.

25 MEMBER APOSTOLAKIS: So, in essence, what

1 you're saying is that this June letter might not be  
2 real. It could be a July letter.

3 MR. KING: That's always an option. We  
4 send our paper forward and you follow up in July with  
5 a letter. That's an option also. But what we --  
6 ideally, we'd like to have a letter before our paper  
7 goes up so we can reference it in our paper. And the  
8 steps to get to that point are negotiable, but I think  
9 we'd like to have our public meeting first and then  
10 get back and have some further interaction.

11 MEMBER APOSTOLAKIS: Well, anyway, if you  
12 don't think it's a problem, that's fine. But I  
13 thought it would be a problem. You know, May -- mid-  
14 May, early June, I mean, it sounds like things are  
15 happening with lightning speed there.

16 Now, you are committed to give something  
17 to the Commission by June 29th?

18 MR. KING: Yes.

19 MEMBER APOSTOLAKIS: Okay.

20 MR. KING: That's our current commitment  
21 date, due date, to the Commission.

22 MEMBER APOSTOLAKIS: And what is it that  
23 says that the public meeting cannot be in early April?

24 MR. KING: There's nothing that says that,  
25 other than getting everybody's calendars coordinated

1 and picking a time and scheduling it.

2 MEMBER APOSTOLAKIS: Well, that would make  
3 everything else much easier.

4 MR. KING: Yes. And Mary Drouin will be  
5 setting that up.

6 (Laughter.)

7 MEMBER APOSTOLAKIS: So if it's not early  
8 April, we know whose fault it is.

9 (Laughter.)

10 MS. DROUIN: Alan's.

11 (Laughter.)

12 MR. KING: Okay. Slide 6. As I said,  
13 we're going to talk basically about two things. We're  
14 going to talk about the work we've done looking at  
15 risk-informing the definition of the large break LOCA,  
16 and then we're going to talk about other things that  
17 are on -- that we've considered beyond just redefining  
18 the large break LOCA. And, again, these are going to  
19 break down into some near term and some longer term  
20 changes.

21 And with that, I'm going to turn it over  
22 to Mike, who is going to talk about the large break  
23 LOCA redefinition area.

24 MR. KURITZKY: Actually, before Mike takes  
25 over the large break LOCA redefinition, I just wanted

1 to mention something up here which I hope after Tom  
2 has clarified things for you this isn't going to  
3 further confuse them. But we had -- under this Option  
4 3 we had come up with a number of various options for  
5 risk-informing the technical requirements of 50.46 and  
6 the large break LOCA and associated GDCs, etcetera.

7 And we have about three of those options  
8 for various takes on redefining large break LOCA, and  
9 then another seven or so involve actual changes to  
10 just the technical -- the various technical  
11 requirements.

12 These three right here are the three that  
13 we have that all fall into the category of redefining  
14 large break LOCA. And when I explain the difference  
15 between the three, hopefully that will further clarify  
16 what Tom was saying and not further muddy it up.

17 But in the first -- when we were going to  
18 redefine the large break LOCA by plant, you know,  
19 except what we do there is a plant would then be  
20 permitted to define its own maximum design basis LOCA  
21 using leak before break and probabilistic fracture  
22 mechanics analyses. It's very similar to what  
23 Westinghouse or NEI industry was discussing earlier  
24 today.

25 MEMBER KRESS: Tell me, how would they do

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1 that? That sounds like a task that I see has no  
2 relevance to this issue.

3 MR. KURITZKY: Well, this one is focused  
4 on -- would be focused on the frequency of the break.

5 MEMBER KRESS: Yes, but that's just a PRA  
6 issue.

7 MR. KURITZKY: No, it's actually even  
8 before that. It's -- well, actually, the next thing  
9 I'm going to tell you about, actually bring more of  
10 the -- the carrying the risk. This one would be on  
11 the frequency, and this --

12 MEMBER KRESS: Well, what you're doing is  
13 using leak before break technology to -- to refine the  
14 frequencies of certain leak sizes, to the PRA issue.  
15 I don't see its relevance to this issue of defining a  
16 design basis large break LOCA. I mean, unless you're  
17 going to say something which I think is the wrong  
18 thing to do, that -- if that frequency turns out to be  
19 below  $10^{-6}$  or some magic number, then we -- then we've  
20 screened all pipes or leakages bigger than that, which  
21 is -- which sounds like what it sounds like.

22 But I think that's the wrong way to go,  
23 because the issue is really if I change this design  
24 basis LOCA definition, what changes will I expect to  
25 see in the plants? And are those changes acceptable

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1 from a risk standpoint?

2 That really has nothing -- very little to  
3 do with the actual frequency of it.

4 MR. MAYFIELD: But don't changes in the  
5 plant hinge on what size break you go --

6 MEMBER KRESS: Oh, absolutely. But that  
7 -- what I'm saying is you -- you make your rules say  
8 you will -- your large break LOCA will be a leak size  
9 specification that doesn't allow your plant to exceed  
10 these risk acceptance criteria, something like that  
11 1.174 but not exactly.

12 And then, they say -- all right. And then  
13 use the leak before break technology to translate that  
14 leak size into a pipe size, but that's -- you know,  
15 that's sort of a detail. And it doesn't have anything  
16 to do with the rule.

17 MR. MAYFIELD: But it's a sticky detail to  
18 get to.

19 MEMBER KRESS: Yes, it's not easy. It's  
20 not easy. I didn't mean to say that. But it doesn't  
21 have anything to do with the rule, I don't think.  
22 That's my point. Other than if that helps define the  
23 frequency that goes into a PRA to do your calculations  
24 for risk. It's useful there, too, but, you know,  
25 presumably we've already got that in the PRA to some

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1 extent.

2 But that's my point. I don't see how leak  
3 before break really plays much of a role here except  
4 in translating your leak size into pipe size.

5 MR. MAYFIELD: I think that's -- why don't  
6 we go and then -- why don't we go ahead and walk  
7 through this, and then come back to it, Tom, if we  
8 don't address your issue.

9 We spent some time -- slide 8. We spent  
10 some time thinking about what would go into the  
11 analysis, the probabilistic fracture mechanics  
12 analysis that might support this kind of change,  
13 whether you go at it to determine what would be an  
14 acceptable frequency or the analysis that you'd have  
15 to have to work backwards from at leak size to pipe  
16 sizes.

17 We spent some time thinking about what  
18 should go into that, what kinds of things would have  
19 to be considered. First of all, we think service  
20 experience is the right place to start. We'll talk a  
21 little bit about that. Some analysis to predict  
22 piping failure frequency -- and, again, it's the same  
23 basic analysis, whichever direction you're going.

24 And the other one is to look at what kinds  
25 of failures -- other failures where the large break is

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1 currently a surrogate to cover those, and we'll talk  
2 a little bit about that.

3 We've had some prior analyses that have  
4 addressed these same kinds of subjects; it's  
5 probabilistic fracture mechanics kind of stuff. Those  
6 have been presented to the committee going back to  
7 1985, '86, the changes to general design criterion 4;  
8 more recently, the risk-informed, in-service  
9 inspection programs.

10 Neither of those approaches were  
11 sufficiently rigorous to support the kind of rule  
12 change we're talking about here. And I'll talk a  
13 little bit more about why we believe that. We think  
14 that the analysis to support this kind of rule change  
15 -- and, again, whether it's going to the frequency or  
16 backing from leak size to pipe size -- that level of  
17 analysis ought to be at least as rigorous as what  
18 we're going through on the PPS rule change.

19 We think that's beginning to set a  
20 standard for the level of rigor that we think should  
21 be in the analyses to support these fundamental type  
22 of rule changes.

23 Can we have slide 9?

24 The prior staff study that, interestingly,  
25 was referenced this morning was NUREG CR-5750,

1 estimated large break LOCA frequencies. For the PWRs,  
2 that was a five times  $10^{-6}$  kind of frequency, with a  
3 90 percent confidence interval running from  $10^{-7}$  to  $10^{-5}$   
4 per year.

5 The recent experience at V.C. Summer,  
6 while it certainly wasn't a large break LOCA, did  
7 contribute to the same kinds of cracking that was  
8 looked at. That would increase the best estimate that  
9 the staff has looked at to something on the order of  
10 seven times  $10^{-6}$ , which is certainly within the band  
11 that came out of the earlier study.

12 We think that overall these numbers are  
13 conservative, and then it gets to be a challenge of,  
14 well, how conservative are they? And there are a lot  
15 of assumptions. If the committee wants to go there,  
16 we've got the staff here that can talk to them. But  
17 I think the point that I wanted to make is that the  
18 numbers aren't low enough that just out of hand you  
19 say the large break LOCA can be dismissed. So it  
20 requires a little more looking than that.

21 MEMBER KRESS: Where is that?

22 MR. MAYFIELD: Sir?

23 MEMBER KRESS: Where is that level?

24 MR. MAYFIELD: I'm not going to try and  
25 pick it. But when you're in the mid  $10^{-6}$ s --

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1 MEMBER KRESS: You know you're not there.

2 MR. MAYFIELD: -- we think we're not  
3 there. It may be one of these things where,  
4 collectively, the Commission would decide, well this  
5 is -- you know, some number is low enough; I don't  
6 think we have that target today.

7 CHAIRMAN SHACK: It's okay for vessels to  
8 fail at that rate but not pipes?

9 MR. MAYFIELD: Absolutely.

10 MR. KING: Remember, the framework  
11 document had laid out initiating events, sort of in a  
12 frequency -- by frequency category. And when it got  
13 down to rare events, then it had, you know, basically  
14 collectively we want rare events not to add up to be  
15 more frequent than  $10^{-6}$  per year. And any individual  
16 one ought to be substantially less than that.

17 We sort of proposed a rule of thumb of,  
18 you know, at least a factor of 10 lower than the  $10^{-5}$ ,  
19 which would say, really, to exclude something you've  
20 got to be below  $10^{-6}$  per year frequency. It's sort of  
21 the guideline we've been using in the framework  
22 document.

23 MR. MAYFIELD: Slide 10, Alan.

24 We wanted to look at some of the other  
25 changes that we've made, places where we have accepted

1 what's -- analyses that are put in a general class of  
2 leak before break. These are basically probabilistic  
3 fracture mechanics analyses or determinations that  
4 derive from those kinds of analyses.

5 I mentioned the general design criterion  
6 change from 1986. There we -- the underlying notion  
7 was that pipes will leak before they will break, and  
8 that was accepted for eliminating the dynamic effects  
9 associated with the big pipe fracture.

10 What that led to was the removal or relief  
11 from having to install pipe whip restraints and jet  
12 impingement barriers. There were a few other spinoffs  
13 to that, but it -- those were the big issues at the  
14 time the rule was promulgated.

15 Subsequently, we've used these same kinds  
16 of arguments to get some relaxation on break opening  
17 time for the baffle bolt analyses, the risk-informed  
18 changes to the in-service inspection programs, and we  
19 used the same basic approach looking at the resolution  
20 to GSI-190 on environmental effects on fatigue a year  
21 or so ago.

22 Slide 11. The traits from those prior  
23 applications -- they all seem to have both  
24 probabilistic and deterministic aspects. Defense in  
25 depth, however, hasn't been challenged. We were

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1 always still covered by the large break LOCA, the  
2 50.46 requirement. So we weren't getting to  
3 fundamental changes in the plants. Rather, we were  
4 dealing with some ancillary things.

5 The general design criterion 4 change,  
6 back when the staff made the presentation to the ACRS,  
7 they described the pipe whip restraints as the evil  
8 pipe whip restraints. The notion was that, by and  
9 large, these devices were being contrary to safety.

10 They were contributing to containment heat  
11 load, they were impeding access for in-service  
12 inspection, and if they didn't get shimmed up right  
13 you could actually introduce loadings that hadn't been  
14 previously analyzed, if the pipe managed to hang up on  
15 the whip restraint. So there was an underlying notion  
16 that these were good changes.

17 Similarly, with the risk-informed ISI,  
18 there was the underlying notion that inspection  
19 resources could be better shifted to other piping  
20 systems, and there was also a -- both a quantitative  
21 and qualitative approach, and they gave similar  
22 results. So in each of these cases there was  
23 something else that -- that supplemented the change  
24 rather than just the analysis.

25 And as I mentioned, we don't think those

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1 prior analyses, the probabilistic fracture, were as  
2 rigorous as what we would apply today in supporting a  
3 rule change, at least a rule change like this.

4 MEMBER APOSTOLAKIS: But let me, again,  
5 say --

6 MR. MAYFIELD: Sure.

7 MEMBER APOSTOLAKIS: -- what would be the  
8 change of the rule under this option? What exactly  
9 would be the change? I mean, you are arguing that  
10 they don't have sufficient analytical basis.

11 MR. MAYFIELD: But the notion here is that  
12 if you -- if, for example, you wanted to use this type  
13 of analysis to redefine the large break LOCA  
14 frequency, or -- or subsequently use this approach to  
15 determine what is an appropriate break size.

16 MEMBER APOSTOLAKIS: But large break LOCA  
17 frequency -- do you mean the frequency per year?

18 MR. MAYFIELD: Yes, sir.

19 MEMBER APOSTOLAKIS: Wouldn't that be a  
20 fundamental change in the rule there? Because the  
21 rule deals with the conditional stuff. Given that  
22 there is a break, it shows this and this and that.

23 MR. MAYFIELD: And if you -- yes. Now,  
24 the notion is here -- I guess the notion I've been  
25 working to is that the approach would go along the

1 lines of showing that the large break -- the frequency  
2 of the large break LOCA is so low that it shouldn't be  
3 the governing consideration. And so now, what is the  
4 break size that is more appropriate to include in the  
5 analysis?

6 MEMBER APOSTOLAKIS: But does the rule, as  
7 written now, it does not take into account the  
8 frequency of the LOCA at all?

9 MR. MAYFIELD: Then, it assumes it's one.

10 MEMBER APOSTOLAKIS: Does it?

11 MR. MAYFIELD: By --

12 MEMBER APOSTOLAKIS: It assumes it?

13 MR. MAYFIELD: It just assumes it.

14 MEMBER APOSTOLAKIS: But if you go this  
15 way, then you are really changing the argument here in  
16 a fundamental way.

17 MR. MAYFIELD: Well, either that or you're  
18 saying that the frequency -- well, that's right. This  
19 is --

20 MEMBER APOSTOLAKIS: But that's what I  
21 don't understand. That's a fundamental change in the  
22 rule. The rest is the mechanics of doing it. Now,  
23 what there is fundamental? I mean, I read the rule.  
24 I'm trying to --

25 MR. MAYFIELD: Well, the idea is you're



1 going to redefine the break size, the design break  
2 size, as something other than the largest pipe.

3 MEMBER APOSTOLAKIS: So then you would go  
4 back to this idea of conditional that --

5 MR. MAYFIELD: You're going to ultimately  
6 go back to this idea of some conditional break and use  
7 that as the design criterion. And you would use this  
8 type of analysis to support defining that alternate  
9 break.

10 MEMBER APOSTOLAKIS: Again, you know, it's  
11 not obvious to me why you have to switch back to that  
12 and not deal with the frequencies of the accident  
13 sequences of various LOCAs, and deal with the whole  
14 sequence.

15 MR. MAYFIELD: Again, I think the same  
16 analysis schemes would come to play.

17 MEMBER APOSTOLAKIS: That's correct.

18 MR. MAYFIELD: Whether you did it with --  
19 just as an alternative to the existing conditional  
20 approach or deal with a spectrum. The underlying  
21 analysis would be the same.

22 MEMBER APOSTOLAKIS: But you would still  
23 deal with the frequency of the initiator that way.

24 MR. MAYFIELD: That's correct. But  
25 don't --

1 MEMBER APOSTOLAKIS: If we could get a  
2 listing of these changes, that would be very helpful  
3 to me.

4 MR. KING: There's two parts you're going  
5 to hear. Mike is talking about changing the  
6 definition of a large break LOCA, which is really what  
7 size pipe you assume. There's another part we've  
8 looked at; it's all the assumptions that are made.

9 Regardless of what pipe size you assume,  
10 there's a whole bunch of other assumptions that are in  
11 the way we do business today and we're looking at  
12 those as well, because of them don't make sense when  
13 you look at it from a risk perspective. And Alan  
14 Kuritzky is going to talk about those, so there's two  
15 parts to this.

16 MEMBER BONACA: So what you're talking  
17 about now is really addressing what has been presented  
18 this morning by the industry.

19 MR. MAYFIELD: In part, yes.

20 MEMBER APOSTOLAKIS: In part.

21 MEMBER BONACA: And then, one thing that  
22 would be interesting, of course, in that respect would  
23 be if you define large break LOCA as a smaller break  
24 than the current one. What kind of criteria, I mean,  
25 would -- is there a possibility of accepting some

1 higher consequences for a large break LOCA that we  
2 have today? Because this was to get done in the FSAR.

3 It would probably lead to more than 2,200  
4 degrees Fahrenheit temperature. It would lead to some  
5 more percent oxidation.

6 All I'd like to say is that it seems to me  
7 that the only conflicts from the presentations we had  
8 this morning and now is abandoning large break LOCA,  
9 and that becomes almost like a severe accident  
10 consideration where you can have, you know, core  
11 damage to whatever extent.

12 Isn't there some possibility right now you  
13 are setting your target to a smaller break size, but  
14 you can also look at large break LOCA and see what --  
15 given the -- all the changes that a plant would make,  
16 you have some results that you might find as  
17 acceptable now. See, that would allow you to deal  
18 with the fact that you're not abandoning completely  
19 some expectation for large break LOCA.

20 MR. KING: Well, I think what was said  
21 this morning was the risk assessments will still have  
22 the large break LOCA in them.

23 MEMBER BONACA: Yes.

24 MR. KING: And the risk assessments are  
25 still going to need to show that the large break LOCA

1 is a very small contributor to risk for this whole  
2 scheme to work. I mean, if we make changes and now  
3 all of a sudden the large break LOCA is a high  
4 contributor to risk, then we haven't done our job.

5 MEMBER KRESS: I think that's true, that  
6 if it came out to be a high contributor to risk for  
7 specific plants, then you need to consider it in your  
8 design basis. But I don't think the inverse is true,  
9 that if it comes out to be a low contributor to risk,  
10 that doesn't necessarily mean that makes it a bad  
11 design basis.

12 And the reason for that is when you invoke  
13 and impose a design basis, you end up with certain  
14 design features and certain procedures and certain  
15 things that help control the total risk, not just for  
16 that set of sequences but for all of the other  
17 sequences involving LOCAs, and so forth. And you want  
18 that total risk to be within acceptable limits.

19 So, you know, my perspective is your  
20 Option 3, if you look at -- if I go from -- to a  
21 specific leak rate or a specific size different than  
22 this, what changes will the plants make? And are  
23 those changes acceptable from a risk standpoint? And  
24 that, to me, seems to be the only rational way to view  
25 this.

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1 MR. KING: I agree.

2 MEMBER KRESS: Not deal with, is the large  
3 break LOCA a risk contributor? Maybe it is, maybe it  
4 isn't. You know, if it is, you have to deal with.  
5 But if it's not, I still don't think it's the right  
6 perspective.

7 MR. KING: No, I agree with everything you  
8 said. The large break LOCA probably is a surrogate  
9 for some other things that you don't have to worry  
10 about because you take care of it through dealing with  
11 the large break LOCA, although that has to be  
12 considered.

13 MEMBER KRESS: Okay.

14 MR. MAYFIELD: Which I think is at least,  
15 in part, the message here is that this is perhaps a  
16 tougher analysis than has been thought about.

17 And that -- on Slide 12, the notion here  
18 is, again, we think that we've started setting some  
19 guidelines on what is an appropriate level of rigor in  
20 these analyses, based on what we're doing for the PTS  
21 rule. And the presumption here is that we're going to  
22 actually be successful with the PTS rule.

23 You can look, of course, at transients, at  
24 thermal-hydraulic response, and so on. There are a  
25 couple of these that get to be more interesting if you

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1 were actually going to try and do this for piping.  
2 The flaw distribution is one that gets significantly  
3 more challenging.

4 We've actually done more work on flaw  
5 distributions for vessels than we have for piping.  
6 The other one that we haven't gotten into for these  
7 kinds of analyses are the uncertainty analyses, and to  
8 do that rigorously dealing with both epistemic and  
9 aleatory uncertainties.

10 We think that would become a significantly  
11 more challenging approach for this piping analysis  
12 than it is for the vessel. There are more degradation  
13 mechanisms, there are more unknowns, there are more  
14 model uncertainties, and on and on. It gets to be a  
15 much tougher challenge than it is for the vessel.

16 If we can have Slide 13, Alan.

17 The next several slides I don't propose to  
18 go through in any detail. They are more for your  
19 information. They're the kinds of things that we  
20 think would have to be treated, some examples of  
21 issues that we think haven't been dealt with very  
22 well. The analyses themselves would have to deal with  
23 both the initiation of subcritical cracking, the  
24 subcritical crack growth, leak rate detection under  
25 normal operating loads, and the fracture during upset

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1 loads. Those are just the kinds of analyses that have  
2 to be dealt with.

3 The main inputs to the probabilistic  
4 fracture, the material property input, the crack  
5 morphology -- what the crack surfaces look like -- the  
6 loads under normal and transient conditions, the flaw  
7 distributions.

8 On Slide 15, we need to deal with the  
9 current and as-yet unknown mechanisms. This is  
10 something, how do you know what hasn't happened yet,  
11 and that's part of the speculation that gets to be  
12 challenging in doing this.

13 There are some kind of notable examples of  
14 things that we didn't think were likely.

15 MEMBER WALLIS: It's not just what hasn't  
16 happened. It's what you --

17 MR. MAYFIELD: It's what we don't know.

18 MEMBER WALLIS: -- are not yet aware of.

19 MR. MAYFIELD: Yes. Exactly. So there  
20 are some examples here of the kinds of things that  
21 have caught us a bit by surprise in the past, the most  
22 recent one perhaps being the primary water stress  
23 corrosion cracking in the Inconel 182 welds. It's not  
24 that we didn't know that material would crack. We  
25 just didn't think that the loading and conditions were

1 right for it to crack in that particular application.

2 There are a host of things on Slide 16  
3 that go into the leak rate analyses. So if we really  
4 wanted to follow Dr. Kress' suggestion and take a leak  
5 size and work backwards to a pipe size, that gets to  
6 be a -- first of all, you can get a range of pipe  
7 sizes depending on the crack size and loading. So it  
8 -- there would be a fair bit of uncertainty to deal  
9 with in that analysis.

10 But things like residual stresses come  
11 into it, the pipe to system boundary conditions, are  
12 you getting some restraint of free thermal expansion,  
13 some restraint of bending in the pipe, crack face  
14 pressures, some things that haven't been included.  
15 And it -- as you work backwards from a leak size to a  
16 pipe size, those things get to be important and you  
17 change from a conservative approach to a non-  
18 conservative approach, just depending on the direction  
19 you're going.

20 MEMBER KRESS: Would this analysis also be  
21 time-dependent, then?

22 MR. MAYFIELD: Absolutely.

23 MEMBER KRESS: So that's a factor we never  
24 really --

25 MR. MAYFIELD: Yes.



1 MEMBER KRESS: -- had in this design basis  
2 before.

3 MR. MAYFIELD: That's correct. That's  
4 correct.

5 On Slide 17, the fracture mechanics  
6 analyses, this would go to an elastic plastic fracture  
7 rather than the net section collapse or limit load  
8 kinds of approaches. We have historically assumed  
9 some idealized through wall circumferential cracks,  
10 nice regularly-shaped things. But if the subcritical  
11 cracking caused large surface cracks, long on the  
12 inside surface and relatively short on the outside  
13 surface, it introduces another complication in either  
14 direction in the analysis.

15 You'd need to look at things like the  
16 earthquake rate -- loading rate effects on material  
17 properties. These are not dynamic loading rates in  
18 the classic sense, but there is a phenomena known as  
19 dynamic strain aging that at these loading rates does  
20 get to be an issue.

21 One of the interesting things that we've  
22 discovered from some of our experimental work at  
23 Battelle is that if the bending plane happens to be  
24 different than the normal -- the primary plane for the  
25 crack, you can get some significantly different

1 fracture behavior, and that is physically possible.  
2 We've seen it. So that gets to be an interesting  
3 twist to the analyses.

4 On Slide 18, the material property input,  
5 these are normal kinds of things that you would hear  
6 about, and I think you've heard about them before.  
7 The difficulty now comes in quantifying them and  
8 quantifying the distributions on them into the  
9 analysis and to feed into the uncertainty analysis.

10 This is something that we met with the  
11 committee and talked about just on the fracture  
12 toughness for the vessel steels. And that, in and of  
13 itself, is fairly complicated. This expands  
14 significantly.

15 On Slide 19, the loads, looking at normal  
16 operating versus upset loadings, and looking at the  
17 actual stress levels versus the design basis levels --  
18 and that got to be an important consideration when we  
19 were looking at the environmental effects on fatigue,  
20 to not just roll in the design basis stresses but to  
21 actually come up -- try to come up with the true  
22 operating stresses. And in some cases they were  
23 substantially lower.

24 There are some thermal gradient effects  
25 that I guess I hadn't been aware of until a

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1 conversation that was being held on the steam  
2 generator tube ruptures, some helical thermal gradient  
3 in the hot leg. How much that changes with time, is  
4 it a consideration, it's not something we have rolled  
5 into the previous analysis; it's something that ought  
6 to at least be considered here. Whether it has to be  
7 incorporated rigorously is something you'd have to  
8 decide as you went along.

9 The initial flaw distributions -- again,  
10 this is something that will be even more complicated  
11 for the piping evaluation than it was for the vessel  
12 because of the nature of the loadings, the potential  
13 for the environment to expand the number of flaws, the  
14 way you would have to treat the potential for pre-  
15 service or fabrication-induced flaws, to pick up and  
16 grow during operation, which is not something that we  
17 have seen or are able to predict in the vessel  
18 analysis.

19 So, again, the piping is a more difficult  
20 analysis to perform.

21 We've talked about other sources of large  
22 breaks where the large break LOCA or the -- at least  
23 the failure of the big pipe is a surrogate for these  
24 things. Losing the steam generator manways, the  
25 potential for those few plants that have loop stop

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1 valves, the potential for losing the bolts that hold  
2 the bonnet on. We've seen in some smaller valves some  
3 valve body cracking; would that be an issue here?

4 Then, there is the subject of indirect  
5 sources of pipe failure, and the notion here is moving  
6 heavy loads inside the containment during power  
7 operations.

8 In the work that was done by -- at  
9 Lawrence Livermore in support of the GDC4 changes,  
10 these indirect sources of pipe failure -- actually,  
11 you got up to where that was the dominating  
12 contributor to pipe failure frequency. So it's  
13 something that needs to at least be considered here.

14 MEMBER BONACA: Moving heavy loads, the  
15 power operations, is that containment?

16 MR. MAYFIELD: Well, at any rate, in  
17 summary on Slide 22, the service data alone don't  
18 appear to us to support eliminating a large break LOCA  
19 without some further evaluation. The data, such as  
20 they are, with some -- potentially with some limited  
21 additional analysis would appear to be sufficient to  
22 support some other types of changes.

23 The probabilistic analyses to support  
24 eliminating the large break LOCA we believe would have  
25 to be significantly more rigorous than what we've done

1 in the past, both from the staff as well as the  
2 industry. And we think that active degradation of the  
3 piping is not the only consideration.

4 The analyses would have to consider other  
5 breaks, and they'd have to consider things like weld  
6 repair history to make sure we capture potential for  
7 other degradation mechanisms.

8 MR. KING: Okay. Now Alan Kuritzky is  
9 going to talk about putting the redefinition of the  
10 break size aside, what other things that we looked at  
11 in terms of potential changes in risk-informing 50.46.

12 MR. KURITZKY: Yes. As I mentioned  
13 earlier right before Mike began speaking, there was  
14 about 10 different options we looked at during this  
15 program. The first three all involved various -- you  
16 know, different variations of redefining the large  
17 break LOCA, and now here we have seven more options.  
18 And these look more specifically --

19 MEMBER APOSTOLAKIS: Again -- I'm sorry,  
20 maybe it's not a good day for me. Why are they risk  
21 informed?

22 MR. KURITZKY: Why are they risk informed?  
23 Well, because as I go through these items that are on  
24 this list I'll explain the risk implications and what  
25 risk aspects led us to come up with these as options.

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1 MEMBER APOSTOLAKIS: And you have criteria  
2 for deciding that these aspects are good or bad?

3 MR. KURITZKY: Well, what we're using  
4 right now, as Tom mentioned before, is based on our  
5 framework document. We have about a  $10^{-6}$  roughly for  
6 something that may be low enough that it's, you know,  
7 considered to be a rare event and may not need to be  
8 considered. And so that's kind of like a threshold.

9 MS. DROUIN: That's only one threshold.  
10 Also remember that one of our ground rules under  
11 Option 3 is that when you look at the analyses, if the  
12 analyses are conservative, we see that in a risk arena  
13 you want to be realistic. So some of the options  
14 might -- it may have no relationship to the  
15 quantitative guideline. It's because there is excess  
16 conservatism, and our ground rules -- one of the  
17 ground rules in the framework was to be realistic.

18 MEMBER APOSTOLAKIS: But, again, we are  
19 talking about a fleet of 103 units. So, I mean if I  
20 want to delete loss of offsite power consideration,  
21 that may have different impact on CDF on different  
22 units. On what basis do I decide to delete? By the  
23 largest impact or when we --

24 MEMBER KRESS: The average or --

25 MEMBER APOSTOLAKIS: Yes.

1 MEMBER KRESS: On a specific basis?

2 MEMBER APOSTOLAKIS: Yes, I don't know.  
3 You see, that's where I get confused.

4 MEMBER KRESS: Yes, I had that same  
5 problem.

6 MR. KING: Or you set some criteria.

7 MEMBER APOSTOLAKIS: So we don't have them  
8 yet.

9 MR. KING: We have not reached the point  
10 where we've nailed down every detail of what we're  
11 going to propose. What we're talking about are  
12 certain areas that we think make sense for -- for  
13 looking at it a little further and possibly going  
14 forward with recommendations to the Commission.

15 Just take the first one -- simultaneous  
16 loss of offsite power at the same time the large break  
17 LOCA occurs. You know, you can use frequency  
18 information and risk information to say that that  
19 assumption is pretty -- pretty low in terms of  
20 frequency and pretty low in terms of risk --

21 MEMBER KRESS: Well, let me --

22 MR. KING: -- for the large break LOCA.

23 MEMBER KRESS: Yes, let me tell you what  
24 bothers me about that. Let's go back to the framework  
25 document where you have these categories and ranges of

1 frequencies for basically specific sequence sets.

2 Now, if I look at, say, a large break LOCA  
3 of a given size, and it fits into one of those  
4 categories, that's the wrong way to use that framework  
5 document. That's not what it was intended for. What  
6 you need to say is, "We've defined this as my large  
7 break LOCA." What does it do to the frequencies of  
8 all the sequences that go into the PRA, and how does  
9 this shift them all with respect to that framework  
10 document? And is that total shift --

11 MEMBER APOSTOLAKIS: Which means look at  
12 some global method.

13 MEMBER KRESS: Some global method, yes.

14 MEMBER APOSTOLAKIS: Like the CDF.

15 MEMBER KRESS: Well, like the CDF. Well,  
16 not exactly global because I think defense in depth  
17 gets involved in terms of this allocation that you  
18 have. I think that's a defense in depth concept. So  
19 that's one way you bring that in.

20 But I think just to say large break LOCA,  
21 if it's this size, that particular sequence provides  
22 this contribution that we have in this box, is the  
23 wrong way to use that framework.

24 MR. KING: I think you have to do both.  
25 I think you have to start somewhere, and you have to



1 say if large break LOCAs are very low frequency, then  
2 maybe we ought to consider not calling them design  
3 basis accidents anymore. Then you have to go and  
4 look, well, what does that do to my risk for the  
5 plant? And if it turns out that that drives other  
6 things up, then maybe you don't want to do that.

7 If it turns out it doesn't drive other  
8 things up, that it really is a very low risk type of  
9 item --

10 MEMBER KRESS: I think that's the key  
11 element right there.

12 MR. KING: Yes, I agree with you.

13 MEMBER KRESS: I think that part of it --

14 MR. KING: But you've got to start  
15 somewhere.

16 MEMBER KRESS: Yes. Yes, because you  
17 can't really do that other part yet, the second part,  
18 the important part, the risk -- and it's awfully hard  
19 to do. You probably don't have the capabilities of  
20 doing that just yet.

21 MR. KING: Well, I think you have the  
22 capabilities. I think, you know, you have to take  
23 some time and some, you know, effort to do that.

24 MEMBER KRESS: Each plant-specific PRA  
25 would have to be -- would have to decide what changes

1 in a plant are made and see how that impacts the PRA,  
2 and do it on a plant-specific basis, and average it  
3 out or add it up or something. It's not easy.

4 MR. KING: Everything we're talking about  
5 today, not just the break size, there is the question  
6 of how much can you do generically, and how much do  
7 you have to do plant-specific?

8 MEMBER KRESS: And that's --

9 MR. KING: And the question applies to  
10 everything we're talking about. And we haven't nailed  
11 down where you draw that line yet, but we recognize  
12 that that line has to be drawn somewhere.

13 MEMBER APOSTOLAKIS: Now, what is the  
14 Commission's attitude towards Option 3? Have they  
15 approved it or what? I don't remember.

16 MR. KING: Option 3 was approved, yes, a  
17 couple of years ago. Remember, 50.44 was the first  
18 one that came out of that, and this is the second one.

19 MS. DROUIN: It's in the SRM in response  
20 to SECY98-300.

21 MR. KING: Yes.

22 MEMBER KRESS: Yes, 50.44 was a breeze.  
23 That's one of the ones that --

24 MEMBER APOSTOLAKIS: Mary, you live with  
25 those numbers. We come here once a month. You know,

1 SRM does this and that. It's not as alive to me as it  
2 is to you.

3 (Laughter.)

4 MR. KING: Why don't you let Alan talk  
5 about these, and then we can come back and maybe talk  
6 about some of these generic questions.

7 MEMBER APOSTOLAKIS: Okay.

8 MR. KURITZKY: Okay. One of the first  
9 things that we just talked about -- just momentarily  
10 about the simultaneous loss of offsite power  
11 assumption. One of the ways that we can envision  
12 something like that playing out is -- is if the NRC  
13 were to come up with some acceptable frequency  
14 distribution for large break LOCAs, Tom already  
15 mentioned that in NUREG 5750 we have -- or I guess  
16 Mike may have mentioned that we had a range from  $1\text{E-}7$   
17 to  $1\text{E-}5$  for PWRs for large break LOCA.

18 If  $1\text{E-}5$  is your upper bound, you could say  
19 that's the upper bound for large break LOCA and you  
20 can show that your conditional loss of offsite power  
21 -- you know, loss of offsite power frequency is on the  
22 order of  $10^{-2}$ ,  $10^{-3}$ , and that could put you below some  
23 threshold. And you may decide that that doesn't need  
24 to be one of your design basis considerations, you  
25 know, assuming loss of offsite power with the large

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1 break LOCA.

2 Numbers like that have already been -- as  
3 part of the resolution I think of generic issue 171,  
4 there was some look into the conditional loss of  
5 offsite power probabilities and --

6 MEMBER KRESS: As a function of time after  
7 the LOCA?

8 MR. KURITZKY: No, it was just a -- it was  
9 just given that you had --

10 MEMBER KRESS: You may have one eventually  
11 within --

12 MR. KURITZKY: Right. In fact, what was  
13 driving the initial failure probability was the  
14 starting of the large ECCS pumps.

15 MEMBER KRESS: Okay.

16 MR. KURITZKY: And so that was in the  
17 range I think for PWRs about 1.1-something,  $10^{-2}$ , and  
18 for BWRs I think it was  $6^{-2}$ . So we can see that the  
19 numbers -- given the large break LOCA frequencies, and  
20 those numbers put you somewhere in that -- in that  
21 threshold range. It was something that may be  
22 feasible, but --

23 MEMBER KRESS: Once again, I fail to see  
24 the relevance of the, say,  $10^{-7}$ , because what I was  
25 saying is if I want to drop the loop, simultaneous

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1 loop LOCA rule, why does that change? Why do people  
2 want to change? And does that change the risk status?  
3 You know, that's irrespective of the frequency.

4 MR. KURITZKY: And I would have to -- and  
5 if someone were to come through and supply the  
6 justification why they feel their initial loss of  
7 power is -- why they would make a change, then  
8 whatever plant change they would then want to --

9 MEMBER KRESS: You know --

10 MR. KURITZKY: -- make because of it they  
11 would have to justify on a risk basis, and it could  
12 impact many things besides just the large break LOCA.  
13 They have to show that the delta risk is acceptable,  
14 you know, maybe per Reg. Guide 1.174 or --

15 MEMBER KRESS: But, see, my point is I  
16 don't see that you can do ahead of time a look at the  
17 conditional loop, for example, and say you come up  
18 with a frequency of  $10^{-8}$  or  $10^{-7}$  or  $10^{-9}$  even. I don't  
19 see that it tells you anything that's useful in  
20 saying, "Okay. We'll do away with that part of it."  
21 I don't see that that's helpful to you.

22 MR. KING: I don't see why you don't see  
23 it's helpful. I mean, if you're making assumptions  
24 that are rather remote in likelihood, does it really  
25 make sense? And particularly if it's causing the

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1 plant --

2 MEMBER KRESS: There may be some very  
3 specific things just related to that. I don't want to  
4 be, you know, completely on one side of that. There  
5 may be some very specific things relating to that that  
6 has no impact on anything else, and, in fact, may have  
7 a negative impact that you could obviously change.

8 But I think just to use it as an ultimate  
9 reason is --

10 MR. KING: But if it's causing the diesel  
11 generators to have to start up very quickly --

12 MEMBER KRESS: Well, there may be other  
13 reasons that you want the diesels to start up quickly.

14 MR. KING: There may be. There may be  
15 other things that would catch -- I agree with that.

16 MEMBER KRESS: You can't just throw it  
17 out.

18 MS. DROUIN: No. And if you go back to  
19 the framework, nothing is ever thrown away or added in  
20 just because of a number. And that's where we bring  
21 in this -- we bring in the defense in depth and we  
22 have six things that we had identified there.

23 Also, another part of the framework is  
24 that before -- one of the other ground rules before we  
25 delete something, we have to go in and go back and use

1 50.44 as an example, look at all of the tentacles and  
2 where it would have impact. And that has to be  
3 brought in, and that's all part of the ground rules  
4 under which we make the decisions.

5 So it's not just, oh, well, there's a  
6 number and it's below it, so we can throw it away.  
7 It's not -- that's not what we do.

8 MR. KURITZKY: And just to follow -- just  
9 in direct response to what you said, Dr. Kress, in the  
10 case of if we were going to relax -- you know, the  
11 start time had to be relaxed, then we would let -- one  
12 of the things we would need to consider is, do we need  
13 some other type of design-based accident that -- that  
14 governs diesel start time? Because there may be some  
15 other parameters that need to be looked at. So,  
16 you're right. That would have to be considered.

17 Okay. The second one on there is the  
18 excluding highly unlikely combinations of large break  
19 LOCA initiators and single -- it's going to fall along  
20 the same lines of what we just talked about -- loss of  
21 -- initial loss of offsite power. It would run in the  
22 same -- have that same --

23 MEMBER KRESS: Yes, it's the same issue.

24 MR. KURITZKY: So whenever fair, the same  
25 thing holds.

1           Again, so that is something we would  
2 consider. There would be a threshold, and we'd have  
3 to consider other aspects, too, what would be the  
4 overall risk impact of changes associated with that.

5           The next bullet is to look at the  
6 conservatisms in Appendix K and decide whether or not  
7 there are certain conservative models in Appendix K  
8 that we feel can be replaced with more realistic  
9 models or assumptions.

10           MEMBER KRESS: I see that as sort of a  
11 separate issue. I don't know -- I don't see that's  
12 related to this particular issue.

13           MR. KURITZKY: Only in the sense that  
14 we're looking to make things more realistic.

15           MR. KING: Yes. Isn't risk-informing also  
16 being more realistic? I mean, the risk analysis is  
17 supposed to be a realistic analysis.

18           MEMBER KRESS: Well, the risk analysis is  
19 supposed to be realistic. But Appendix K doesn't  
20 necessarily have to be realistic. It can be risk-  
21 informed and be very --

22           MR. KING: If they're going to be risk-  
23 informed, that to me also implies we want to be  
24 realistic.

25           MEMBER WALLIS: Is the idea that something



1 like the peak clad temperature might be a function of  
2 the risk? That you might allow a 2300 if it's less  
3 likely or --

4 MR. KING: Well, it depends. Is the peak  
5 clad temperature 2200? Is that a very conservative  
6 number? Is that a --

7 MEMBER WALLIS: Even if it's conservative.  
8 Does it -- if it's a very likely event, you might want  
9 some more conservatism.

10 MR. KING: Yes, I agree with that. That's  
11 the margin issue.

12 MEMBER WALLIS: So you'd reexamine on the  
13 basis of risk.

14 MR. KING: Yes.

15 MR. KURITZKY: In fact, the last bullet up  
16 there is -- that's pretty low on the screen for you  
17 guys, but it's modify the ECCS acceptance criteria.  
18 It's another one that --

19 MEMBER WALLIS: We got that.

20 MR. KURITZKY: Okay. And then, actually,  
21 the next three bullets all are things that are  
22 associated with the best estimate calculations. And  
23 just various ways of -- well, in the first case, they  
24 would be using -- we would be considering, you know,  
25 would it be possible to use a distribution of break

1 size allocation as input to the best estimate file and  
2 propagate it just like we do with other parameters.  
3 Therefore --

4 MEMBER WALLIS: It's just one of the other  
5 uncertainties.

6 MR. KURITZKY: Right. And, in fact, you  
7 have the very tail end of the LOCA, the very large  
8 break -- you know, it's driving what you're getting  
9 out because it's --

10 MEMBER WALLIS: It's not --

11 MEMBER KRESS: Sorry. Once again, I'm a  
12 little bothered by that one because to me the break  
13 size or, alternatively, the leak rate was the  
14 independent variable. And you don't normally attach  
15 uncertainty distributions to your independent  
16 variable. You're looking at something that results  
17 from that independent variable, which is a specific  
18 number.

19 And you put the uncertainties on the  
20 things that give you the result, and that one -- I  
21 just don't quite understand what that one is saying to  
22 me.

23 MEMBER WALLIS: I don't have any problem  
24 at all admitting I'm uncertain about the break size  
25 and trying to put it into the analysis.

1 MEMBER KRESS: Well, sure you're uncertain  
2 about the break size if you're going to go in and  
3 decide on a frequency of a given break size to feed  
4 into a PRA, as part of PRA. But --

5 MEMBER WALLIS: You don't think it's part  
6 of the thermal-hydraulics?

7 MEMBER KRESS: Oh, I'm sorry. I think  
8 it's part of this element of fracture mechanics that  
9 Mike said when you go from a given leak rate to decide  
10 what kind of a break size that relates to, it's  
11 certainly a part of that. I didn't mean that. But to  
12 me it's not part of risk-informing the 10 CFR 50.46.  
13 It's a -- it's how you implement that risk-informed  
14 version. Once you go back to -- if you're going to go  
15 so -- say, now what break size can I live with?

16 MEMBER WALLIS: I'm just sitting here  
17 looking at all of these things and thinking of how  
18 much work it would take to do them.

19 MEMBER KRESS: Oh, this is -- this looks  
20 like a lot of work.

21 MR. KING: This is a list of things we've  
22 considered. What you're going to hear is how we split  
23 those up as to what we think is reasonable to go  
24 forward with in the short term and which ones need  
25 more work. This is one of the ones that falls on the

1 "more work" list. It's not anything we're to the  
2 point we feel comfortable to go forward with now.

3 MR. KURITZKY: These are all the things we  
4 -- actually, we've had these on the table for probably  
5 close to a year now, and we've presented them at  
6 various public meetings, so -- and in the last --  
7 well, the next two there as far as the best estimate  
8 calculation, the fifth bullet, meet improved  
9 efficiency of the calculations using improved  
10 statistical sampling methods like Latin Hypercube  
11 sampling to try and make it a little more efficient.

12 And the sixth one was one we had  
13 considered the possibility of having the NRC approve  
14 certain uncertainty increments that would then be  
15 input, and licensees could then just do their best  
16 estimate calculation without having to necessarily do  
17 all of the costs of the uncertainty analysis. There  
18 would be some fixed offer or safety margin or  
19 something that would be associated with a  
20 predetermined uncertainty increment.

21 Again, these are just things that we had  
22 put out on the table for possible consideration.

23 And the last one was modifying the ECCS  
24 acceptance criteria for looking at peak cladding  
25 temperature, the oxidation, and determining whether or

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1 not there is any better way, you know, to -- in other  
2 words, of those acceptance criteria, is there a better  
3 way to handle it?

4 MEMBER WALLIS: About like rewriting the  
5 works of Shakespeare.

6 MR. KURITZKY: In our spare time.

7 MEMBER WALLIS: Spare time.

8 (Laughter.)

9 MR. KURITZKY: Okay. Based on the --  
10 those are some of the options we had thought about.  
11 Of those options, there was a few that we felt in the  
12 -- in the short term we felt we could establish the  
13 feasibility of. And when we say "short term" we mean  
14 in order to get something in the Commission paper by  
15 June.

16 And the ones that we thought we had a fair  
17 shot at establishing the feasibility or determining  
18 the feasibility of are the large break LOCA, the  
19 simultaneous loss of offsite power, large break LOCA  
20 assumption, and that effects -- these, in fact, don't  
21 affect -- I think none of these actually affect 50.46  
22 -- the actual 50.46 itself, but rather Appendix K or  
23 some of the GDCs.

24 Also, we have the single failure  
25 assumptions just like we talked about in the previous

1 slide.

2 MEMBER WALLIS: Associated with the large  
3 break LOCA.

4 MR. KURITZKY: Like we have unlikely  
5 combinations. And an additional thing with the single  
6 failure assumption is -- is to pursue maybe the use of  
7 some type of risk-informed approach consistent with  
8 the framework that would us to determine how and where  
9 we might want to change the single failure criteria.  
10 But that's a little broader than just looking at the  
11 single failure associated with that large break LOCA.

12 Reducing decay heat conservatism --  
13 Appendix K is also one we feel we might --

14 MEMBER WALLIS: That might be one of the  
15 easiest ones.

16 MR. KURITZKY: That's what we like to  
17 hear.

18 MEMBER WALLIS: Well, is that your  
19 statement? Isn't this one of the easier ones?

20 MR. KURITZKY: That depends who you ask.

21 MEMBER WALLIS: Oh, okay.

22 MR. KING: We can have Norm Laubin explain  
23 that to you, but we've done some work on it, and it's  
24 not as easy as you may think.

25 MR. KURITZKY: A lot of these are -- some

1 of them appear easier, and then if you ask certain  
2 people there are reasons why they don't think they're  
3 that easy, so it --

4 MS. DROUIN: A lot of it -- why it didn't  
5 get so easy is that, as you see, just the effects of  
6 it and how far you have to dig down and the things  
7 that it affects is sometimes not as straightforward.  
8 And as you start uncovering all these layers it just  
9 becomes a little bit more complicated than you thought  
10 at the onset.

11 MR. KURITZKY: And another one, actually,  
12 is not on this slide, but we are also kind of tossing  
13 about is the possibility of some relaxation in the  
14 break opening time. Right now, I think it's specified  
15 in the standard review plan, Section 3.6.2, as a one  
16 millisecond break opening time. And we're considering  
17 --

18 MEMBER WALLIS: If it goes to two  
19 milliseconds, it won't make much difference.

20 MR. KURITZKY: Or one and a half.

21 (Laughter.)

22 Or maybe something else along the lines of  
23 20 milliseconds or something, and one of the areas  
24 that they may have significant benefit is for the  
25 barrel -- the baffle form of bolt.

1 MEMBER WALLIS: On the loads, is it when  
2 you get sort of --

3 MR. KURITZKY: Yes.

4 MEMBER WALLIS: -- propagations and things  
5 that --

6 MR. KURITZKY: Yes. Lastly, we have up  
7 there consider enhancements based upon risk insights,  
8 and then we want to look through the risk insights and  
9 see if there -- if it indicates that there may be any,  
10 you know, related safety concerns.

11 MEMBER WALLIS: What do you mean by  
12 "enhancement" here?

13 MR. KURITZKY: Enhancement would be if  
14 there is a safety concern that is indicated by the  
15 risk insights, is there something we feel needs to be  
16 beefed up?

17 MEMBER WALLIS: Oh, beefed up. Okay. It  
18 means toughening up the regulation.

19 MR. KING: An example is maybe automatic  
20 switchover to ECCS recirculation for those plants that  
21 don't have it. Is that something the risk insights  
22 are telling us ought to be in place? You know, that's  
23 an example of what we're looking at.

24 MEMBER WALLIS: It makes sense that you  
25 should look at both directions, if you can improve



1 safety based on risk insights.

2 MR. KURITZKY: Right. And then our  
3 Option 3 framework. That's part of the Option 3  
4 program.

5 Okay. Some of the benefits that we've  
6 identified with these near term -- these possible  
7 near-term changes, and as they relate to the agency's  
8 performance goals -- to maintain safety, we feel that  
9 these changes would help to maintain safety. In fact,  
10 there may even be some improvement in safety.

11 Diesel generator liability, as was  
12 discussed earlier today, is one area where there may  
13 be some improvement in safety. We would maintain the  
14 elements of defense in depth so there would be no  
15 degradation there.

16 And, again, safety system reliability  
17 would either -- we would -- there would be no  
18 significant decrease based on these changes, and, in  
19 fact, in some cases there may be an increase,  
20 depending on how that -- how we would address the  
21 single failure criteria. There's actually some places  
22 where there may be enhanced system reliability.

23 Also, these changes -- these near-term  
24 changes would make the PRSA activities more effective,  
25 efficient, and realistic. Particularly in the

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1 realistic arena we would have more realistic  
2 assumptions in the DBAs. We'd have, you know, maybe  
3 more realistic assumptions for Appendix K, and so that  
4 would -- in keeping with that second goal.

5 MEMBER APOSTOLAKIS: How would you decide  
6 whether key elements of defense in depth are  
7 maintained? Is that a judgment call, really?

8 MR. KURITZKY: Well, I guess the actual  
9 elements themselves we're going to take from doing the  
10 framework document, which is fairly similar to the one  
11 that is in Reg. Guide 1.174. And you would -- I guess  
12 it is -- I mean, it's necessarily a qualitative  
13 analysis. I mean, there may be some qualitative  
14 pieces to it, but it's going to be some kind of  
15 judgment qualitative decision that you're not  
16 degrading anything.

17 MR. KING: Do you still have prevention  
18 and mitigation? Do you still have sufficient, you  
19 know, redundancy based upon the reliability of the  
20 system?

21 MEMBER APOSTOLAKIS: You can look at the  
22 single failure criterion and you'll decide to abolish  
23 it. You will rely on some quantitative analysis to  
24 show that you have not really degraded the --

25 MR. KING: Some, for example,

1 probabilistic definition of the failure criteria.  
2 Maybe it results in not having to assume a single  
3 failure. Maybe it results in having to assume a  
4 multiple failure, depending upon the system  
5 reliability and the break you're looking at. So it  
6 can work both ways again.

7 MEMBER WALLIS: Some people might argue  
8 that certainly large break LOCA is the biggest thing  
9 that could ever happen. Is that kind of element -- it  
10 has an element of defense in depth to it. I mean,  
11 that you -- because you're uncertain, you look at the  
12 extreme case and defend against that?

13 MR. KING: Sounds like pre-TMI  
14 discussions.

15 MEMBER WALLIS: Isn't that the sort of  
16 argument that was originally used in support of the  
17 regulation?

18 MR. KING: Yes, I think it probably was.

19 MEMBER WALLIS: Was that defense in depth  
20 or is that something else?

21 MR. KING: I'm not sure I'd call it  
22 defense in depth. You may argue, well, that gives you  
23 a margin because you know you can handle this big  
24 break. Therefore, you can handle anything smaller.

25 MEMBER WALLIS: Defense in depth in depth

1 is what you went to when you were uncertain, because  
2 you sort of have a nagging feeling that if something  
3 were to happen you're not quite certain about, then  
4 you --

5 MR. KING: Defense in depth to me is  
6 different ways to accomplish the same function.  
7 Again, you know, just assuming the large break covers  
8 everything that --

9 MEMBER WALLIS: The containment is there  
10 for the same sort of reason. But there are different  
11 ways to perform the function that containment  
12 performs. But because you're uncertain you put it  
13 there anyway.

14 MR. KING: Okay.

15 MR. KURITZKY: And the last thing here we  
16 have the performance goal reduce the unnecessary  
17 regulatory burden. And the near-term changes that we  
18 listed previously should help in a number of these  
19 areas that are listed up there. Extension of the  
20 diesel generator start and loading time, which was  
21 discussed already. That's one of the big issues.

22 In fact, we have some cost information  
23 that was provided to us from industry which shows that  
24 extending the diesel generator start and loading time  
25 could, in fact, save upwards of \$400,000 to as much as

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1 \$1.2 million per plant per year. The big swing there  
2 is whether or not it's on the critical path outage.

3 Also, relaxation of some AOTs or, in fact,  
4 even removing equipment from the tech specs, like the  
5 accumulator, which, again, I think we had some data  
6 from industry that shows that could save upwards of  
7 around \$17,000 per plant per year. And additional  
8 analytic margin for plants that are limited by  
9 Appendix K right now.

10 It's only going to be some plants, and  
11 exactly how they're limited and what -- unnecessary  
12 regulatory burden, we feel, again, is going to be very  
13 plant-specific. But it's certainly one area where  
14 there's some potential.

15 Okay. We recognize that, obviously, as we  
16 move forward with these short-term potential changes  
17 that there's a number of implementation issues that  
18 will have to be addressed. And we have them listed I  
19 think on the next two slides. We don't need to go  
20 into a lot of detail on them because there is stuff  
21 that we can still -- the staff needs to still think  
22 about the nuances of them, but basically they're many  
23 of the similar things that we've discussed already.

24 If we're going to use something like a  
25 combined reliability threshold or a frequency

1 threshold for the San Mateas LOOP assumption or the  
2 single failure criterion, then we're going to need to  
3 have some kind of frequency of the large break LOCA  
4 distribution. And since we can't make a convenient  
5 cut necessarily at the six inches or wherever a PRA  
6 says a large break LOCA is, we would actually need to  
7 have that distribution across all pipe sizes or all  
8 affected break sizes. That's one thing we'd have to  
9 -- we have to consider.

10 When going to the San Mateas LOOP  
11 assumption there are a number of concerns, at least  
12 from doing something generically because there are a  
13 lot of plant-specific aspects. Plants have different  
14 types of procedures and designs to handle loss of  
15 offsite power, particularly delayed loss of offsite  
16 power concerns, and so there may be, you know, some  
17 significant work that may have to be done to make sure  
18 that that's feasible.

19 Again, as we mentioned before for the  
20 single failure criterion, we may consider whether  
21 there's some kind of risk-informed replacement for  
22 what will be combined initiator frequency and failure  
23 probabilities.

24 One of the issues we want to keep in mind  
25 as we move forward is that we want to try and utilize

1 a performance-based approach wherever possible.

2 MEMBER WALLIS: How do you apply that to  
3 LOCA?

4 MR. KURITZKY: Well, I think that  
5 performance-based to my mind -- maybe in the example  
6 we've talked before about the conditional loss of  
7 offsite power where if you have some kind of curve for  
8 the -- you know, for the frequency of the large break  
9 or breaks, then the utility may come in and try and  
10 demonstrate that there conditional loss of offsite  
11 power probability is of a certain value.

12 MEMBER WALLIS: It also would involve  
13 perhaps utilities showing that their ultrasound method  
14 for detecting cracks really could detect cracks. Is  
15 that performance-based, too?

16 MR. KURITZKY: I leave that one to Mike.

17 MEMBER WALLIS: They would just go through  
18 the ritual, but it actually works.

19 MR. MAYFIELD: There is clearly a  
20 performance-based element in that, yes.

21 MR. KURITZKY: Delayed LOOP we just talked  
22 about. Just a couple of the issues there -- the  
23 double sequencing and the degraded voltage issues are  
24 the ones that we have to kind of do some more thinking  
25 on.

1           And also, the impact other modes of  
2           operation and potential accidents. Low power  
3           shutdown, for example -- whatever we do for --  
4           anything for 50.46 or large break LOCA, we have to  
5           make sure that while we're thinking primarily of this  
6           operation, we've got to make sure that for low power  
7           shutdown modes we're not going to do anything dumb,  
8           not giving anything away, we need to be conscious of  
9           it.

10           MEMBER APOSTOLAKIS: Are you going to be  
11           able to do that without very good risk assessments for  
12           shutdown?

13           MR. KURITZKY: There are limitations that  
14           we have to deal with. I mean, that's obvious. And  
15           even for operation for --

16           MEMBER APOSTOLAKIS: What does it mean  
17           "limitations"? So how would you do it? Would you be  
18           more concerned with it?

19           MR. KURITZKY: That's one possibility.  
20           You have to be -- I mean, where there's uncertainty,  
21           you go to conservatism if you can't address certain  
22           things.

23           Okay. Some things aren't --

24           MS. DROUIN: We don't have an answer to  
25           that, George, at this point of how we're going to deal

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1 with it.

2 MEMBER APOSTOLAKIS: All right.

3 MR. KURITZKY: Okay. As Tom mentioned  
4 before, there is also some things that we're thinking  
5 about more for the longer term, other changes to  
6 10 CFR 50.46 or associated GDCs.

7 One is to redefine large break LOCA. As  
8 was discussed previously, that goes back to the first  
9 three options that we talked about right before Mike  
10 spoke and also what industry spoke of this morning.  
11 We would want to continue working with industry on the  
12 scope and depth of what work would be entailed.

13 MEMBER WALLIS: I've been waiting to ask  
14 you the question, and it seems to me your presentation  
15 and the industry presentation don't have too much  
16 overlap.

17 MR. KURITZKY: Where the overlap would  
18 have been is those first three options or parts of  
19 this first step which we've kind of -- we skipped over  
20 pretty quickly.

21 MEMBER WALLIS: Maybe we need to discover  
22 what this extent -- the extent of this work with  
23 industry is. I mean, they have their point of view,  
24 and you have your point of view. They seem to be  
25 rather different. Are you working together or --

1 MR. KURITZKY: We are now having exchanges  
2 of information, but our first three options that we  
3 discussed in the beginning where we -- particularly  
4 Option 1 is very closely related to what industry is  
5 doing.

6 MR. KING: We've had a number of meetings  
7 with the industry as was mentioned, and I think what  
8 you heard Mike say was we're not closing the door on  
9 the path that they're pursuing. What Mike's  
10 presentation tried to do was lay out the issues that  
11 we felt needed to be addressed if we're going to go  
12 down that path.

13 It doesn't mean ultimately we won't go  
14 down that path, but it means between now and June not  
15 enough work has been done for us to go to the  
16 Commission and say, "Let's proceed down that path."

17 MEMBER WALLIS: What they seem to be  
18 looking for, though, was for you to open the door and  
19 say, "We're going to encourage you to do more work  
20 because we think it's fruitful," rather than to hang  
21 a plaque on the door which discourages them from doing  
22 a lot more work.

23 MR. KING: I think one of the things we  
24 have to talk about is, how wide is the door? You  
25 know, how wide do they see it, and how wide do we see

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1 it?

2 MEMBER WALLIS: We don't seem to agree yet  
3 on that.

4 MR. KING: We probably don't agree on  
5 that, but I think from our perspective the door is  
6 open, and we've got to talk about is how wide is it  
7 open.

8 MEMBER WALLIS: I'm not sure that at this  
9 stage the ACRS has enough evidence from both sides to  
10 give much advice about how open the door is. If  
11 that's what we're being asked to do.

12 MEMBER BONACA: One question I have is,  
13 have you given second thoughts about the generic  
14 implications of this step? Really, this is the LOCA.  
15 It was presented as the first DBA that can be changed  
16 where there is implications to load rejection.

17 It's equally unlikely, I think, as an  
18 event that you will have a sheer load rejection the  
19 way that you have in the FSAR. It's true of the steam  
20 line break.

21 So if you make a change to the LOCA and  
22 then you go back into the risk evaluation and look at  
23 the comparisons between, you know, LOCA, you are  
24 reducing now the expectation resulting from the LOCA,  
25 but you are looking at the one imposed by the steam

1 line break. Well, tomorrow you will be changing the  
2 steam line break. It will change further.

3 I think you have to look globally at here  
4 you are really fundamentally changing the way you're  
5 looking at your design of the plant, I mean, and  
6 you'll do it for a LOCA. That's a point that also Dr.  
7 Kress has made, and, you know, without the  
8 implications for the other accidents. I mean, it's --

9 MR. KURITZKY: I think your point is very  
10 good. Even if --

11 MEMBER BONACA: I don't think you can wait  
12 until you have gone through this gate, and then decide  
13 how you're going to treat the other accident. I think  
14 you have to think about and have some position on  
15 that, because it will have implications about, you  
16 know, anything that -- I mean, the example I made of  
17 doing your risk assessment based on the consequences  
18 of the LOCA and comparing it to other restrictions  
19 being imposed by the steam line break, and then coming  
20 in and having changes to the steam line break that  
21 will affect the changes you have made now with the  
22 LOCA. I mean --

23 MR. KING: What you are suggesting is  
24 let's take the whole set of DBAs, take a look at what  
25 risk information says about them.

1 MEMBER BONACA: Yes. I mean, if you're  
2 making --

3 MR. KING: Make whatever changes you think  
4 make sense and then assess that.

5 MEMBER BONACA: Or even if you progress  
6 aggressively just with the LOCA, I think you ought to  
7 have in mind some thoughts about how do you agree with  
8 the fact that this is a new approach that most likely  
9 is going to be applied with time to the other  
10 accidents in the way you design your plant. I think  
11 you have to have an understanding; at least I think we  
12 have to have an understanding of how that will come  
13 together.

14 MR. KING: I agree there are other things  
15 on the plate to be looked at, like the rod ejection  
16 accident.

17 MEMBER BONACA: Yes. Steam line break,  
18 too, most likely.

19 MR. KING: Steam line break, probably some  
20 others as well.

21 MEMBER BONACA: Yes.

22 MR. KING: And I agree you need to think  
23 about the implications of this for those other events,  
24 particularly if -- if those other events are  
25 preventing some of the -- the benefit or some of the

1 improvements you're really expecting when you go to  
2 make this change, does it make sense to do that  
3 individually, or would you be better to go in and look  
4 at them as a group?

5 MEMBER BONACA: Right.

6 MR. KING: One of the things we need to  
7 spend more time on is looking at, if we would make  
8 such a change here, what are the other things that are  
9 going to catch you? And how do we deal with those  
10 things, so that we take more of a collective or  
11 holistic look at this whole LOCA situation?

12 CHAIRMAN SHACK: Of course, you know, one  
13 of the problems that Tom keeps pointing out, when you  
14 tackle the design basis approach here, you have a  
15 touch time evaluating the risk, because you don't --  
16 you're not really dealing with a specific change in a  
17 plant.

18 You know, it's easier to estimate the  
19 change in CDF if the guy comes in and says, "I want to  
20 change my tech spec for diesel startup." I can sit  
21 down and compute a delta CDF score. Here you're going  
22 to change a design basis accident, and you really  
23 don't know exactly what he's going to do in response  
24 to that.

25 MR. KING: Right.

1 CHAIRMAN SHACK: So it becomes very  
2 difficult to go back and try to estimate the risk  
3 impact of this change because you don't know what the  
4 changes are, whereas if you're coming the other way  
5 it's a good deal easier.

6 MR. KING: You have to think through, what  
7 are those changes that would ensue? And what is the  
8 risk impact? And maybe some licensees will implement  
9 them all and some won't.

10 CHAIRMAN SHACK: But that's the fortune-  
11 telling aspect of this.

12 MR. KING: Right. But you've got to look  
13 at that. I mean, there's no way around it.

14 MEMBER BONACA: Although, I mean, for  
15 those changes which are being driven by LOCA -- for  
16 example, the diesel start times -- and you can  
17 determine that there are no other accidents driving  
18 that, okay, then you can, you know -- some assessment  
19 of it can be done.

20 There are others which are more  
21 complicated because they are driven by other events,  
22 and so I agree with --

23 CHAIRMAN SHACK: Yes. But could you do a  
24 -- you know, a standard tech spec change for diesel  
25 start times? You know, I mean, we -- I was just going

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1 to make a wise remark that, you know, it was a good  
2 thing you got the jet pipe whip restraints out there  
3 before we decided to risk-inform the regulations.

4 MR. MAYFIELD: They'd still be there.

5 CHAIRMAN SHACK: They'd still be there.

6 MR. MAYFIELD: You were talk about the  
7 tentacles this thing has. There was mention made this  
8 morning that one of the reliefs you'd get is some  
9 improvement. Without making a change in containment  
10 design, you'd get some improvement in the calculated  
11 margin against failure.

12 If you had that improved calculated margin  
13 and then discovered that your containment was being  
14 degraded, and it was going to be a major deal to go  
15 get to it to repair it, would you then be inclined to  
16 use up that margin, or a part of it, to avoid a repair  
17 for a degraded containment?

18 I'm not going to speculate, but it seems  
19 to me that that's a question that if you were going to  
20 look at how the -- what changes might be made to a  
21 plant, you get captured in those kinds of things. And  
22 it -- I think that's a very tough thing to do to -- to  
23 get out the crystal ball and guess at all the things  
24 people might do.

25 MEMBER KRESS: It's crystal-balling,

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1       that's right, yes. That's why it's hard.

2               MR. WARD: That's one reason that we had  
3       -- are proposing an implementation guide with the  
4       large break LOCA redefinition, so that we go to you  
5       with a complete package of standard changes that had  
6       already been reviewed, so that if I get the rule  
7       change for my plant, then what we have already looked  
8       at on a generic basis for the diesel start times,  
9       accumulator number reduction, ECCS flow balancing, on  
10      and on and on, and have a complete package already  
11      reviewed and looked at as a compiled list, instead of  
12      trying to go at it like this, you know, piecemeal one  
13      at a time, and then figure out the impact, and then to  
14      piecemeal another one and figure out the impact of it.

15              There are other things, you know, that  
16      would go beyond that, of course, but if we -- if we  
17      try to piecemeal it one piece at a time like this, I  
18      don't think we'll get through it in my lifetime or  
19      most of our careers. I think we will still be working  
20      on that list -- the near-term list, you know, when all  
21      of us are retired.

22              I think that's the reason we felt like we  
23      had to go all the way to the beginning and start from  
24      there and then work down and come up with a reasonable  
25      list of things to work on at the same time and not try

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1 to piecemeal this thing to death, because I think  
2 that's what will happen if we try to take that  
3 approach.

4 MR. KURITZKY: Okay. In any case, so on  
5 the rest of these things, I think most of these items  
6 we've already discussed at various times. Some of the  
7 things we're looking at in the longer term, maybe  
8 changing the ECCS acceptance criteria, the propagation  
9 of break size frequency, looking at ECCS availability  
10 for other modes of operation, and things like multiple  
11 steam generator tube rupture, you know, whether  
12 there's a need for multiple steam generator tube  
13 rupture DBA.

14 Going back to what we discussed before,  
15 even -- or maybe even in the short term looking at the  
16 need for maybe a different diesel generator DBA if  
17 we're going to relax that loss of offsite power  
18 assumption.

19 So these are some of the things that in  
20 the longer term we still -- we think we can come to  
21 some kind of grips on their feasibility.

22 MR. KING: Okay. The last viewgraph -- I  
23 mean, the purpose of the meeting today was to sort of  
24 put our cards on the table to show you where we stand.  
25 We don't have all the answers. We still have some

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1 work to do. But at least we wanted to give you the  
2 opportunity here, from all the work that's been done  
3 so far, you know, where we've -- where we are today on  
4 some of these issues and how we see perceiving in the  
5 future both the near term and the long term.

6 Again, we're subject to scheduling. You  
7 know, we'd like to have some future interactions with  
8 the committee leading up to our June paper. That's  
9 it.

10 CHAIRMAN SHACK: Just, you know, if you  
11 take the industry's suggestion with, you know, this --  
12 you're not defining -- you're not redefining the large  
13 break LOCA in the rule. You're simply saying the  
14 large break LOCA can be redefined, and they will have  
15 to submit a package showing all the implications of  
16 that in terms of a risk argument.

17 Doesn't that still leave you in control  
18 and let you evaluate the things the way they -- rather  
19 than trying to crystal ball it --

20 MR. KING: That's certainly one way to do  
21 it, just open the door for any plant to come in and  
22 say, "Here's my proposal. These are the things I want  
23 to change."

24 CHAIRMAN SHACK: But I'd have to do a  
25 fully risk-informed version of that.

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1 MR. KING: Risk study, fracture mechanics  
2 study, everything that comes along with it. I think  
3 the question -- maybe Mike is better to answer this  
4 than me -- but are we in the position to lay out the  
5 Regulatory Guide that would have to be met, and the  
6 acceptance criteria that would have to be met?

7 There's a lot of things on Mike's list of  
8 things that should be addressed in such an analysis,  
9 and, you know, it's not clear to me that at this point  
10 we're ready to say, "This is the list, and this is how  
11 it ought to be approached."

12 MR. MAYFIELD: I think that that really  
13 was the point I was trying to get to. It's not that  
14 it can't be done. It's that it's, we believe, a much  
15 more significant undertaking than has been suggested  
16 by some of the other discussions we've had.

17 As we've looked at what would -- what  
18 kinds of things would have to be addressed, it's a  
19 tougher analysis than has been suggested, where we  
20 don't believe what was done before for the leak before  
21 break rule change, in and of itself, was sufficient.  
22 Is it a starting point? Sure. Of course.

23 But it's a much tougher analysis to do.  
24 The hurdle is higher than it has been for these other  
25 kinds of changes. I mean, it's a tough job. It's not

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1 that it can't be done, although I personally am  
2 skeptical that it's practical, but it's not that it  
3 can't be done. But it's going to be a major resource  
4 investment.

5 MEMBER BONACA: You said that that was  
6 because for leak before break defense in depth was not  
7 challenged. You said that it was covered by large  
8 break LOCA in 50.46 requirements. So in case we  
9 really missed it, and you have a large break LOCA, you  
10 still have the ECCS capable of dealing with its own  
11 certain criteria.

12 MR. MAYFIELD: Right.

13 MEMBER BONACA: Well, have you thought  
14 about the possibility of the criteria being -- I'm  
15 talking about, you know, there are a number of  
16 restrictions to the plant that you could relax based  
17 on a more likely break -- maximum break size. And you  
18 could still impose some fundamental requirements, for  
19 example, coolability of the core, for, you know, that  
20 will end -- you can break.

21 I'm just throwing out a thought because --  
22 because you still will have some results by the ECCS  
23 that will not deliver exactly for a full -- give you  
24 what you are supposed to, but it will, you know --

25 MR. KING: You say relax the acceptance

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1 criteria for the large break, is that --

2 MEMBER BONACA: I'm thinking about the  
3 fact that if you take out the DBA, not only the LOCA,  
4 and you reevaluate those with these new concepts in  
5 mind, you may think about the criteria as something  
6 with -- with expectations for the current DBAs to  
7 still be fulfilled, and probably systems are capable  
8 of delivering that. And, you know, just --

9 MR. KING: Yes. I think I'm still not  
10 sure exactly what you're proposing. Maybe we need  
11 some discussion.

12 MEMBER BONACA: Well, once you relax your  
13 diesel starting time, and all of the other things we  
14 have seen here, okay, you still deliver a flow, and  
15 you will have some expectations for coolability of the  
16 core in case -- in case you have the truly double-  
17 ended guillotine break.

18 MR. KING: I don't know. Given the fact  
19 that the plants already have the right size pumps and  
20 pipes and everything in there --

21 MEMBER BONACA: That's exactly right.

22 MR. KING: For existing plants, that  
23 probably is --

24 MEMBER BONACA: As was said this morning,  
25 that for new plants there will be a different kind

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1 of --

2 MR. KING: Yes, new plants will be a  
3 different story.

4 I may want to go back and mention one  
5 other fundamental assumption. We're talking about,  
6 you know, we have a short-term and a long-term list.  
7 One of our fundamental assumptions was, I mean, we  
8 could continue to work on the issues Mike has raised  
9 and do the -- do all of the analysis and develop the  
10 Reg. Guide and then have a complete package type  
11 change.

12 We're not ready to do that by June, but  
13 one of our fundamental assumptions was we thought it  
14 would be important to get some short-term successes  
15 under our belt on this issue and some short-term, you  
16 know, changes that would get rid of some of these  
17 unnecessary burdens and maybe -- maybe plug some  
18 safety enhancement holes.

19 That's why we're proposing to go forward  
20 in June with some -- some things that we think are  
21 reasonable, some things that will provide some  
22 advantages, some safety improvements, and continue to  
23 work on the long-term.

24 I think if we decide not to do anything  
25 until all of the work is done, it's going to take some

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1 more time, and it's going to have negative  
2 implications for all of Option 3. I think getting  
3 some successes under our belt is important, and that's  
4 one of the reasons we're proposing to have this two-  
5 tiered approach. So, you know, I don't know what the  
6 committee's views on that are, or the industry's  
7 views, but that's our view.

8 MEMBER WALLIS: Well, my impression, if  
9 you want a view, is that you have thought enough about  
10 these issues that you will probably come up with a  
11 good document in April, whenever this -- you know,  
12 April/May, that timeframe. I mean, I've got a feeling  
13 that you know enough about it that --

14 MR. KING: For the short-term things.

15 MEMBER WALLIS: -- that you will come up  
16 with something by then, yes.

17 MR. KING: Right.

18 MEMBER WALLIS: So I'm sort of encouraged  
19 by the progress I've seen so far.

20 MEMBER KRESS: I would like to throw out  
21 one of my favorite comments, and that is when you  
22 actually get around to doing this, the risk  
23 implications of the changes -- which may be way down  
24 the road on this thing -- I urge you to reconsider the  
25 guidance in 1.174 a little more, because the overall

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1 objectives of this agency are not just CDF and LERF.

2 They're releases of all magnitudes of  
3 fission products, including late failures and  
4 contamination, and even worker exposure. So if those  
5 things are impacted and are going to change, you need  
6 to know it also. And when you do the risk impact  
7 evaluation, don't just focus on CDF and LERF. That's  
8 my plain issue.

9 MR. KING: Okay. We're finished with our  
10 presentation.

11 CHAIRMAN SHACK: Okay. I believe Mr.  
12 Heymer wanted to make some comments.

13 MR. HEYMER: Adrian Heymer, NEI. I've  
14 listened to the staff. We've been discussing the  
15 issues with the staff for 15 months now. I think what  
16 you've heard today is very much along the lines that  
17 the discussions have gone for the last 15 months.  
18 We've looked into this. We've evaluated it.

19 The owners groups have got funding  
20 authorized to move forward on redefining the large  
21 break LOCA, and we believe that's where the priority  
22 should be.

23 So that's what we believe at the moment,  
24 and we are under no illusions that it's going to be a  
25 tough task. But it's a tough task that's got, we

1 believe, rewards commensurate with what they're going  
2 to have to expend to achieve our aim, in the order of  
3 probably quite substantial funding from the owners  
4 groups. And by substantial I'm talking in the  
5 millions, not in the thousands.

6 I hear the staff talk about short term and  
7 near term, and I don't want to ask a question of the  
8 staff, but at some stage I would like a definition of  
9 what near term and short term is in their mind,  
10 because I've got a nasty feeling that what I think is  
11 near term is what they're thinking is something else.  
12 So I'd be interested in hearing from the staff at that  
13 point in time.

14 We need to think about what's been said  
15 here today again and go back and discuss it amongst  
16 ourselves as an industry, and then see where we go  
17 from here. So that's what I wanted to say.

18 MR. KING: I mean, I think near term is  
19 propose some changes this June. That's near term. We  
20 want to be able to --

21 MR. HEYMER: And do rulemaking by the end  
22 of the year?

23 MR. KING: No, of course not. You know,  
24 we go to the Commission in June and propose specific  
25 changes. They say yes; the rulemaking starts. Now,

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1 rulemaking doesn't take six months. Generally, it  
2 takes two years. Maybe 18 months if --

3 MR. HEYMER: But, I mean, the -- it would  
4 be out by, say, six to nine months from the time the  
5 Commission said move ahead.

6 MR. KING: Do you mean the proposed -- the  
7 notice of proposed rulemaking?

8 MR. HEYMER: Yes.

9 MR. KING: With the proposed rule?

10 MR. HEYMER: Yes.

11 MR. KING: That's probably a reasonable  
12 timeframe.

13 CHAIRMAN SHACK: Are there any more  
14 comments or questions from the committee members? Any  
15 more questions or comments from the members of the  
16 audience?

17 Okay. Mike tells me our next subcommittee  
18 meeting on this subject will be May 8th. Whether  
19 that's --

20 MEMBER WALLIS: It will be a joint  
21 subcommittee like these three subcommittees together.

22 MEMBER APOSTOLAKIS: Why was -- why  
23 May 8th for the May meeting?

24 MR. MARKLEY: You decided at the last full  
25 committee meeting on that date.

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1 MEMBER APOSTOLAKIS: Well, that's a good  
2 reason.

3 (Laughter.)

4 So May 8th is -- okay.

5 CHAIRMAN SHACK: That basically means that  
6 the full committee can attend the meeting because it's  
7 sort of banged up against the full committee meeting,  
8 which is probably a good thing.

9 If there are no more questions or  
10 comments, then I think we can adjourn.

11 (Whereupon, at 2:07 p.m., the proceedings  
12 in the foregoing matter were adjourned.)  
13  
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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: Advisory Committee on  
Reactor Safeguards

Docket Number: (Not Applicable)

Location: Rockville, Maryland

were held as herein appears, and that this is the  
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REVISED 3/5/01

**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  
MARCH 16, 2000**

ACRS Contact: Michael T. Markley (301) 415-6885  
E-mail: mtm@nrc.gov

**- PROPOSED SCHEDULE -**

	<u>TOPIC</u>	<u>PRESENTER</u>	<u>TIME</u>
1)	<b>Introduction</b>		8:30-8:35 am
•	Review goals and objectives for this meeting; introductions	Bill Shack, ACRS	
•	Proposed final ACRS report on the NRC Safety Research Program		
•	Risk-informing 10 CFR 50.46 for emergency core cooling systems		
•	Technical issues associated with large-break loss-of-coolant accidents (LBLOCA), leak-before-break phenomena (LBB), and probabilistic fracture mechanics (PFM)		
2)	<b>NRC Safety Research Program</b>		8:35-9:30 am
•	Proposed final ACRS report on the NRC Safety Research Program	George Apostolakis, ACRS	
3)	<b>Industry Presentation</b>		9:30-10:30 am
•	Overall industry approach: Why redefine LBLOCA?	Adrian Heymer, NEI	
•	Owners Group perspectives	Bob Osterrieder, WOG Lewis Ward, SNC (TBD), CEOG (TBD), B&WOG	
	<b>** BREAK **</b>		10:30-10:45 am

**4) Industry Presentation-continued** 10:45-11:30 am

- Overall industry approach: Why redefine LBLOCA? Adrian Heymer, NEI
- Owners Group perspectives Bob Osterrieder, WOG  
Lewis Ward, SNC  
(TBD), CEOG  
(TBD), B&WOG

**\*\* LUNCH \*\*** 11:30-12:30 pm

**5) NRC Staff Presentation** 12:30-2:00 pm

- Overview of staff activities Tom King, RES
- Options for revising 10 CFR 50.46; advantages and disadvantages Mark Cunningham, RES  
Mary Drouin, RES  
NRC contractors (TBD)
- Comments on approach proposed by the industry M.Mayfield, RES
- Preliminary approach proposed by the staff Mark Cunningham, RES  
Mary Drouin, RES

**6) ACRS General Discussion and Adjournment** 2:00-2:30 pm

- General discussion and comments by Members of the Subcommittee; items for future meetings Bill Shack, ACRS

**Note:** Presentation time should not exceed 50% of the total time allocated for a specific item. Number of copies of presentation materials to be provided to the ACRS/ACNW - 35.

# **Risk-Informing NRC Technical Requirements-- Redefining LBLOCA Requirement**

**Industry Presentation  
USNRC Advisory Committee on  
Reactor Safeguards  
March 16, 2001**

**NEI**

## **Risk-Informing NRC Technical Requirements**

- **Focus on redefining LBLOCA**
- **Background information & general approach**
- **Owners' group activities & approach**
- **Example of a LBLOCA application**

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## **Risk-Informing NRC Technical Requirements**

- **Improve the efficiency and effectiveness of the NRC regulatory regime in a manner that increases the focus on safety-significant matters while reducing unnecessary resource burden**
- **Assess and, as necessary, amend**
  - NRC regulations
  - Regulatory guidance (Reg. Guides, NUREGS, Standard Review Plan, etc.,...)
  - Industry codes & standards

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## **Why Redefine LBLOCA?**

- **Enhance safety and improve process efficiency**
- **Opportunity to shift design and operational focus onto more safety significant events**
- **LBLOCA very low probability event (NUREG 5750)**
  - Very low risk significance -- Negligible public risk
- **Evaluations, detection and piping inspections ensure integrity and high reliability**

**NEI**

## **Why Redefine LBLOCA?**

- **Linked to numerous requirements and regulatory guidance documents**
  - A central & controlling element for other requirements & guidance documents
  - Large focus of design, operational and management resources
- **Initial industry activity based on WOG LBLOCA project**
  - All Owners' groups involved
  - Meetings & workshops with NRC staff

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## **Safety Enhancements from Redefining LBLOCA**

- **Resources can be focused on activities of greater risk significance**
- **Reduction in the number of unnecessary plant transients**
- **Operator and maintenance procedures and training focused on more probable, more risk significant equipment and events**
- **Realistic equipment testing requirements**

NEI

## **Safety Enhancements from Redefining LBLOCA**

- Improved worker safety profile
- Potential to increase ECCS efficiency and effectiveness for more probable events
- More realistic safety and PRA assessments
- Improved regulatory consistency

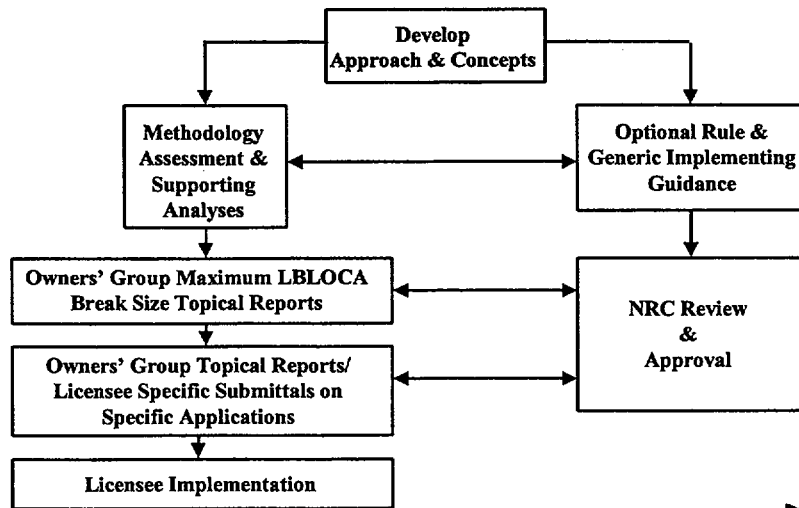
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## **Industry LBLOCA Approach**

- Simple rule change to allow NRC to approve alternative break-sizes
  - Specific break size not in the rule
  - Conforming changes to other regulations
- Owners' group submittal to justify new break-size
- Owners' group specific application(s) submittals
- Licensee submittals

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# LBLOCA REDEFINITION PROGRAM



NEI

**Westinghouse Owners Group  
Large Break (LB) LOCA Redefinition Program**

**ACRS  
March 16, 2001**

**Westinghouse Owners Group  
LBLOCA Redefinition Program**

**Presentation Overview**

- Safety Benefits
- Program Approach
- Example Follow-on Activities
- Safety Margin
- Conclusions

## Westinghouse Owners Group LBLOCA Redefinition Program

### **Safety Benefits**

- Focus Resources on Activities of Greater Risk Significance
- Reduce Burden of Revising and Maintaining LBLOCA Design/Licensing Basis
- Consistency within the Regulations
- Consistency in Various Individual Analytical Applications
- Provides a More Realistic Basis for Design Evaluations
- Promotes Realistic Equipment Testing Requirements

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3

## Westinghouse Owners Group LBLOCA Redefinition Program

### **Program Approach**

- Utilize Rule-making Based on SECY-98-300 Option 3
- Include Option of Retaining Current Licensing Basis
- Changes to 10 CFR Part 50
  - 50.46 Acceptance Criteria for ECCS
  - Appendix A GDC (LOCA definition)
  - Appendix K (I.C.1)
- Redefine the Licensing Basis LOCA
  - Maximum Size
  - Attendant Consequences
- Maintain an Acceptable Margin of Safety

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4

Westinghouse Owners Group  
LBLOCA Redefinition Program

**Program Approach (continued)**

- Technical Justification
  - Use Risk-Informed Technology to Show Low Risk of LBLOCA
    - Utilize the Framework Contained in Regulatory Guide 1.174
  - Use Leak Before Break Analysis to Justify Break Size
    - Define New Maximum Break Size & Reanalyze, as Necessary, to Obtain Benefits

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Westinghouse Owners Group  
LBLOCA Redefinition Program

**Program Approach (continued)**

- Leak Before Break (LBB)
  - GDC 4 Allows Application of LBB to High Energy Piping
  - LBB Approved to Eliminate Dynamic Effects (GDC 4) for Some Plants
    - Main Coolant Piping
    - Pressurizer Surge Piping
    - Accumulator Piping
    - RHR Piping
    - Main Coolant Bypass Piping

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Westinghouse Owners Group  
LBLOCA Redefinition Program

**Program Approach (continued)**

- Extend Existing LBB Approvals to Other Applications
  - Extend Beyond Application to Dynamic Effects
    - No Changes to Existing Methodology Contained in NUREG-1061, Vol. 3 and Draft SRP 3.6.3
- Perform LBB on additional lines as needed to implement desired maximum LOCA size in plant licensing basis
- Perform scoping review to justify one maximum size LOCA for Westinghouse fleet of plants

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Westinghouse Owners Group  
LBLOCA Redefinition Program

**Program Approach (continued)**

- Determine if any events previously bounded by LBLOCA must be analyzed following LOCA Redefinition

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## Westinghouse Owners Group LBLOCA Redefinition Program

### Program Approach (continued)

- Following Rule Change, Plant Specific Change to Maximum LOCA Break Size in Licensing Basis Requires Submittal and NRC Approval
- Follow-up Plant Changes to Obtain Benefits
  - Plant will follow the appropriate change control process for licensing basis (e.g., §50.59, §50.92,...)
  - NRC Submittal will be made if Required by Change Control Processes

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## Westinghouse Owners Group LBLOCA Redefinition Program

### Example Follow-on Activities

- Increase Diesel Generator Start Time  
(Enhance diesel reliability)
- Relax ECCS Flow Balancing Requirements  
(Increase ECCS effectiveness for more probable events)
- Decrease Number of Accumulators in Tech Specs (N-1) or Relax Accumulator Parameter Requirements (Boron, Pressure, Water Volume)  
(Reduce potential for unnecessary plant shutdowns and thermal transients)
- Relax Ultimate Heat Sink Requirements  
(Reduce potential for unnecessary plant shutdowns and thermal transients)
- Relax Containment Fan Cooler Requirements
- Power Uprate
- More realistic Emergency Procedures and Operator training

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## Westinghouse Owners Group LBLOCA Redefinition Program

### **Safety Margin**

- Risk-Informed Approach Maintains the Defense-In-Depth Philosophy that Underlies the Safety Regulations (SECY-98-300)
- CDF and LERF Ensure Margins for Health and Safety of the Public
- Redefinition of LBLOCA, Retains LOCA as a DBE
- Other DBAs Continue to Maintain Adequate Margin
- Focus Resources on Activities of Greater Risk Significance

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## Westinghouse Owners Group LBLOCA Redefinition Program

### **Conclusions**

- Maintains Acceptable Margin of Safety
- Single Approach to Reduce Burdens Imposed by an Unrealistic Event
  - Complementary to the 1987 GDC-4 Rule Change
  - Integrates Pursuit of Individual Applications in a Cohesive One Time Rule Change
- Consistent with Technological Advances/Knowledge
- Reduces both Staff and Industry Resources Associated with LBLOCA
- Increases Efficiency and Effectiveness
- LBLOCA Redefinition should be Pursued

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# Combustion Engineering Owners Group (CEOG)

## Large Break (LB) LOCA Redefinition

Dave Bajumpaa  
Millstone Nuclear Power Station

Slide 1

CEOG ACRS Presentation

March 16, 2001

## Large Break LOCA Redefinition

- GDC 4 Currently Allows for the Application of Leak Before Break Analyses to Eliminate Dynamic Effects Associated with LBLOCA
- CEOG Supports the Consistent Application of LBLOCA Redefinition throughout the 10CFR50 Regulations, Including:
  - » 10CFR50.46 and 10CFR50 Appendix K
    - ECCS Performance Analyses
  - » 10CFR50 Appendix A General Design Criteria
    - Containment Related Analyses

Slide 2

CEOG ACRS Presentation

March 16, 2001

## Large Break LOCA Redefinition

- NEI and WOG Presentations Identified the Safety Benefits and Programmatic Approach for Large Break LOCA Redefinition.
- The CEOG Approach to Redefine LBLOCA would be similar to the WOG Approach:
  - » Using risk informed technology to show low risk of LBLOCA
  - » Using leak before break analyses to justify a maximum break size
  - » Continue to analyze LOCAs up to this maximum break size

Slide 3

CEOG ACRS Presentation

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## Large Break LOCA Redefinition

- Two Major Applications for the Extension of LBLOCA Redefinition :
  - » 10CFR50.46 ECCS Performance Analyses
    - LOCA analysis performed to demonstrate compliance with the 10CFR50.46 limits
  - » Containment Related Analyses:
    - Increased analytical margin to several containment related design limits

Slide 4

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## **Containment Related LOCA Design Limits**

- Peak Containment Pressure
- Inside Containment EQ Temperature Profile
- ECCS/Containment Spray Pump Room Temperature Profile.
- Closed Cooling Water Inlet and Outlet Temperatures at the Containment Air Recirculation Coolers, and Shutdown Cooling and Spent Fuel Pool Cooling Heat Exchangers.
- GL 96-06 Evaluations of the CAR Coolers
- Service Water Discharge Temperature
- Sub-Compartment Pressure Analyses
- Debris Generation/Transport for Sump Design Verification

Slide 5

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## **Application of LBLOCA Redefinition - Containment Related LOCA Design Limits**

- Analytical margin to these design limits are generally small
- Changes to these design limits are costly
- Increased analytical margin to these design limits proves useful to accommodate unforeseen plant problems, and reduces complexity and frequency of re-analyses
- Limiting maximum break size by LBLOCA redefinition expected to increase analytical margin to containment design pressure by approximately 10%

Slide 6

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## **LOCA Redefinition - Examples of Containment-Related Benefits**

- **Peak Containment Pressure - Typical Large Dry Containment**
  - » Containment design pressure - 54 psig
  - » Peak calculated containment pressure following a LOCA - 52.9 psig
  - » Peak calculated containment pressure following a main steam line break 53.8 psig
  - » Plant is main steam line break limited
    - While not a direct benefit, increased LOCA containment pressure margin simplifies evaluation of various plant changes

Slide 7

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## **LOCA Redefinition - Examples of Containment-Related Benefits**

- **Inside Containment EQ Temperature Profile**
  - » Increased analytical margin between the calculated post accident containment temperature profile and the EQ test envelope of equipment inside containment
- **ECCS/Containment Spray Pump Room EQ Temperature Profile.**
  - » Reduction in calculated post accident Closed Cooling Water (CCW) temperature profile. Reduced CCW temperature profile reduces post-accident room temperature. Increased analytical margin between the calculated post-accident room temperature and EQ test envelope of equipment in the room.
- **CCW Temperature Limits**
  - » Increased analytical between the post accident calculated temperatures and the design limits in the Containment Air Recirculation Coolers.

Slide 8

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## **LOCA Redefinition - Examples of Containment-Related Benefits**

- **Potential Uses of Increased Analytical Margin to Design Limits**
  - » Relax CCW flow limits through containment air recirculation coolers, shutdown cooling and spent fuel pool cooling heat exchangers
  - » Greater tube plugging limits
    - CCW to service water heat exchanger
    - Shutdown cooling heat exchanger
    - Containment air recirculation cooling units
  - » Increased ultimate heat sink temperature limit
  - » Accommodate power uprates

Slide 9

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## **LOCA Redefinition - Examples of Containment-Related Benefits**

- **Additional Potential Uses of Increased Margin to Design Limits**
  - » Margin to accommodate unforeseen problems without revising design limits
    - Examples of recent changes to LOCA containment pressure analyses at an existing plant
      - Increased safety injection pump flow
      - Increased spent fuel pool cooling heat loads
      - More detailed containment air cooling modeling including CCW and service water feedbacks
      - Increased containment spray header fill time
      - Increased containment paint thickness
      - Increased refueling water storage tank temperature

Slide 10

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## Consistent Application of Large Break LOCA Redefinition to 10CFR50

- Allows Optimization of Potential Safety Benefits
  - » e.g., increase Emergency Diesel Generator (EDG) start time to enhance diesel reliability
    - Impacted by ECCS analyses (increased ECCS pump start time) and containment analyses (containment spray, CCW and containment air recirculation cooler start time)
    - Benefit of relaxed EDG start time may not realized if LOCA redefinition limited to ECCS performance area.
      - » Subtle containment related impact - increased time to restart CCW pumps has the potential to increase water hammer loading beyond limits (Generic Letter 96-06 issue)

Slide 11

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## Large Break LOCA Redefinition - Summary

- CEOG Supports the Consistent Application of LBLOCA Redefinition throughout the 10CFR50 Regulations, Including:
  - » 10CFR50.46 and 10CFR50 Appendix K
    - ECCS Performance Analyses
  - » 10CFR50 Appendix A General Design Criteria
    - Containment Related Analyses

Slide 12

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March 16, 2001



## Potential Impact from LBLOCA Redefinition

- Emergency Diesel Generators
- Systems inspection & testing
- Piping & piping support inspections
- Containment heat removal
- Debris
- Maintaining coolable fuel geometry & improving fuel design
- RCS & Core Internals analyses
- Ultimate Heat Sink Capacity
- Electrical coordination & sequencing
- Coolant injection requirements (timing and flow)
- Reactivity insertion events
- Technical specifications
- Safety analyses
- Power uprates
- More realistic treatment of emergent issues

NEI

# Risk-Informing 10 CFR 50.46

Presented to  
Advisory Committee on Reactor Safeguards

Presented by  
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## 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
- No letter requested

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## Staff Approach for Risk-Informing 10 CFR Part 50

### Review/Prioritize All of Part 50

For candidate regulation or DBA prioritized high:

- Identify potentially feasible risk-informed options
- Recommend a feasible risk-informed alternative to Commission consistent with the Strategic Plan Performance Goals and the guidelines from the Option 3 framework
- For recommendations approved by Commission, proceed to rulemaking/detailed technical study

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## Status

- 10 CFR 50.46 and Large break LOCA (LBLOCA) – Identifying potentially feasible risk-informed options
- Consideration of industry and public views:
  - Public workshops (February and October 2000)
  - Public meetings (Mar., May, July, Nov. 2000; Jan. 2001)

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## Schedule/Milestones

- Public meeting (April/May)
- ACRS subcommittee meeting (May)
- Draft SECY paper to ACRS (mid-May)
- ACRS full committee meeting (early-June) [letter]
- SECY paper to Commission (June 29)
  - Preliminary recommendations on the feasibility of risk-informed changes to 10 CFR 50.46 and feasibility of redefining the LBLOCA
  - Plan and schedule for completion of work on 50.46

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## Overview of Risk-Informed Options

- Risk-informing LBLOCA definition
- Risk-informing the technical requirements associated with 10 CFR 50.46 and associated implementing documents
- Near term vs. longer term changes

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## Risk-Informed Options: LBLOCA Redefinition

- Redefine LBLOCA by plant based on leak-before-break (LBB) and probabilistic fracture mechanics (PFM) analyses
- Exclude low risk LBLOCAs by plant type
- Exclude LBLOCAs for plants with small risk increments associated with plant changes

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## Suggested Redefinition of LBLOCA

- Estimates of LBLOCA frequency should address
  - Service Experience
  - Analysis to predict piping failure frequency
  - Other failures where large break is surrogate
- Prior analyses addressing piping failure frequency not sufficiently rigorous basis for change to 50.46
  - 1986 change to GDC-4
  - RI-ISI programs
- Analysis at least as rigorous as PTS

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## Service Experience

- Prior staff study (NUREG/CR-5750) estimated LBLOCA
  - PWRs –  $5\text{E-}06$ /critical-year with 90% confidence interval of ( $1\text{E-}07$  to  $1\text{E-}05$ /critical year)
- Recent experience at V.C. Summer
  - Best Estimate is  $7\text{E-}06$ /critical-year
  - Within band of NUREG/CR-5750 study
  - Believed to be conservative estimate

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## Prior Applications of Pipe Fracture Analysis and LBB

- 1986 GDC-4 change
  - LBB accepted for eliminating dynamic effects from postulated pipe fracture
    - Removal, or relief from, pipe whip restraints and jet impingement shields
- Break Opening Time Relaxed for Baffel Bolt Analyses
- Risk-Informed Changes to ISI Program
- Resolution of GSI-190 on Environmental Effects on Fatigue

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## Prior Applications of Pipe Fracture Analysis and LBB

- Traits of Prior Applications
  - Analyses have both probabilistic and deterministic aspects
  - Defense in Depth not challenged
    - Still covered by LBLOCA and 50.46 requirements
  - Supplemental Analyses and Information
    - RI-ISI supported by quantitative and qualitative approaches – similar results
- Prior analyses not as rigorous as analyses supporting rule changes today

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## Analytical Treatment Premise

- Analysis rigor should be consistent with current effort on PTS rule reevaluation
  - Transients
  - T-H response
  - Material Properties
  - Degradation Mechanisms
  - Flaw Distributions
  - Uncertainty Analyses

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## **Probabilistic Fracture Mechanics (PFM) Considerations**

### **Main elements of PFM analysis**

#### **– Analyses**

- Initiation of subcritical crack
- Subcritical crack growth
- Leak-rate detection under normal operating loads
- Fracture under upset loads

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## **Probabilistic Fracture Mechanics (PFM) Considerations**

### **Main elements of PFM analysis**

#### **– Input and variables**

- Material property input (environmental/fatigue; toughness; aging and loading rate effect; weld repair history)
- Crack morphology by cracking mechanism
- Loads (normal and transient)
- Flaw distributions and orientations

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## Probabilistic Fracture Mechanics (PFM) Considerations

### Initiation of subcritical crack and subcritical crack growth analyses

- Handle current and as-yet-unknown mechanisms.  
Some cases previously not thought likely;
  - IGSCC in TP304 stainless steel (BWRs)
  - Corrosion fatigue of feedwater lines
  - Flow accelerated corrosion (erosion/corrosion)
  - IGSCC of Ti stabilized stainless steel (Germany)
  - PWSCC of Inconel 182/82 welds (Summer, Ringhals, and Krsko)

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## Probabilistic Fracture Mechanics (PFM) Considerations

### Leak-Rate Analyses

- Factors that affect crack-opening displacements, i.e.,
  - **Residual stresses** (depends on distribution and relative magnitude compared to normal operating loads)
  - **Pipe-system boundary conditions** (restraint of pipe rotation for pressure-induced and other axial loads)
  - **Other than circumferential through-wall cracks in straight pipe**, i.e., axial cracks in welds, cracks in elbows, etc.
  - **Crack-face pressure**, conservatively ignored in past
  - **Real cracks may not be centered on the bending plane**
- Factors that affect thermal hydraulic analyses, i.e.,
  - **Roughness and number of turns**

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## Probabilistic Fracture Mechanics (PFM) Considerations

### Fracture Analyses

- Use EPFM rather than limit load (PRAISE/SRRA)
- LBB analyses assume idealized through-wall circumferential crack in straight pipe
  - What if subcritical cracking causes long surface flaws?
  - Cracks in elbows or pipe fittings
  - SSE rate effects on material properties (DSA)
- Primary and secondary stresses combination affects on margins
- Bending plane different for normal and SSE loading?

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## Probabilistic Fracture Mechanics (PFM) Considerations

### Material property input

- Environmental/fatigue crack initiation variability
  - Impact of Section XI allowable fabrication flaws on Section III Fatigue Design Curves
- Rate of subcritical crack growth
- Strength variability
- Toughness
  - Base metal, welds, fusion lines
  - Seismic loading rates lower toughness of most carbon steels (dynamic strain aging)
  - Thermal aging of cast stainless and stainless weld metals

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## Probabilistic Fracture Mechanics (PFM) Considerations

### **Loads**

- Normal operating
  - Pressure, dead-weight, and thermal expansion
  - Combining bending and torsional loads
  - Residual stress (including repairs)
  - Fabrication
  - Thermal transients
- Upset (seismic, thermal transient, or water hammer)
  - Include probability of variable SSE levels, i.e., beyond-design-basis-earthquakes
  - Seismic anchor motion
  - Thermal transients may be worse than SSE loading in surge lines
- Design basis versus actual

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## Probabilistic Fracture Mechanics (PFM) Considerations

- **Initial flaw distributions**
  - Pre-service inspection allowable flaws (undocumented?)
  - Multiple flaws (typically ignored in PFM analysis)
  - Locations (in pipe or fitting)
  - Orientation (axial or circumferential, circumferential position relative to bending plane)

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## Other Sources of 'Large Break'

- Manway bolting failure
- Large valve bonnet bolting failure – valve body cracking?
- Indirect sources of pipe failure – moving heavy loads inside containment during power operations

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## Summary: LBLOCA Redefinition

- Service Data alone do not appear to support eliminating LBLOCA without further evaluation
  - Data or data with limited analysis may be sufficient to support other changes
- Probabilistic analyses to support eliminating LBLOCA would have to be significantly more rigorous than previous applications
- Active degradation of piping is not only consideration
  - Analyses would have to address other breaks and other causes, and weld repair history

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## **Risk-Informed Options: Technical Requirements Related to 10 CFR 50.46**

- Delete loss of offsite power (LOOP) consideration for some or all LBLOCAs
- Exclude highly unlikely combinations of LBLOCA initiators and single failures
- Replace conservatisms in Appendix K with more realistic models/assumptions
- Propagate uncertainty in break size and location
- Improve efficiency of best-estimate ECCS performance analyses and reviews
- Allow NRC-approved uncertainty increments to be used in best-estimate ECCS performance analyses
- Modify ECCS acceptance criteria

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## **Potential Near Term Risk-Informed Changes Related to 10 CFR 50.46**

- Change design basis LBLOCA-LOOP assumptions (GDCs 17, 34, 35, 38, 41 and 44)
- Change single failure assumptions (GDCs 17, 21, 34, 35, 38, 41 and 44)
- Reduce decay heat conservatism in Appendix K
- Consider enhancements based upon risk insights

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## Benefits of Near Term Risk-Informed Changes Related to 10 CFR 50.46

- **Maintain safety**
  - Improvement in emergency AC system reliability/availability (reduction in fast start and loading of diesel generators)
  - Key elements of defense-in-depth maintained and no significant decrease in safety system reliability
- **Make NRC activities and decision-making more effective, efficient and realistic**
  - More realistic assumptions for postulated DBAs
  - More realistic Appendix K models/assumptions

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## Benefits of Near Term Risk-Informed Changes Related to 10 CFR 50.46 (Continued)

- **Reduce unnecessary regulatory burden**
  - Extension of DG start and loading time
  - Relaxation of some AOTs
  - Removal of equipment from Tech. Specs. (e.g., one accumulator)
  - Additional analytic margin for plants that are Appendix K limited

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## Implementation Issues

- Identification of the LBLOCA size where the LOOP and single failure assumptions no longer need be applied
- Plant-specific analysis (due to wide range of grid capability and plant design and procedures) to determine conditional LOOP probability, in order to change LOCA-LOOP assumption
- Development of a risk-informed replacement for the single failure criterion (e.g., combined initiator frequency and system reliability threshold)

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## Implementation Issues (Continued)

- Utilize performance-based approach, where possible
- Delayed LOOP
  - Double-sequencing
  - Degraded voltage
- Impact on other modes of operation and potential accidents

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## Potential Longer Term Risk-Informed Changes to 10 CFR 50.46

- Redefine LBLOCA
  - Continue to work with industry on scope/depth of work required
- Replacement of 2200°F PCT/17% oxidation/cladding specification with more general criteria
- Propagation of pipe break size frequency distribution into best estimate analysis
- ECCS availability for shutdown
- Multiple SGTR DBA

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## Conclusions

- Staff proceeding to evaluate feasibility of risk-informed changes to 10 CFR 50.46 and LBLOCA
  - Near term
  - Longer term
- Will provide recommendations to Commission in June on the feasibility of near term potential changes

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**BWR Owners Group  
Risk-Informed Part 50  
Option 3 Program**

**Terry Rieck**

**ACRS**

**March 16, 2001**

# **BWROG Risk-Informed Part 50 Option 3 Program**

## **BWROG Technical Committee Position**

- Agree that Redefining the LBLOCA should be the highest priority
- LBLOCA Redefinition comparison to PWR approach:
  - Safety benefits similar
  - More BWR LBLOCA margin
  - BWROG may need to perform additional analyses so implementation cost may be greater or alternative pipe break size may be larger
- Option 3 Framework refinement through LBLOCA redefinition will provide for better cost/benefit analysis for other Option 3 activities
- Other potential Option 3 activities are being prioritized

# **BWROG Risk-Informed Regulation Option 3 Program**

## **LBLOCA Redefinition Activities**

- Refine safety benefits and burden reduction
- Assess approaches
- Perform cost/benefit analysis

## **Other Option 3 Activities**

- Perform assessment (safety and cost/benefit analyses) on other potential Option 3 programs