

Official Transcript of Proceedings
NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards
Regulatory Policies and Practices Subcomm.

Docket Number: (not applicable)

Location: Rockville, Maryland

Date: Tuesday, October 31, 2006

Work Order No.: NRC-1296

Pages 1-221

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

MEETING OF REGULATORY POLICIES & PRACTICES

SUBCOMMITTEE

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TUESDAY,

OCTOBER 31, 2006

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The meeting was convened in Room T-2B3 of Two White Flint North, 11545 Rockville Pike, Rockville, Maryland, at 8:30 a.m., Dr. William J. Shack, Chairman, presiding.

MEMBERS PRESENT:

- WILLIAM J. SHACK Chair
- GRAHAM B. WALLIS Vice-Chair
- OTTO L. MAYNARD Member
- SANJOY BANERJEE Member
- J. SAM ARMIJO Member
- GEORGE E. APOSTOLAKIS Member
- MICHAEL CORRADINI Member
- THOMAS S. KRESS Member
- JOHN D. SIEBER Member

1 ACRS STAFF PRESENT:

2 ERIC THORNSBURY Cognizant Staff Engineer

3

4 NRR STAFF PRESENT:

5 RICHARD DUDLEY

6 STEVEN DINSMORE

7 MIKE TSCHILTZ

8 RALPH LANDRY

9 ROB TRAGONING

10 GARY HAMMER

11

12 BWROG REPRESENTATIVES PRESENT:

13 RANDY BUNT

14 TONY BROWNING

15 FRAN BOLGER

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I-N-D-E-X

	Page
1	
2	
3	Opening Remarks and Objectives 4
4	W. Shack, ACRS
5	Draft Final Rule Language for 10 CFR 50.46(a)
6	D. Dudley, NRR 5
7	R. Landry, NRR 44
8	S. Dinsmore, NRR 72
9	G. Hammer, NRR 144
10	Comments on BWR Transition Break Size
11	R. Bunt, BWROG 173
12	T. Browning, BWROG 173
13	F. Bolger, BWROG 187
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	

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1 M-O-R-N-I-N-G S-E-S-S-I-O-N

2 8:32 a.m.

3 CHAIR SHACK: On the record. The meeting
4 will now come to order. It's the meeting of the
5 Advisory Committee on Reactor Safeguard Subcommittee
6 on Reactor Policies and Practices. I am Bill Shack,
7 Chairman of the Subcommittee. Members in attendance
8 are George Apostolakis, Sam Armijo, Sanjoy Banerjee,
9 Mike Corradini, Tom Kress, Otto Maynard, Jack Sieber
10 and Graham Wallis.

11 The purpose of this meeting is to review
12 details of the draft final risk inform revision to 10
13 CFR 50.46. The subcommittee will gather information,
14 analyze relevant issues and facts and formulate
15 proposed positions and actions as appropriate for
16 deliberation by the full Committee. Eric Thornsberry
17 is the Designated Federal Official.

18 The rules for participation in today's
19 meeting have been announced as part of the notice of
20 this meeting previously published in the *Federal*
21 *Register* on October 19, 2006. A transcript of
22 portions of the meeting is being kept and will be made
23 available as stated in the *Federal Register* notice.
24 It is requested that speakers first identify
25 themselves and speak with sufficient clarity and

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1 volume so that they can be readily heard. Mr. Randy
2 Bunt, Chair of the BWR's Owners Group, has submitted
3 written material for our consideration, has requested
4 time to make an oral presentation to the subcommittee.
5 We will hear from him following the staff's formal
6 presentation.

7 We've had some substantial discussion of
8 this issue already through the emails. So I think
9 we're just going to go right to the staff's
10 presentation and I'll proceed with the meeting and
11 call Mr. Richard Dudley from the Office of Nuclear
12 Reactor Regulation to begin his presentation.

13 MR. DUDLEY: Good morning. I am Richard
14 Dudley. I'm the Rulemaking Project Manager for the
15 50.46(a) ECCS Rule. As you said, the Committee has a
16 substantial history with hearing us. I think we've
17 met with you five or six times before. Our most
18 recent meeting with you was on March 3, 2005 on the
19 proposed rule and we received an ACRS letter on March
20 14th recommending that we go forward with publishing
21 the proposed rule.

22 We provided the proposed rule to the
23 Commission on March 29th in SECY-05-0052. The
24 Commission deliberated on the proposed rule for about
25 three months and on July 29th, they gave us a staff

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1 requirements memo. The Commission made some
2 substantial changes to the proposed rule that the
3 staff provided and to the rule as the Committee last
4 saw it on March 3rd.

5 The most significant, however, of the
6 changes that the Commission made was that they
7 directed us for the risk informed evaluation effort or
8 the program they called the RISP, the Commission
9 directed that the RISP process be applied to all
10 facility changes. Not just the ones in our proposed
11 rule had been enabled or made possible by thte
12 50.46(a) new rules. The Commission said this RISP
13 should apply to all facility changes since all
14 facility changes have the potential to affect risk at
15 a facility.

16 We made those changes and other
17 substantial --

18 VICE CHAIR WALLIS: Could I ask something?
19 I'm sorry to interrupt you, but you seem to be getting
20 into the details. Would you give us some indications
21 particularly for new members as to what the purpose of
22 the rule is and then perhaps we could see if what you
23 propose to do meets the objectives that you've set
24 out? Could you do that for us please?

25 MR. DUDLEY: Yes. This is a voluntary

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1 alternative rule. Licensees may choose to take this
2 option or not. Basically under this proposal,
3 licensees would be allowed to redefine their large
4 break LOCA with at a level we call the transition
5 break size. The proposed rule takes your LOCAs and
6 divides them into two regions separated by the
7 transition break size or the TBS and LOCAs in the
8 smaller break region up to and including the TBS are
9 design basis accidents and they're analyzed by the
10 existing process, procedures and requirements that we
11 have for design basis accidents.

12 LOCAs between the TBS and the double ended
13 guillotine break, previously the largest break that
14 would be looked at is design basis are no longer
15 called design basis accidents.

16 VICE CHAIR WALLIS: Now you're giving me
17 the rule. You're only giving me the rationale for the
18 rule. I'd like to go back a step before that. Why is
19 this the solution to some problem? What is the
20 problem you're solving with the rule?

21 MR. DUDLEY: I think it was the view of
22 the Commission and others that many of our
23 requirements for emergency core cooling systems
24 established many, many years ago by wise men had
25 through experience over time been shown to be perhaps

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1 a little too much swayed to large break accidents and
2 not quite so much focused on the more frequent small
3 break accidents. And so the purpose of risk informing
4 the ECCS requirements would be to allow licensees to
5 perhaps optimize their emergency core cooling systems
6 more on the more likely smaller breaks and be less
7 dependent, have the equipment less --

8 VICE CHAIR WALLIS: So the main motivation
9 is the low likelihood of large breaks.

10 MR. DUDLEY: That's correct, yes.

11 VICE CHAIR WALLIS: Is that the problem
12 resolving or is it something else?

13 MR. DUDLEY: It is, yes. The issue is
14 that large breaks are highly unlikely. Yet our
15 facilities have been designed so that their
16 performance and design greatly depend on being able to
17 mitigate this large break LOCA.

18 VICE CHAIR WALLIS: And this transition
19 break size is one way to address that problem.

20 MR. DUDLEY: That's correct.

21 VICE CHAIR WALLIS: And was this the only
22 way you considered or did you consider other ways you
23 might do it or what or did this just get decided as
24 being the solution without much consideration or what?

25 MR. DUDLEY: There are a number of other

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1 efforts underway. We've changed the emergency core
2 cooling analysis requirements. Ralph Landry might
3 need to help me talk about that, but we've gone to
4 best estimate analysis procedures that also are less
5 -- allow you to focus a little more on the smaller
6 breaks and not the --

7 VICE CHAIR WALLIS: The best estimate
8 introduces this idea of probability and with high
9 probability. Right? So probability is already there
10 in the best estimate approach. You have to show that
11 ECCS functions with high probability. That's in the
12 rule now.

13 MR. DUDLEY: That's the current 50.46, is
14 that correct, with the best estimate option? I
15 believe that, yes.

16 VICE CHAIR WALLIS: So the motion of
17 probability is already there.

18 MR. DUDLEY: That's my understanding.

19 VICE CHAIR WALLIS: Okay. Thank you.

20 MEMBER APOSTOLAKIS: Well, we keep saying
21 that this will allow the licensees to focus on the
22 smaller breaks. Can you elaborate on that a little
23 bit? How would that allow them to do this? From what
24 I read, they will have more flexibility for breaks
25 above the TBS. Is that the same as allowing them to

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1 focus on smaller, more likely breaks? I don't see
2 that.

3 MR. DUDLEY: Well, for example, if you
4 started your diesels, if you didn't have to -- I guess
5 the reason you have to start your diesels as fast
6 starts is in order to mitigate the very large break.

7 MEMBER APOSTOLAKIS: Right.

8 MR. DUDLEY: Smaller breaks don't require
9 diesels to start as rapidly and if you start your
10 diesels on a slower start schedule or you load your
11 electrical components on a less aggressive loading
12 rate or whatever, you put less strain on the
13 equipment. The diesels could potentially be more
14 reliable and more reliable diesels because you don't
15 start them fast could also give you risk/benefits on
16 other accidents in other areas. So that's --

17 VICE CHAIR WALLIS: Does this mean that
18 they would not start fast enough for a large break
19 then?

20 MEMBER SIEBER: Right.

21 CHAIR SHACK: Or a large break with a
22 simultaneous LOOP.

23 MR. DUDLEY: That's correct.

24 VICE CHAIR WALLIS: Yes, but that's a big
25 conservatism. You don't need to assume a simultaneous

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1 LOOP.

2 MR. DUDLEY: But yet we do for the --

3 VICE CHAIR WALLIS: But you could take
4 that out. That would help a lot. Take that out.

5 MEMBER SIEBER: But the answer to the
6 question is yes.

7 VICE CHAIR WALLIS: Would it? I mean if
8 you take out the LOOP, does that do it as far as the
9 diesels go?

10 MEMBER SIEBER: You aren't going to be
11 able to code proof for that accident in a timely way.

12 CHAIR SHACK: We'll have a chance to
13 discuss that with the BWR Owners Group.

14 VICE CHAIR WALLIS: Okay.

15 CHAIR SHACK: Because they're talking
16 about break size and --

17 VICE CHAIR WALLIS: LOOPS.

18 CHAIR SHACK: -- LOOPS and things like
19 that. But again as I read the BWR NEDO Report here,
20 one of things I would do is I would optimize my
21 immersage (phonetic) diesel loading which we talked
22 about. I would put 1HRHR LOOP in essentially
23 containment cooling mode. I would eliminate my low
24 pressure coolant injection LOOP selection thing.
25 There are a number of things that they've proposed

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1 here and that would be their --

2 MEMBER SIEBER: You would probably also
3 want to change the accumulator pressure.

4 MR. DUDLEY: That's another thing you
5 could do.

6 MEMBER SIEBER: Which would optimize for
7 smaller breaks. I would expect folks to do that. On
8 the other hand, you aren't going to be as good if you
9 ever did get a double ended break as you would the
10 optimized way the plans were optimized now.

11 MEMBER APOSTOLAKIS: But all these changes
12 would have to be approved separately on a risk
13 informed basis.

14 MEMBER SIEBER: Yes.

15 MEMBER BANERJEE: Can I ask a couple of
16 questions though just for clarification? You said the
17 Commission wanted you to do this. When did they ask
18 for this?

19 MR. DUDLEY: The history of risk informing
20 by regulations goes back many years and there's just
21 sort of an evolution.

22 MEMBER BANERJEE: No, but this is -- Was
23 this a specific instruction that you need to do this
24 and when was that instruction given and does this
25 Commission feel the same way?

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1 MR. DUDLEY: I can't tell you how this
2 Commission feels because --

3 MEMBER BANERJEE: So you haven't gone back
4 to them?

5 MR. DUDLEY: None of these issues have
6 gone to the Commission.

7 MEMBER BANERJEE: Okay.

8 MR. DUDLEY: The last information we got
9 from the Commission was July 29, 2005.

10 MEMBER BANERJEE: This was the
11 instruction?

12 MR. DUDLEY: This was the instruction of
13 that Commission. This Commission has not spoken nor
14 been involved with these efforts.

15 MEMBER BANERJEE: Okay, and the second
16 question I had was you said that some new information
17 had come about since the wise men had set up this
18 rule. Can you tell me what this new information is?

19 MR. DUDLEY: I think it's the experience
20 that we developed over many, many reactor years of
21 operation.

22 MEMBER BANERJEE: What experience?

23 MR. DUDLEY: We've seen that small break
24 LOCAs do occur. Large break LOCAs are a much, much
25 less frequent.

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1 MEMBER APOSTOLAKIS: They never occur.

2 CHAIR SHACK: They never have occurred.

3 MR. DUDLEY: They have never occurred. It
4 depends on what you call large.

5 MEMBER APOSTOLAKIS: Much less frequent.

6 MR. DUDLEY: But certainly the double
7 ended guillotine break has never occurred.

8 MEMBER APOSTOLAKIS: Correct.

9 MR. DUDLEY: And so there is that kind of
10 experience.

11 MEMBER BANERJEE: What about things like
12 Davis-Besse? Did you take those things into account
13 in experience?

14 MR. DUDLEY: Davis-Besse I believe would
15 have been what? An intermediate break?

16 MEMBER APOSTOLAKIS: Medium, yeah.

17 MR. DUDLEY: An intermediate break.

18 MEMBER BANERJEE: It could have been
19 larger and not an double ended.

20 MR. DUDLEY: It wouldn't have the double
21 ended guillotine break. I can't really tell you how
22 fast the diesels would have had to start to mitigate
23 that but it wouldn't have been the double ended break.

24 MEMBER KRESS: Sanjoy, on your first
25 question, the Commission back then instructed the

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1 staff to start risk informing the regulations and they
2 went -- The industry came in and said if you're going
3 to do this we have some we'd prefer you start with and
4 they named two or three and one of them was this
5 50.46. That's why it seems to be one that they were
6 working on that.

7 VICE CHAIR WALLIS: The history is that
8 industry kept promising us that they would come up
9 with arguments for changing 50.46 and they never
10 seemed to do so and somehow it turned around and it
11 came from the Commission instead of from industry.
12 Isn't that what happened or am I misrepresenting
13 history? I remember industry coming here and saying
14 we're going to give you the arguments why you should
15 change 50.46 and it never seemed to happen.

16 MEMBER CORRADINI: I had a clarification.
17 Can I just have a couple more clarification questions?
18 So you said a couple things that I guess, and I'm new
19 too so even newer, much newer than Sanjoy in this, you
20 said the Commission changed some things between what
21 the ACRS saw and issued a letter on in March to what
22 occurred on July 29th. The one thing I reread in the
23 letter of March, it asked what were the risks/benefits
24 of this. Are you going to later address that
25 specifically or we've just kind of run through them in

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1 a very qualitative fashion and those are the
2 risks/benefits, optimizing for small, etc., etc. or
3 are there others that there are?

4 I'm curious because I'm looking to turn
5 this in a positive way. If this were to come into
6 play, what are the benefits and I heard a few. Are
7 there others?

8 And then also if you wouldn't mind, you
9 mentioned what were the changes in the rule between
10 the time what was seen in March to what now we see
11 here. That's one thing I guess I need to understand
12 a bit.

13 MEMBER APOSTOLAKIS: Right. He will
14 address this I hope.

15 MEMBER CORRADINI: If we ever let them get
16 there.

17 MR. DUDLEY: I was going to --

18 MEMBER APOSTOLAKIS: Experienced speakers
19 do this even when they are not allowed --

20 VICE CHAIR WALLIS: I think there is
21 somewhere in the record the rule and then the changes
22 marked out in red ink. You can get a hold of that.

23 MR. DINSMORE: To answer your first
24 question, we're not entirely sure what all can be done
25 with this rule which is why we've been somewhat

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1 cautious about setting it up because we were told that
2 we should permit the changes that flow naturally from
3 this rule to be implemented and a number of licensees
4 and owners' groups have come in and they've been
5 giving us suggestions of what they want to do and this
6 is what they think they can do and Dr. Shack had
7 probably the best list on the table when he went
8 through that. So there are many things they could do
9 and we simply don't know. So we've been trying to
10 make sure that the rule itself will be able to
11 accommodate the whole spectrum.

12 MEMBER CORRADINI: Okay, and then one
13 other --

14 MR. DINSMORE: I'm sorry. Steven Dinsmore
15 from NRR.

16 MEMBER CORRADINI: So just one more
17 clarification. So in what was seen in the ACRS, what
18 was seen in the rule in March still had the transition
19 that anything beyond the TBS was not a DBA. That was
20 in the rule as of the March time frame.

21 MR. DUDLEY: Yes, and that was left in by
22 the Commission and that's still in there.

23 MEMBER CORRADINI: Okay. Thank you.

24 MR. DUDLEY: Licensees in the proposed
25 rule and even in the final rule, they still have to

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1 mitigate accidents between the TBS and the double
2 ended break, but the mitigation requirements are much
3 less severe associated with the lower probability of
4 breaks in that region.

5 MEMBER CORRADINI: Okay, but that
6 clarified my question. Thank you.

7 MEMBER SIEBER: If that's the case, it's
8 still a DBA then.

9 MR. DUDLEY: It's hard to say. It's kind
10 of like severe accident in that it's not a design
11 basis accident. It's kind of like station blackout.
12 We have regulations.

13 MEMBER SIEBER: I get disturbed when you
14 say that. In my mind, the design basis is the rupture
15 of anything other than the reactor vessel.

16 MR. DUDLEY: Equipment to mitigate the
17 double ended break will still be --

18 MEMBER SIEBER: It could be size.

19 MR. DUDLEY: -- considered in the design
20 basis of the facility. Yet if you look at the
21 specifics and the wording in the history it's not
22 considered a design basis access. Yet it will be ---
23 It's just kind of a silly distinction.

24 MEMBER SIEBER: I would be happier if we
25 could clean that up a little bit because to me it's

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1 still a design basis accident. Your mitigation
2 requirements are less stringent than those at the TBS
3 or below.

4 MR. DUDLEY: But design basis accidents
5 usually have more severe requirements associated with
6 them.

7 MEMBER SIEBER: Right.

8 MR. DUDLEY: So that's why it's awkward to
9 call it a design basis accident. Yet you're
10 absolutely correct. It is still within the design
11 basis of the plant.

12 MEMBER SIEBER: You aren't going to change
13 the QA category, but you may say I can relax the
14 surveillance requirement with respect to pressure and
15 flow which I think is a degradation that's probably
16 not in our best interest.

17 MEMBER MAYNARD: Yes, but they're going to
18 have to come back and ask licensee for each one of
19 these changes individually and justify the changes
20 that they make. Mr. Chairman, I'd really suggest that
21 we give them a chance to move on.

22 CHAIR SHACK: Since we have new members,
23 I wanted to let them explore things.

24 VICE CHAIR WALLIS: I think we need to go
25 over some of this.

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1 MEMBER APOSTOLAKIS: But Mr. Dudley said
2 something that I think needs clarification coming back
3 to your presentation. The third bullet, Commission
4 approval, you said that there was a change regarding
5 the risk informed part or the Commission changed
6 something. Can you explain that a little bit?

7 MR. DUDLEY: The proposed rule as the
8 staff prepared it and as the committee saw it had
9 licensees required to for every facility change that
10 historically they would not have been able to make
11 under the existing 50.46, those changes which would
12 now be possible under the alternative requirements
13 were called 50.46(a) enabled changes.

14 MEMBER APOSTOLAKIS: Right.

15 MR. DUDLEY: Licensees who made 50.46(a)
16 enabled changes had to run those changes through this
17 risk evaluation process to make sure the delta risk
18 was okay, make sure the defense-in-depth was remained,
19 safety margins were preserved and that monitoring was.

20 MEMBER APOSTOLAKIS: Right.

21 MR. DUDLEY: So that was the process and
22 we only applied it in our proposed rule to 50.46(a)
23 enabled changes. The Commission applied this risk
24 informed evaluation to all facility changes.

25 MEMBER APOSTOLAKIS: What does that mean

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1 "all"?

2 MR. DUDLEY: All changes, those under 50
3 -- Well.

4 MR. DINSMORE: The Commission came back
5 and said it's going to very difficult or impossible to
6 identify changes which were enabled by this rule
7 compared to changes that were enabled by any of the
8 other rules. So you shouldn't treat them differently
9 and essentially you should apply the risk informed
10 processes to all changes in the plant.

11 There was back --

12 MEMBER APOSTOLAKIS: How is that different
13 from what we had before with 1.174?

14 MEMBER KRESS: 1.174 was not mandatory
15 before.

16 MEMBER APOSTOLAKIS: Well, this is not
17 mandatory either.

18 MEMBER KRESS: It's mandatory --

19 MR. DUDLEY: Once you accept that option,
20 it's mandatory.

21 MEMBER KRESS: Yes, that's the difference.

22 MEMBER APOSTOLAKIS: Wait a minute. We
23 said the same thing when NFBA-805 was discussed that
24 if you elect to adopt an NFBA-805 then everything you
25 change in the future would be risk informed. So it

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1 seems to me that that was something that was already
2 in place. So that's why I'm having difficulty
3 understanding what the Commission changed.

4 MR. DINSMORE: Yes. Okay

5 MEMBER APOSTOLAKIS: I mean they are not
6 allowed to request a change using deterministic
7 methods anymore.

8 MR. DINSMORE: No, they would have to do
9 a risk analysis on every change that they proposed.
10 One of the discussions which came up, which floated up
11 and down, because there was some confusion on our part
12 as well. It was if they were changing the curb
13 heights in the parking lot, they should do a risk
14 analysis on it. Now it's a simple risk analysis. It
15 has no effect on risk, but the change the Commission
16 made was you're going to apply this to every change in
17 the plant which is a lot different than I have all my
18 change control processes out there. I have 50.59. I
19 have all these different -- And I follow those
20 processes unless I want to use a risk informed
21 application to do something that I might not otherwise
22 been able to do. This was now you have to do it on
23 everything.

24 CHAIR SHACK: George, let's not focus on
25 this too much because what we need to get to

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1 eventually is the change control process they are now
2 proposing for 50.46 rather than --

3 MEMBER APOSTOLAKIS: Is this clear to
4 everyone?

5 CHAIR SHACK: -- this historical one.

6 MEMBER APOSTOLAKIS: It's not to me.

7 CHAIR SHACK: It comes back to this thing
8 where they used to track your allowable delta CDF
9 under 1.174 sort by each rule change. It goes back in
10 history. I don't think we want to go back there.

11 VICE CHAIR WALLIS: I would like to know
12 more about how you define the design basis accident
13 and does the ECCS rule apply only to design basis
14 accidents?

15 MR. RUBEN: That's correct. This is Mark
16 Ruben from the staff, the PRA group. Yes, the ECCS
17 Appendix K requirements apply only to design basis
18 activities.

19 VICE CHAIR WALLIS: Can you apply
20 something to beyond design basis accident?

21 MR. RUBEN: There is a --

22 VICE CHAIR WALLIS: A changing of a rule
23 that applies to design basis accidents.

24 MR. RUBEN: There is a requirement in the
25 rule and it was in fact mandated by the Commission

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1 that mitigation capability be available possible for
2 breaks up to the original design basis double and its
3 size. The intent of that was to prevent plants for
4 example from taking out LPCI pumps.

5 But at the same time, I would like to
6 supplement the question asked earlier on design basis
7 versus not design basis. All the requirements for a
8 design basis accident in safety related equipment
9 needed to respond there is an extensive list of
10 requirements for such equipment. Their quality, how
11 they respond, the assumptions that go into the
12 analysis, that only applies to design basis accidents.
13 Single failure is the one of the major assumptions.
14 Loss of outside power is one of the major assumptions
15 and the analysis acceptance criteria meets generally
16 90 to 95 percent.

17 VICE CHAIR WALLIS: I'm going to ask a
18 much simpler question.

19 MR. RUBEN: Okay.

20 VICE CHAIR WALLIS: The 50.46, does that
21 apply to design basis accidents?

22 MR. RUBEN: Yes.

23 VICE CHAIR WALLIS: Well, does it only
24 apply to design basis accidents?

25 MR. RUBEN: Yes.

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1 VICE CHAIR WALLIS: So what are you doing
2 saying some of them are now not design basis access
3 and yet putting it in this CC and the rule that
4 applies to the design basis? I don't understand that.

5 MR. RUBEN: The rule presents alternate
6 criteria for the non-design basis portion of the LOCA
7 at larger sizes just like the staff has some set of
8 requirements for station blackout and that was --
9 Excuse me?

10 VICE CHAIR WALLIS: It shouldn't be a rule
11 that applies to design basis. That should be
12 somewhere but I don't see how you can put it in a rule
13 that is itself only applying to design basis accident.

14 MR. RUBEN: We think it's essential that
15 it be in this rule and the rule is a expansion of the
16 original 50.46 that redefines the size where the
17 design basis accident terminates now at a smaller
18 size. But at the same time, it points out requires
19 the accomplishment of other criteria much looser for
20 the beyond design basis size just like non-design
21 basis accidents as SPO and that was set requirements.

22 CHAIR SHACK: Okay. One more and then
23 it's time to move on.

24 MEMBER CORRADINI: So just to walk this
25 through. I want to say it once so I have it. So

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1 Jack, Sanjoy, and what we were asking relative to
2 this, if beyond the TBS it's not a design basis
3 accident, if they choose this alternative, they are
4 then in a mode that everything they do within the
5 plant, not just CCS related, but everything they do
6 within the plant must be risk informed. That is if
7 they choose to do something on a procedure that might
8 be to do with the simulator it must be risk informed,
9 anything within the plant structure. Do I have this
10 correct?

11 MR. DINSMORE: Yes.

12 MEMBER CORRADINI: Okay.

13 MR. DINSMORE: With the understanding that
14 much of the risk, much of these analysis on peripheral
15 stuff, the risk informed is going to be more or less
16 a check or a no.

17 MR. RUBEN: This is Mark Ruben again.
18 Let me emphasize that because that is a key point
19 here. There are a number of issues, topics, parts of
20 the plant that aren't in the PRA model at all because
21 they have no impact on risk. We expect the --
22 Certainly in many instances, if not the majority of
23 instances, changes being contemplated by the licensee
24 will have essentially zero risk impact and the
25 screening assessment, a quick check assessment, as Mr.

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1 Dinsmore said a check list, will be sufficient to
2 provide a qualitative basis for that.

3 CHAIR SHACK: Okay. Now that we've opened
4 this one, let me -- One of the big changes between the
5 last version of the rule and this one is in the last
6 rule you actually had a whole set of criteria for when
7 a change was sort of negligibly small and could be
8 sort of done by the licensee once he adopted 50.46
9 without a review by the staff. Now all that seems to
10 have disappeared in the current version.

11 Is the new screening basically 50.59 now
12 and that is the process that you're going to use to
13 distinguish minor changes from significant changes?

14 MR. DINSMORE: The new screening process
15 on what must be evaluated prior -- Before I get to the
16 slides, the short answer is the new screening process
17 is reverted back to the original current processes to
18 determine what must be submitted and what must not be
19 submitted. So nothing that -- Then there's a caveat,
20 but it's easier if I get to this. It's been reduced
21 substantially and we've taken the greatest --

22 CHAIR SHACK: It's disappeared as far as
23 I can tell.

24 MR. TSCHILTZ: This is Mike Tschiltz. I'm
25 the Deputy Director of the Division of Risk

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1 Assessment. I would offer that we have a flow chart
2 and a process in the presentation that would
3 facilitate a better understanding of what we're
4 proposing and if we could focus on that when we get to
5 that slide.

6 MR. DUDLEY: If I could through with my
7 introduction.

8 CHAIR SHACK: Why don't you get through?

9 MR. DUDLEY: We can actually get to the
10 real discussions.

11 (Off the record comments.)

12 MR. DUDLEY: And the fourth bullet of the
13 day, we published the proposed rule on November 7th
14 and we had an extended comment period and we also had
15 industry requests for an additional 30 days. The
16 comment period didn't end until March 8, 2006.

17 We had a number of public meetings on the
18 proposed rule. We had one in February when it was
19 still before the comment period expired so that we
20 could debut the rules so that we could make sure that
21 the public understood with the rules so that the
22 comments would not be misdirected or misinformed.
23 Then we had meetings in June and August of 2006 to
24 discuss proposed resolution of some public comments
25 with the public. We got some good feedback from the

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1 meetings and that and the analysis of other comments
2 that we had we developed our draft final rule language
3 and we posted it on the NRC Rule Forum website on
4 October 3rd.

5 The draft *Federal Register* notice and the
6 discussion of comments and their resolution was
7 prepared consistent with the language posted on
8 October 3rd and we provided the committee with the
9 draft *Federal Register* notice on October 16th and
10 that's the document, the main document, you had for
11 review. Our current schedule is to provide a final
12 rule to the Commission for their review by the end of
13 February 2007. We will meet later with the ACRS in
14 the spring of 2007 to discuss the implementing of reg
15 guide with you.

16 We're here today to request an ACRS letter
17 on the final rule. But an issue has arisen since
18 we've provided you with the *Federal Register* notice on
19 the 16th and what has occurred is there is potential
20 impact of some pipe crack indications that were seen
21 at the Wolf Creek plant and because that's early
22 preliminary information the staff has taken the
23 cautious position that we want to review that
24 information and review our position on the seismic
25 analysis that it supports the transition break size

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1 for PWRs to make sure it is unaffected by information
2 that came out of Wolf Creek.

3 MEMBER SIEBER: Now all those indications
4 are below the TBS, surge line.

5 MR. DUDLEY: I think some were equal to
6 it. That's correct.

7 MEMBER SIEBER: Yes, there are three on
8 the surge line. There is one on each of the two
9 pressurizer nozzles, PRVs and safety valves. So
10 whatever you do in rule space applies to those
11 indications. Right?

12 MR. DUDLEY: Yes. But nevertheless what
13 we're here to discuss with you today would be all the
14 other technical issues.

15 VICE CHAIR WALLIS: Could I ask you a
16 question about that? I looked at your slides and
17 almost all of them seem to be dedicated to process.
18 What are the technical issues with this rule? All the
19 slides are devoted and a lot of our discussion gets
20 involved with process. That's not really what the
21 ACRS does best. It's these technical issues. So what
22 are these technical issues you want us to review?

23 MR. DUDLEY: The way we do risk analysis,
24 the way we do the risk informed evaluations. There
25 are a number of technical issues associated with PRA

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1 and other things that we would like feedback on.

2 MEMBER ARMIJO: Isn't that on your next
3 chart, the agenda where we get into the technical
4 stuff, the discussions on thermal hydraulics, risk
5 analysis, TBS sizes, etc.?

6 MR. DUDLEY: That's correct, but you know
7 Dr. Wallis is right. We are primarily talking about
8 process issues.

9 VICE CHAIR WALLIS: It looks as if someone
10 has decided that technical issues have been resolved
11 and now we're doing process.

12 MR. DUDLEY: Maybe my slide is a little
13 inappropriate. All the other technical or process
14 program issues --

15 MEMBER APOSTOLAKIS: Is there a place
16 where I could go and find out what kinds of changes
17 would the licensees request for breaks higher than the
18 TBS? That may cause concern from a technical basis or
19 from a technical point of view. I have been unable to
20 find that and I hear, you know, random thoughts like
21 they may request power uprates and that will have the
22 same fact that we don't like that. Is there a place
23 where you guys have thought about it and said if this
24 rule becomes the law, they may come back and request
25 A, B, C, D, and this is how we're going to handle this

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1 because right now, it's a little bit of a mystery to
2 me what kinds of changes the licensees may request if
3 this becomes a rule? I'm sure you have thought about
4 it in your deliberations, internal deliberations, but
5 it's not clear to me in reading the document what
6 could happen.

7 MR. RUBEN: This is Mark Ruben again. I
8 can provide a couple insights. They may not be fully
9 comprehensive. But the acceptance criteria and the
10 guidance that was developed for the rule was done so
11 with the concept that what was defined as an
12 acceptable change would apply to any potential changes
13 the licensee would want to make and there is criteria
14 on what they have to review, what we have to review
15 and the acceptance criteria or guidelines because it
16 will be in reg guide that they have to meet. So any
17 changes they make to the plant will have some risk
18 impacts. The rule requires meeting some risk
19 criteria. There are thermal hydraulic requirements,
20 meaning some criteria that Mr. Landry can speak to.
21 So pretty much independent of what they do, we expect
22 the rule will provide enough guidance on how to assess
23 its acceptability.

24 Now if something comes in that we think
25 challenges the ability of the rule to appropriately

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1 control it, then we will certainly move forward and
2 try to identify what the issue is and maybe what kind
3 of addition thoughts should be brought into mind. But
4 at this point, we don't know of any.

5 VICE CHAIR WALLIS: I think, I'm with
6 George, before you do anything especially something
7 significant like this, you have to evaluate the
8 consequences. That's the basis of mortality. This is
9 what you tell your teenagers. Before you do anything,
10 you think about the consequences.

11 Now I've made this speech before and the
12 staff has done this before, proposed things without
13 any evaluation whatsoever of what would happen if they
14 did it and I find that a little disconcerting.

15 MEMBER APOSTOLAKIS: I guess I want to see
16 a couple of specific examples. Mark's point is that
17 we will face that if they ever come and request
18 specific changes.

19 MR. DINSMORE: They have -- The BWR Owners
20 Group provided us a couple years ago with a long list
21 of stuff that they thought they were going to do. Dr.
22 Shack had a short list. I guess it wasn't BWR Owners
23 Group. So they are these different lists drifting
24 around. We have read all the lists, but we keep
25 coming back to the point that if it's not on the list,

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1 that doesn't mean they can't do it.

2 MR. DUDLEY: And if it is on the list it
3 may not be acceptable at certain plants. It's a plant
4 specific evaluation also.

5 MR. DINSMORE: But if you want the list,
6 we can dig up these lists and provide you with the
7 different lists. They are kind of --

8 MEMBER APOSTOLAKIS: Do we have -- I
9 remember seeing one some time ago.

10 MEMBER BANERJEE: But without this sort of
11 analysis, how can you evaluate what the impact of the
12 change would be? What are the increased risks
13 associated with it?

14 MR. RUBEN: This is Mark Ruben. Let me
15 try to answer that and then Mr. Dinsmore should jump
16 in. The answer is you need an assessment methodology
17 as such that is laid in 50.46(a) and it doesn't just
18 include risk PRA type calculations. It also includes
19 some thermal hydraulic considerations for the TH
20 analysis to demonstrate acceptability to meet criteria
21 both below and above transition break size.

22 We wanted something that would be flexible
23 enough to deal with a wide gambit of changes. We
24 don't know exactly what the licensees will all want to
25 do, but there is one thing I can assure you of. The

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1 day that this rule is put into place, there is no
2 change in risk in the operating plant. It's purely a
3 function of what each plant decides to do and the most
4 -- one of the things, one of the changes is most
5 likely and could have some risk impact is very large
6 power uprates because their ECCS requirements only
7 have to meet the Appendix K requirements below the
8 transition break size.

9 A number of PWR plants are running very
10 near to peak clad temperature limit 2200 within a
11 couple of degrees, a few degrees, using often
12 conservative methods acknowledged and same for the
13 oxidation limits in Appendix K. The challenge to
14 those limits are significantly a function of break
15 size and by changing the break size you'll get a lot
16 more margin in your calculated core response to
17 reactor response as compared to the current regulatory
18 limits and criteria.

19 So one of the most obvious actions would
20 be increased power because now you'll drive the peak
21 clad temperature back up near the limit of 2200
22 degrees but for a smaller break because you have a
23 higher power density, more decay heat, and you've put
24 that into the calculation and for boiler transition
25 break size you meet the current Appendix K

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1 requirements. For above, you meet a looser mitigation
2 requirement that focuses on coolable geometry.

3 VICE CHAIR WALLIS: That's very useful.
4 Before I can get enthusiastic about this at all, I
5 want to see that it would achieve something desirable.
6 So I have to decide that power uprates are desirable
7 in order to get enthusiastic about this rule. Is that
8 true?

9 MR. RUBEN: It may be desirable to the
10 utility and some members of the public critique power.
11 We didn't evaluate it against desirability per se. We
12 used the same framework approach as in Reg Guide 174
13 and as supplemented by the Commission SRM Guidance,
14 namely that small increases in risk are acceptable
15 following the guidelines in 174 that the committee has
16 seen many times and has endorsed.

17 As far as what you might call desirable
18 changes taken in the spirit that they increase safety
19 and reduce risk, we know of a couple that could do
20 that. I'll give you a couple examples, but it depends
21 on what each licensee wishes to do and wants to
22 submit. But just for sake of an example, there's a
23 change that the BWR Owners Group indicated on the
24 docket for another topical report rulemaking activity
25 related to LOCA LOOP but there's a close correlation

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1 between that effort and this work and one of the
2 changes they had indicated was mentioned by one of the
3 committee members three or four minutes ago which was
4 the alignment of one of the LPCI to pressure support
5 cooling rather than injection and having just one LPCI
6 pump lined up for injection. That will indeed reduce
7 risk.

8 Another example is the slower start of the
9 diesels that's required to successfully meet Appendix
10 K requirements for a smaller break may not be ten
11 seconds to start and load, come up to speed and load.
12 Everyone knows such requirements and the associated
13 testing does some harm to the diesels rather than
14 promote increased diesel reliability. We've been
15 aware of that for a long time, have made some
16 adjustments requirements that I'm sure the committee
17 is aware of, but at the same time, the slow start, 30
18 or 40 seconds may be all you need for the new design
19 basis break size and that gives you an opportunity to
20 preLOOP, do a slow start, let the diesel warm a little
21 bit before you lock in the breakers. And we don't
22 have hard data but I think everyone concludes that
23 it's most likely going to produce increased diesel
24 reliability.

25 MEMBER SIEBER: From a PRA standpoint

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1 though, none of those factors go into the PRA and if
2 you use CDF and LERF as the surrogates and the PRA has
3 a go/no-go success criteria, then there's no change in
4 risk.

5 MR. RUBEN: Your comment on the
6 reliability of the diesels is correct because we don't
7 have an appropriately sophisticated model to reflect
8 the benefits of the changes that may come from this
9 rule, but that doesn't mean they aren't real and don't
10 exist. But for some of the actual line-up changes and
11 the hardware changes that have been looked at by the
12 BWR Owners Group, they are able to modeled in the PRAs
13 such as the changes in the LPCI alignment and get CDF.

14 MEMBER SIEBER: It would take --

15 CHAIR SHACK: But you get a CDF
16 improvement of 1×10^{-9} .

17 MR. RUBEN: Is that what it is, Steve?

18 CHAIR SHACK: That's what the report says.

19 VICE CHAIR WALLIS: If it is, it's a plus.

20 CHAIR SHACK: The RHR LOOP is 4×10^{-8} .
21 The optimized EDG loading is 1.2×10^{-8} .

22 VICE CHAIR WALLIS: So a look at
23 improvements in risk which are so minuscule that
24 normally you would forget them.

25 CHAIR SHACK: The increase in reliability

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1 again if you assume a ten percent increase without
2 really knowing how to quantify it but if you assume
3 that gets you a little bit more. But the change --The
4 people shouldn't get carried away here. The computed
5 changes at any rate are small. Now I'm sure we'll get
6 more discussion in a qualitative sense from the BWR
7 Owners Group that will make a stronger case than that,
8 but the computed numbers at least in this report seem
9 to be pretty small.

10 PARTICIPANT: Yes.

11 MEMBER APOSTOLAKIS: And we will get the
12 more detailed discussion, I guess, on this statements
13 in the draft rule that one can have qualitative
14 estimates of changes to CDR and LERF at some point.
15 Right? This is a checklist that you mentioned, Steve.
16 Qualitative estimated of changes to LDF and LERF, I'm
17 always intrigued by that. So we'll have to discuss
18 that.

19 MR. DINSMORE: Okay.

20 MEMBER APOSTOLAKIS: Not now. At some
21 point.

22 CHAIR SHACK: We should just -- Whenever
23 we look at power uprates, we always get computed in
24 delta CDF that are very small.

25 MEMBER APOSTOLAKIS: -- qualitative.

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1 MEMBER BANERJEE: Now I want to ask Dr.
2 Ruben a question. You said that as a response to this
3 change in the rule we may get requests for larger
4 power uprates because clad temperature and oxidation
5 or whatever is limiting. Can't these things be
6 achieved under the best estimate for less uncertainly
7 methodology that is available today?

8 MR. RUBEN: I am not the right person to
9 give the full answer. I'll give a little snippet of
10 it and then Dr. Landry will I'm sure will answer it
11 more properly than I do. It's my perception that you
12 can probably do more with this rule than just best
13 estimate a LOCA analysis will give you. Some plants
14 have already implemented best estimate LOCA. It's a
15 small number but some have. So maybe they recovered
16 an ability to have some higher peaking rates, maybe
17 push the power a little bit more. But I think Dr.
18 Landry should answer.

19 VICE CHAIR WALLIS: Let's see here --

20 MEMBER BANERJEE: You can defer that until
21 he makes --

22 VICE CHAIR WALLIS: You can defer that,
23 but these methods used so far have not considered the
24 low probability of large breaks.

25 MR. RUBEN: Which method, Graham?

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1 VICE CHAIR WALLIS: The best estimate
2 method so far has not considered the low probability
3 of large breaks.

4 MR. RUBEN: All the current acceptance
5 criteria for design basis accidents assume that the
6 event occurs in the category that it falls into during
7 the staff review. This is a limiting fault event and
8 as such it has to meet the full regulatory
9 requirements. The LPCI (phonetic), right, is in that
10 assessment.

11 VICE CHAIR WALLIS: Maybe we should
12 examine Mr. Landry on these points later on.

13 CHAIR SHACK: Yes, let's just move ahead
14 here until we get there.

15 MR. DUDLEY: Just shortly I'm going to get
16 to the agenda.

17 VICE CHAIR WALLIS: I think you can skip
18 over lots of the history of stuff and just get on with
19 the technical issues.

20 MR. DUDLEY: I just want to make it clear
21 that we would like feedback and recommendations from
22 the ACRS on all issues other than the transition break
23 size for PWRs due to some relooking at things we're
24 going to do.

25 MEMBER APOSTOLAKIS: If we write a letter

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1 this time, when will we know your response to the
2 first bullet?

3 MR. DUDLEY: We hope to get back to you in
4 December. That would be our hope that we come back to
5 you for hopefully a short meeting and explain to you
6 what we've looked at between now and then and explain
7 to you any changes necessary, if any at all, in the
8 rule that you have before you.

9 VICE CHAIR WALLIS: This is showing me
10 something. You were going to go ahead with something
11 and then here's an event and you say, gee whiz, maybe
12 we were wrong. We're going to change it. That's
13 telling me something even if I don't know what it was.

14 MR. DUDLEY: I just think it means that
15 we're being prudent. All right.

16 VICE CHAIR WALLIS: But it's telling me
17 something about how much you knew before perhaps.

18 MEMBER MAYNARD: I think what they're
19 trying to do is to see if this falls within what they
20 knew before and already have factored in.

21 VICE CHAIR WALLIS: That would be good.
22 That's a good point.

23 MEMBER MAYNARD: I think I know exactly
24 what was found there and I think that when it's all
25 over it's going to turn out to be that it was all

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1 encompassed by the original assumptions in this. But
2 they have to take a look at that and come to that
3 conclusion.

4 MR. DUDLEY: And so we hope to meet again
5 with you in December to close the loop on this one
6 issue.

7 CHAIR SHACK: Okay.

8 MR. DUDLEY: All right. Now with the
9 agenda, Dr. Landry will talk about the thermal
10 hydraulic analysis and the comments necessary that we
11 got on that. Steve Dinsmore will speak to you at some
12 length on the comments related to risk analysis and
13 operational requirements because those were by far the
14 largest group of comments that we received on the
15 proposed rule. I'll speak briefly on the
16 applicability of this rule to future reactors and Gary
17 Hammer will talk to you about how we selected the
18 transition break size for BWRs and how we
19 dispositioned the comments that we received on the BWR
20 TBS.

21 MEMBER APOSTOLAKIS: So the PWR Owners
22 Group is not unhappy.

23 MR. DUDLEY: That's our understanding.

24 Just to summarize the comments in general,
25 most of the comments came from industry

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1 representatives. We had six licensees, two reactor
2 vendors, four industry groups, NEI, the BWR Owners
3 Group, Westinghouse Owners Group and STARS, a
4 strategic alliance of a number of facilities and one
5 NRC employee also made a comment. We also looked
6 during this period at the public comments on the
7 expert elicitation. The expert elicitation developed
8 the curbs that we used to start our development of the
9 transition break size. So we also made sure that none
10 of the public comments on the elicitation were going
11 to cause the curbs to change.

12 Dr. Landry will talk to you about thermal
13 hydraulics now.

14 DR. LANDRY: I'll stand up.

15 (Off the record comments.)

16 DR. LANDRY: Okay. I only have two slides
17 and based on the discussion so far, that should be
18 good for about an hour and a half. The thermal
19 hydraulic requirements, today 50.46 says that you can
20 analyze a LOCA using either a realistic methodology
21 with uncertainty determination or you can use the
22 prescriptive Appendix K.

23 VICE CHAIR WALLIS: Let me ask you about
24 this. These requirements have to be met with a high
25 level of probability. That's in the rule.

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1 DR. LANDRY: Okay.

2 VICE CHAIR WALLIS: Now you're implying
3 this probability to a smaller range of break sizes.
4 So now shouldn't the level of probability now increase
5 because you're neglecting the other ones which
6 previously had less probability?

7 MEMBER CORRADINI: More uncertain.

8 VICE CHAIR WALLIS: Uncertainty is taken
9 care by probabilistic methods.

10 DR. LANDRY: No. Today the rule says that
11 you have to analyze the range of rates all the way up
12 to the double ended guillotine rupture to determine
13 that you have encompassed the worst size.

14 VICE CHAIR WALLIS: It doesn't say
15 anything about worst. It just says you have to
16 analyze the number of breaks.

17 DR. LANDRY: And have determined the
18 highest peak cladding temperature.

19 VICE CHAIR WALLIS: It doesn't say that
20 either in the rule.

21 DR. LANDRY: I don't have the rule.

22 VICE CHAIR WALLIS: Maybe I misread the
23 rule, but I couldn't find that in the rule.

24 DR. LANDRY: This is in the first
25 paragraph of the rule and it says that you can use

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1 uncertainty analysis methodology but you must
2 determine the worst event.

3 VICE CHAIR WALLIS: We'll look at the rule
4 and see.

5 MEMBER APOSTOLAKIS: Or you can show for
6 all of them which is the same thing. You can show for
7 a spectrum of breaks that you are below the criteria
8 which is the same thing as the maximum.

9 (Off the record discussion.)

10 VICE CHAIR WALLIS: We need the rule. We
11 don't have any staff here. We need the rule. It
12 simply says to make sure the most severe causative
13 loss of coolant accidents are calculated.

14 DR. LANDRY: Right.

15 VICE CHAIR WALLIS: It doesn't say they
16 have to meet the criteria. It just says they have to
17 be calculated.

18 DR. LANDRY: It does say in that paragraph
19 that they must meet the acceptance criteria of
20 paragraph B.

21 CHAIR SHACK: "The maximum fuel cladding
22 temperature shall not exceed..."

23 VICE CHAIR WALLIS: But that's after
24 you've done the uncertainty analysis.

25 DR. LANDRY: That's after you've done --

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1 VICE CHAIR WALLIS: We'll read it with a
2 fine -- We will read it very carefully later on.

3 DR. LANDRY: You can do an uncertainty
4 analysis approach, a realistic approach, and analyze
5 a spectrum of breaks to determine if you have
6 calculated the worst event.

7 (Off the record discussion.)

8 DR. LANDRY: Or you can use the
9 prescriptive Appendix K approach.

10 VICE CHAIR WALLIS: I think it's been
11 interpreted that way but we're going to look carefully
12 what the rule says. Okay.

13 DR. LANDRY: Okay. Today, if you're doing
14 an uncertainty analysis approach and you're ranging
15 the break size, you can use the break size as one of
16 your sample parameters in doing the analysis.
17 Traditionally, all analyses for ECCS performance have
18 looked at the large break as one segment and the small
19 break as another.

20 Looking at the large break the way the
21 rule has been interpreted is that if you're going to
22 encompass the worst event you have to start with the
23 1.0 double ended guillotine and typically they'll drop
24 down to 0.8 times that area and 0.6. If 0.6 is higher
25 than the other two, then they'll drop down to 0.4

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1 simply to show that they have calculated the worst PCT
2 event. Now --

3 VICE CHAIR WALLIS: When you calculate
4 them probabilistically --

5 DR. LANDRY: Now if you're doing them
6 probabilistically, you can still go in and fix the
7 break size, do your statistical analysis around
8 particular break sizes.

9 VICE CHAIR WALLIS: You can, but you --

10 DR. LANDRY: Or, Graham, you can range the
11 break size and use the break size as a sampled
12 parameter. That's been done by one vendor and we've
13 allowed that because the rule does not preclude using
14 break size as a sampled parameter. Now if you're
15 going to do something such as a full spectrum analysis
16 using one code to run from the smallest break to the
17 largest break which nobody can do today because
18 nothing has an approved small break realistic model,
19 but if you're going to use a full spectrum analysis,
20 you could in theory use something a selector for the
21 break size for a probabilistic distribution function
22 derived from the results of NUREG 1829.

23 In theory, you could. Nobody has
24 suggested that and we haven't seen that. But that
25 could be done to weight your analyses towards to the

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1 smaller break sizes. But the current rule still
2 insists that you have to do all the way up to the
3 worst break size.

4 VICE CHAIR WALLIS: You have calculate it,
5 but how you weigh it is not specified by the rule.

6 DR. LANDRY: Right.

7 VICE CHAIR WALLIS: And this rule doesn't
8 say that the highest break size must meet the criteria
9 exactly. The probability comes later on in the rule.
10 So well anyway.

11 DR. LANDRY: The probability is only in a
12 very --

13 MEMBER BANERJEE: Really the issue is does
14 the existing rule allow you to take the probability of
15 different break sizes occurring into account.

16 DR. LANDRY: Yes, there is nothing in the
17 rule today that precludes doing that.

18 MEMBER BANERJEE: So why do we need to
19 change this rule now?

20 DR. LANDRY: If you want to gain more
21 margin though, the current rule is under the guidance
22 of the general design criteria. The general design
23 criteria say that you must have these certain
24 assumptions in design basis events. The design basis
25 events have to consider the worst single failure. You

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1 must do the analysis with and without offsite power
2 availability. Today, that means the full spectrum
3 must be analyzed with the worst single failure which
4 is generally offsite power.

5 VICE CHAIR WALLIS: But you could change
6 those to be probabilistic the way you do it in the
7 PRA.

8 DR. LANDRY: One of the things that has
9 been done with this 50.46(a) proposal is to change
10 specific general design criteria so that the design
11 basis of that goes up to the TBS. Beyond the TBS,
12 you're no longer a design basis event, so you don't
13 have to use the single failure criterion and you don't
14 have to use the loss of offsite power criterion.

15 VICE CHAIR WALLIS: So we're not just
16 looking at 50.46. We're looking at these general
17 design criteria modifications as well.

18 DR. LANDRY: You can't look at one without
19 looking at the other.

20 MEMBER CORRADINI: Can I? You said this
21 and maybe if you're going to say it again later I'll
22 hold my question.

23 DR. LANDRY: I only have two slides, Mike.
24 I wasn't planning on saying a whole lot at all.

25 VICE CHAIR WALLIS: But it's much better.

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1 MEMBER CORRADINI: I'm still very fuzzy as
2 I read the explanation of the rule in one document and
3 the rule itself as to what the staff is expecting the
4 licensee to do above TBS and below DEGB. I'm very
5 fuzzy.

6 DR. LANDRY: Okay. That means getting
7 back to my slides. Above the TBS, now under 50.46(a)
8 the rule says that anything below the TBS everything
9 you do today still applies. You can use Appendix K
10 analysis or you can use a realistic analysis with
11 uncertainty determination, both of which have to be
12 reviewed and approved by the staff. Above the TBS,
13 you can use Appendix K analysis method, you can use an
14 approved, already reviewed and approved, best estimate
15 with uncertainty analysis method or you can propose
16 another alternative analysis method or you can use
17 another alternative method. The new rule would not
18 require you to submit for review an approval that
19 methodology.

20 MEMBER CORRADINI: Which one? Any of the
21 three?

22 DR. LANDRY: Above the TBS.

23 VICE CHAIR WALLIS: So this could be a one
24 page -- This could be a one page sort of back of the
25 envelope analysis.

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1 DR. LANDRY: Above the TBS you do not have
2 to submit for review and approval by the staff the
3 analysis methodology. We have in the --

4 MEMBER BANERJEE: -- enough water or
5 something around.

6 DR. LANDRY: Just a minute, Sanjoy. We
7 have stated in the rule though that you have to
8 identify the method you have used and then the
9 methodology is available for the staff should we
10 determine that we don't understand. You use Code XYZ
11 which we've never heard of or what sheet back of the
12 envelope calculation. We have the option to always
13 come out and audit, inspect and audit, the work that
14 you've done. We can look at what you've done.

15 In the regulatory guide, we are
16 identifying those phenomena which are important to
17 large break LOCA which we are giving as guidance that
18 should be accounted for in your methodology. Some of
19 those are the old familiar items that everybody loves
20 to talk about. Momentum must be accounted for.

21 The rule 50.46 or Appendix K states that
22 you have to account for a momentum flux. For a large
23 break LOCA, you have flow reversal. So you have to
24 account for momentum whether it's a mechanical
25 conservation term or you call it momentum

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1 conservation. You still have to do something to
2 account for momentum. So our goal while we're not
3 being prescribed in telling you how you do your
4 analysis above the TBS you're making guidance
5 statements in the regulatory guidance as to what
6 phenomena should be considered and accounted for in
7 your analysis methodology. This precludes using
8 essentially back of the envelope calculation because
9 you're not going to be able to account for some of
10 these factors.

11 MEMBER CORRADINI: So let me just play
12 this out. So therefore if you had this analysis and
13 you informed the staff and the staff didn't want to
14 audit it but it's there somewhere there would be
15 likely a range of break sizes which would above the
16 peak clad temperature.

17 DR. LANDRY: There would be a range of
18 break sizes that would be above the design basis event
19 peak clad temperature.

20 MEMBER CORRADINI: Okay. All right. Then
21 below what so I don't get nervous? Here's where I'm
22 coming from and I'll give you my concern because I'm
23 not sure where it sits; it seems like you're inventing
24 a new category of accidents that are not severe
25 accidents that are not designed basis accidents and I

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1 don't see how they are watched over.

2 DR. LANDRY: They would be in my next
3 slide.

4 MEMBER CORRADINI: Okay. Currently, the
5 acceptance criteria are that the PCT must be under
6 2200 degrees, maximum local oxidation under 17
7 percent, hydrogen generation equivalent to less than
8 10 percent of the core-wide oxidation. Coolable
9 geometry and you must provide for long-term coolant.

10 VICE CHAIR WALLIS: Coolable core geometry
11 is really defined by the above three.

12 MEMBER CORRADINI: Right, it is somewhat
13 redundant because the above are what we'll define a
14 coolable --

15 VICE CHAIR WALLIS: The coolable core
16 geometry unless defined, doesn't mean anything to me
17 at all because TMI was cooled and all kinds of things
18 can be cooled.

19 MEMBER CORRADINI: Everything is going to
20 be cooled.

21 VICE CHAIR WALLIS: So you must have a
22 better acceptance criteria than coolable core
23 geometry.

24 DR. LANDRY: We're doing to get to that
25 above the TBS. We're now saying below the TBS all of

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1 these acceptance criteria are the same. Above the Tbs
2 though, we say that you must maintain a coolable
3 geometry and you must provide for long-term cooling.

4 VICE CHAIR WALLIS: But both of those, the
5 purpose of those is to prevent damage to the core.
6 The release is radioactivity.

7 DR. LANDRY: Correct.

8 VICE CHAIR WALLIS: That's got to be the
9 definition. Otherwise it doesn't mean anything. How
10 good does this have to be as cooling?

11 DR. LANDRY: If you go into the statement
12 of considerations and the regulatory guide, we are
13 defining that the staff, at this point understands the
14 coolable geometry to be this and this.

15 VICE CHAIR WALLIS: Okay, so what's
16 changed about TBS?

17 DR. LANDRY: This is to give the option to
18 the industry to come in with data or information which
19 says, "We can go to a higher temperature or we can go
20 to a higher oxidation level and still maintain a
21 coolable geometry.

22 VICE CHAIR WALLIS: Oh, we have an
23 improved cladding or something that will go to 2500.

24 DR. LANDRY: Today this is the best
25 information we have. If you go out and you obtain the

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1 data that says you can go to 2700 degrees and 20
2 percent oxidation and still maintain the cladding in
3 what looks like a cylindrical configuration, come in
4 with the data and show it.

5 VICE CHAIR WALLIS: Well, if that's valid,
6 why don't you accept it for all breaks?

7 MEMBER CORRADINI: Say again.

8 VICE CHAIR WALLIS: If that's valid, why
9 don't you accept it for all breaks? I mean, if
10 there's a certain temperature which the coolable
11 geometry fails, why don't you apply it to all breaks,
12 not just above TBS. If they come back and say, "Our
13 core is good enough for 2500", and they're clearly
14 convincing --

15 MR. RUBEN: Ralph, can I add something and
16 I'm sure you can answer better? Not meeting the
17 definitive acceptance criteria Dr. Landry has put up
18 there, may be defensible through alternate analysis,
19 processes, or new information as he pointed out but it
20 may also put you in a scenario were you have some
21 about of limited fuel failure, including potentially
22 some small amount of localized melting, but you don't
23 have a major challenge to the core integrity or the
24 vessel integrity.

25 Now, we currently don't have criteria to

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1 differentiate beyond the criteria he has up there
2 right now. And it would have to be a proposal from a
3 licensee that gave high confidence that even though
4 you exceed those values, the small amount of damage
5 that may occur to the core won't challenge the
6 geometric structure of the core that insures its
7 coolability and won't result in so much relocation of
8 the core that you could potentially challenge the
9 lower head of the vessel. We won't be well away from
10 that point.

11 MEMBER CORRADINI: So now you're into my
12 regime. Now, I'm getting very nervous because what I
13 just heard was said and I may have misheard, so please
14 correct me, and I want to start with you, Ralph,
15 you're saying that for the moment the guidance on
16 those three words "coolable core geometry" really are
17 the three quantitative numbers above.

18 DR. LANDRY: Correct.

19 MEMBER CORRADINI: So what has changed
20 then above the TBS? Has it changed by the way you're
21 interpreting this that those three quantitative
22 numbers are applicable but you don't have to worry
23 about offsite power and you don't have to worry about
24 single failure criterion? Is that what is changing?

25 DR. LANDRY: Right, you are allowed to --

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1 MEMBER BANERJEE: It sounds like that.

2 DR. LANDRY: You can do that analysis
3 today assuming you have offsite power available and
4 assuming that all the equipment operates. You don't
5 have to take the single failure penalty.

6 CHAIR SHACK: Okay, why don't we just
7 define it that way?

8 DR. LANDRY: That's a huge plus. To the
9 availability of --

10 MEMBER CORRADINI: So why not just define
11 it that way and leave the quantitative value --
12 because the next thing I was going to say is, I don't
13 know of any data anywhere that I believe that
14 supplants those three quantitative things and I don't
15 believe the industry is going to invest in any new
16 data to do it, so --

17 DR. LANDRY: But we were trying to leave
18 that door open.

19 MEMBER CORRADINI: Yeah, but come on.

20 DR. LANDRY: We wanted to leave that door
21 open so that if the industry had the data, then they
22 could come in, make the argument --

23 MEMBER CORRADINI: I understand.

24 DR. LANDRY: -- and we did not have it in
25 the rule that these criteria were required.

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1 MEMBER CORRADINI: Okay, but --

2 DR. LANDRY: This is what we're aiming
3 for.

4 MEMBER CORRADINI: So just to say it
5 again, those three quantitative are assumed below and
6 they --

7 DR. LANDRY: But they're not in the
8 regulation.

9 MEMBER CORRADINI: And they're not in the
10 regulation, and in the below single -- loss of offsite
11 power and single failure criteria must not be -- are
12 not necessarily need to be invoked.

13 DR. LANDRY: That's correct.

14 MR. TSCHILTZ: And if I could add there
15 that they're also allows to use -- Mike Tschiltz, NRR.
16 They're also allows to use a more realistic analysis
17 and they are also allowed to credit non-safety related
18 equipment in that analysis. That's, I think, the full
19 spectrum of changes from what's in the existing
20 criteria.

21 DR. LANDRY: You're allowed to credit
22 anything you want up there, anything that's available.

23 MEMBER MAYNARD: But this is only being
24 allowed because again, you still have to have some
25 level of confidence about coolable core geometry but

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1 it's for the very low probability events. Above the
2 transition break size is supposed to be an extremely
3 low probability event.

4 DR. LANDRY: That's correct. Os we're not
5 adding onto that low probability event the probability
6 of loss of offsite power and the probability of single
7 failure.

8 MEMBER MAYNARD: And that's why you would
9 not relax those criteria for below the transition
10 break size because it's not considered as lower
11 probability of --

12 DR. LANDRY: Right, those are the more
13 probable events.

14 MEMBER ARMIJO: Okay, so let's say a PWR
15 comes in. They've used all the flexibility you
16 provide above TBS. The best estimate codes, all the
17 tricks in their bag and they come up with a peak clad
18 temperature of 27, 2800 degrees F. Is that still
19 okay?

20 DR. LANDRY: They would have to show us
21 why it would be okay. To the staff today, no.

22 MEMBER ARMIJO: So, if that's the case,
23 why don't you just keep those same requirements, peak
24 clad temperature, oxidation, hydrogen and say, "Hey,
25 look, keep those requirements because that defines

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1 coolable core geometry," you've got all this other
2 flexibility and take advantage of that and you should
3 be able to beat that.

4 DR. LANDRY: We wanted to give the
5 capability to out, get new data, new information and
6 come in here and show us that we don't have to have
7 these very prescriptive limits. That if you can come
8 in with the data, we'll consider it and allow this
9 relaxation.

10 MEMBER ARMIJO: Do you have any reason to
11 believe that anybody has such data?

12 DR. LANDRY: No, not today.

13 MEMBER ARMIJO: I don't think so either.
14 I think it's going to be very tough to show that
15 you'll keep the fuel together.

16 DR. LANDRY: We were trying to not lock
17 everybody in and we were trying to be flexible.

18 MEMBER SIEBER: I think if you look at the
19 way the original fact criteria was developed, there's
20 a lot of margin in these numbers.

21 DR. LANDRY: Yeah, and --

22 MEMBER SIEBER: The real numbers like 2300
23 and something and say, well, you know, let's be really
24 sure this is the right number, we'll make it 2200.
25 And that's the way that rulemaking went and --

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1 CHAIR SHACK: Well, that's a debate for
2 another day.

3 CHAIR SHACK: Well, that's a debate for
4 another day.

5 MEMBER ARMIJO: Yeah, that will come up
6 again, though.

7 MEMBER APOSTOLAKIS: Ralph, I have a
8 question about this. It seems to me that things above
9 the TBS you don't define a design basis accident and
10 people can use equipment that is there or not there.
11 Wouldn't you need as part of the acceptance criteria
12 to say something about the frequency of the sequences?
13 Let me tell you what I think about it. I'm looking at
14 the number of sequences now. I am not forced to
15 assume loss of offsite power and so on. So in some of
16 these sequences the power is there. I have other non-
17 safety equipment or so on and I meet the criteria, but
18 I have a bunch of sequences.

19 And some of these sequences with very,
20 very low frequency almost none of this is available,
21 and then I exceed the criteria. Then are you going to
22 argue that these sequences are so rare that even
23 though you exceed these three criteria, you're still
24 okay? In other words, you bring an additional
25 dimension here to the argument so you will need to

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1 have some sort of acceptance criteria regarding the
2 frequency of the sequence that leads you to violate
3 the criteria. Isn't that true, because you don't
4 have a well-defined sequence now that you are
5 analyzing? So would these be --

6 DR. LANDRY: But this is going to be --

7 MEMBER APOSTOLAKIS: I'm sorry.

8 DR. LANDRY: This is going to be analyzed,
9 George, on a case by case basis. A plant comes in and
10 wants to adopt 5046A. They're not required to do
11 this.

12 MEMBER APOSTOLAKIS: I understand that.
13 I understand that, yeah.

14 DR. LANDRY: Do you follow, George?

15 MEMBER APOSTOLAKIS: I understand that,
16 yeah.

17 DR. LANDRY: And then in support of it,
18 they come in and say, "Well, we've analyzed this and
19 we've -- up to the TBS," et cetera and above,
20 everything is fine and then we can say, "We want to
21 come out and we want to see your analysis, the risk
22 analysis you've done, equipment availability analysis
23 that you've done, the results of your thermal
24 hydraulic analysis". And we can look on a case by
25 case basis and do exactly what you're saying.

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1 "Have you considered all the proper
2 sequences, yes or no and what are the results"?

3 MEMBER APOSTOLAKIS: But there has to be
4 something about the frequency itself. You have -- you
5 will do this in the regulatory guide, perhaps.

6 MR. DINSMORE: I think you have -- this is
7 Steve Dinsmore from the NRR. I think what Ralph's
8 talking about is success paths. He's going to be
9 identifying success paths. Now once we implement the
10 rule, and they go into this risk informed change
11 process, the failure of those success paths coupled
12 with the frequency of having to enter them, will go
13 into the change in risk estimates.

14 VICE CHAIR WALLIS: Risk has nothing to do
15 with these numbers up here.

16 MR. DINSMORE: Right, but these are just
17 success paths. This is just saying, well --

18 MEMBER APOSTOLAKIS: What do you mean by
19 success paths, you assume that the equipment is
20 available?

21 MR. DINSMORE: Yes.

22 VICE CHAIR WALLIS: That bothers me. I
23 mean, that's not --

24 MEMBER APOSTOLAKIS: It may not be. I
25 mean, that's the point. The benefit that you have

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1 from the design basis accident is that the sequence is
2 well-defined. Thou shall assume spectrum of breaks
3 and the largest break perhaps, assume that you don't
4 have outside power, assume single failure, the worst
5 single failure but everything else is available, so
6 the sequence is well-defined and you do your thermal
7 hydraulic calculations.

8 Now, you're entering a space where the
9 sequence is not well-defined and you're saying, you
10 know, I'm getting rid of all these extra requirements
11 but now I have to consider a spectrum of sequences
12 because sometimes --

13 CHAIR SHACK: But as I understand the
14 rule, if you credit the equipment, then you're going
15 to put it into your tech spec that it can't be out of
16 service for example, more than seven days.

17 VICE CHAIR WALLIS: And it can't fail?

18 CHAIR SHACK: Well, failure is a different
19 -- you know, that comes back into --

20 MR. DINSMORE: If it fails you can't --

21 CHAIR SHACK: That's in the PRA space and
22 risk space, but in terms of a definable situation, if
23 you say I'm going to meet this criterion with this
24 equipment, then that equipment has to be available
25 within this technical specification requirement that

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1 you can't have an outage of --

2 MEMBER APOSTOLAKIS: And I'm done if I do
3 that?

4 MR. DINSMORE: No, then you have to do
5 your risk analysis to make --

6 CHAIR SHACK: You have to do your risk
7 analysis.

8 MR. DINSMORE: -- to make sure that you --

9 MEMBER APOSTOLAKIS: But there will be
10 some sequences where I violate this criteria, correct?

11 MR. DINSMORE: Okay, if something fails.

12 MR. RUBEN: Let me supplement.

13 MR. DINSMORE: Then you do good, then it
14 goes into the risk analysis as a failure.

15 VICE CHAIR WALLIS: It doesn't appear in
16 your ECCS analysis though. It only appears in the
17 risk analysis.

18 MEMBER APOSTOLAKIS: It does not, no.

19 CHAIR SHACK: Yeah, but the design basis
20 doesn't -- it never fails in design basis space but it
21 fails in the PRA now, too already.

22 VICE CHAIR WALLIS: But now you're going
23 to say with the new rule nothing fails?

24 MR. DINSMORE: No, we're going to say if
25 we're going to identify the operating configurations

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1 where the --

2 VICE CHAIR WALLIS: How do you deal with
3 -- you just -- you get rid of single failure. I
4 understand, that probably is the sensible thing to do.
5 It would be nice to know what some number associated
6 with abandoning it. What are you now going to do
7 about failure? Are you going to assume no failures?
8 Are you going to do a probabilistic analysis of
9 failures?

10 MR. DINSMORE: But the greater than --

11 VICE CHAIR WALLIS: What are you going to
12 do?

13 MR. DINSMORE: But the greater than TBS
14 sequences that they're looking at they can assume
15 there's no failure.

16 VICE CHAIR WALLIS: There's no failure.
17 They assume no failure. That's a big change.

18 MR. RUBEN: Let me supplement the answer
19 a little bit if I could. This is mark Ruben again
20 from the Division of Risk Assessment. The evaluation
21 process that Dr. Apostolakis identified is a good
22 process and it's the formation of the advance reactor
23 framework, a licensing basis approach that is pretty
24 much fully risk informed that identifies this sequence
25 frequencies and puts them into various design basis

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1 groups according to the sequence frequencies and has
2 different acceptance criteria.

3 That is a very different licensing design
4 review approach and we're some years away from being
5 able to implement that. But it would account for the
6 sequence frequencies explicitly. Here we've made a
7 coarser cut based on initiation frequency. So we have
8 two groups and in the second group, even though it's
9 a coarse cut, we believe the initiation frequency is
10 low enough that the requirements -- that the
11 deterministic analysis requirements need not make the
12 traditional assumptions for DBAs single failure and
13 loss of offsite power at T_0 and some other things.

14 However, we acknowledge that there is some
15 likelihood that those assumptions will not be met if
16 a real event occurs due to failure modes, failure
17 frequencies of various components and to make sure
18 that that doesn't pose an unacceptable risk to the
19 public is the second part of the 5046A criteria which
20 is that as best as we can a realistic risk evaluation
21 is conducted reflecting all the changes they wish to
22 make for the plant and this model will include as Mr.
23 Dinsmore pointed out before, includes the full PRA
24 model with all the failure rates of the systems that
25 are in the PRA.

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1 So looking at you know, nominal PRA model
2 calculations even though the acceptance criteria is
3 analytically run in a deterministic sense, without
4 these assumptions, the safety impact with those
5 assumptions not being met in risk based is calculated
6 and compared to a guideline metric of acceptability.

7 MEMBER CORRADINI: Can I just run that
8 example? I think I understand what you just said, so
9 let me pretend something. So take a reactor, Zion,
10 Zion is running and now they want to come in with a 25
11 percent uprate. By what you just said is by this
12 method of calculation, they could find that they are
13 okay above the TBS and yet their CDF could go up by a
14 factor of two or three. Two separate calculations,
15 two separate calculations, one would raise the risk
16 because it's a PRA and one would be acceptable via the
17 TBS. Am I on base here?

18 MR. RUBEN: Ninety percent. The 10
19 percent where I would have to scratch a little deeper,
20 I believe the Zion baseline risk is high enough so
21 that if you took it two to three factor increase, it
22 wouldn't meet the risk acceptance guidelines that
23 would be part of this rule, which is 10^{-5} for
24 everything that's done after a licensee adopts the
25 rule.

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1 MEMBER CORRADINI: So the second trigger
2 is not that -- a second trigger is not that this is --
3 not only is this accepted but they must not hit the
4 risk trigger.

5 MR. RUBEN: That's correct, and the risk
6 trigger is very, very broadly applied, capturing all
7 the changes made to the plan.

8 MEMBER APOSTOLAKIS: Steve, when you said
9 the success paths, you mean the thermal hydraulic
10 analysis will assume that the equipment is available.

11 MR. DINSMORE: Yes.

12 MEMBER APOSTOLAKIS: Okay, okay.

13 MR. RUBEN: Okay for the low frequency
14 zone, only for the low frequency where we made that
15 coarse cut.

16 MEMBER APOSTOLAKIS: Well, above the TBS.

17 MR. RUBEN: Right, yes, sir.

18 CHAIR SHACK: Okay, I'm going to take the
19 chairman's prerogative and ask one last question then
20 we're going to move on. The -- my question sort of
21 goes back to Dr. Sieber's question. Suppose we said
22 that beyond the TBS it was still a design basis
23 accident? We were just going to redefine the design
24 basis accident not to have LOOP and not to have single
25 failure but you would still have to bring in a prior

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1 approval for your code and you would still have to
2 meet all the other requirements on the equipment that
3 you need, can we do that?

4 DR. LANDRY: You still -- you would have
5 to have a rule change to do that.

6 CHAIR SHACK: Yes, of course, to do that.

7 DR. LANDRY: Of course, you're in a
8 different space, Bill. You can do any rule change, of
9 course any rule change you want. If that's what --

10 CHAIR SHACK: It's a different rule change
11 than you're proposing.

12 DR. LANDRY: -- you want to do, you would
13 still have to have a rule change.

14 VICE CHAIR WALLIS: No, it's not you.
15 It's the Commission that can do it.

16 DR. LANDRY: But if you came in and you
17 were successful in having a rule change to permit it,
18 of course you could that.

19 CHAIR SHACK: Let's move onto Mr. Dinsmore
20 then at this point. The risk analysis is a large part
21 of this.

22 MEMBER APOSTOLAKIS: Are we following the
23 agenda, Mr. Chairman?

24 CHAIR SHACK: Yes.

25 MEMBER APOSTOLAKIS: What does the agenda

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1 say?

2 CHAIR SHACK: We've had comments on the
3 thermal hydraulic analysis. We're about to have
4 comments on the risk analysis.

5 MEMBER BANERJEE: Did they get any
6 comments from outside about the thermal hydraulic
7 analysis?

8 MEMBER ARMIJO: They're going to show
9 that.

10 MEMBER BANERJEE: Oh, they're going to
11 show the data.

12 MR. DINSMORE: Okay, my name is Steve
13 Dinsmore. I'm a Senior Reliability and Risk Analyst
14 in the Office of Nuclear Regulation and I'm going to
15 talk to you about the major public comments related to
16 the PRA or to the risk aspects of this change.

17 I'm going to present a brief summary of
18 these comments that we received and the resolution of
19 some of the comments cause us to make changes to the
20 rule and the resolutions of others did not. So any
21 changes to the rule that were made to resolve the
22 comments are identified in the presentation.

23 VICE CHAIR WALLIS: When you say public
24 comments, these are comments from industry?

25 MR. DINSMORE: Yeah, pretty exclusively.

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1 VICE CHAIR WALLIS: Are they all from
2 industry?

3 MR. DINSMORE: From one --

4 PARTICIPANT: Almost all, yes.

5 MEMBER APOSTOLAKIS: This NRC employee, he
6 commented on what? You mentioned an NRC employee.

7 MR. DINSMORE: His is the last comment in
8 here.

9 MEMBER APOSTOLAKIS: Okay.

10 MR. DINSMORE: The major comments that we
11 got were regarding the scope of the facility changes
12 requiring a risk evaluation, identification of changes
13 that require prior staff review and approval, tracking
14 of risk increases, PRA -- periodic PRA updating and
15 reporting, acceptance criteria on amount by which risk
16 increases and these operational restrictions and
17 maintaining that --

18 VICE CHAIR WALLIS: Go back to my question
19 about the public. So there are skeptical members of
20 the public out there, we know some of them.
21 Presumably they're waiting until you take this step
22 before they come back and comment on it.

23 MR. DINSMORE: They have not been showing
24 up at any of the meetings that I'm aware of.

25 VICE CHAIR WALLIS: Yes, but I would

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1 imagine that's what they're doing.

2 MR. DINSMORE: They also get --

3 VICE CHAIR WALLIS: And if they're not
4 commenting now, they probably will comment some time.
5 It's obviously, a very commendable thing to do.

6 MR. DINSMORE: We are surprised as well,
7 but we just --

8 VICE CHAIR WALLIS: Well, I think they're
9 waiting, they're biding their time is what's
10 happening.

11 MEMBER BANERJEE: What advantage would
12 they get by that?

13 VICE CHAIR WALLIS: Because then they can
14 -- you know, then they've got something substantial
15 that's happened they can critique.

16 CHAIR SHACK: You'd think they'd like to
17 prevent it from happening.

18 VICE CHAIR WALLIS: Oh, no, they want to
19 show that the NRC has done something unwise but
20 anyway, let's move on.

21 MR. DINSMORE: You're making me feel nervous here.
22 Okay, from these comments, the first two comments, the
23 scope of facility changes requiring evaluation and
24 identification of changes that require prior staff
25 review and the very last one, operational

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1 restrictions, the industry claim that these were show
2 stopper which meant that if the rule went out without
3 changes to these areas that the industry didn't think
4 it was going to be worthwhile for them to implement
5 the rule. And since this is a voluntary rule, there
6 is some consideration that it would be a waste to put
7 on a rule that they wouldn't implement. So --

8 MEMBER BANERJEE: What were the points
9 again, the show stoppers?

10 MR. DINSMORE: The scope of the facility
11 changes requiring a risk evaluation, the
12 identification of changes that require prior staff
13 review and approval and the operational restrictions.
14 There's a slide on each one of these.

15 MEMBER BANERJEE: Okay.

16 MR. DINSMORE: Okay, the first --

17 VICE CHAIR WALLIS: This is backwards,
18 isn't it? You're saying that you want to put out a
19 rule and then you ask industry and they say don't put
20 that out because if you put it out, we won't do
21 anything. It ought to be the other way around. They
22 ought to come in and say, we want to do something
23 because and then you evaluate it and say, yeah, you
24 can because we're going to make changes in the rule.
25 The whole thing seems backwards to me.

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1 MR. RUBEN: Let me give just a little tad
2 of perspective on this. Your comment is extremely
3 well-founded. We were though, directed by the
4 Commission to engage in extensive stakeholder
5 interactions before finalizing the rule to insure that
6 not only were the safety public protection criteria
7 maintained but also to insure that it was a useable
8 rule, one that could be applied and one that would be
9 flexible enough so the licensees might want to apply
10 it. But again, our primary focus was that sufficient
11 safety be maintained as a result of the rule but also,
12 as I said, secondarily, that it be useful for
13 something.

14 VICE CHAIR WALLIS: But presumably, the
15 motivation was to do something useful from beginning.
16 And therefore, the -- if this were a design problem,
17 you'd make your specifications in terms of utility
18 right at the start, not look for it at the end.

19 MEMBER BANERJEE: Well, that's why I asked
20 how did this whole process initiate and what I heard
21 is you were instructed to do this by the Commission.

22 MR. RUBEN: It's a little broader than
23 that. This goes back to 1998 when SECY 98-300 was
24 issued which identified options for going forward with
25 risk informed rulemaking activities and we gave three

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1 options. In fact, the committee was briefed on that
2 many years ago. The Commission decided to choose the
3 options 1, 2, and 3 and 3 was to go forward to see how
4 effectively we could risk inform revise some of the
5 most significant rules. When that effort was started,
6 there was an associated activity to sort of prioritize
7 which of the rules should we give attention to first
8 and two or three were identified. One was combustible
9 gas control, I think 50.48. We've already changed
10 that. And now we're working on this one and so it was
11 early on where the Commission was given some
12 information and the prioritization was an effort by
13 research was that our involvement on where the biggest
14 bang for the buck was to risk inform the rules. This
15 one was identified six, seven years ago and the
16 Commission not only endorsed the staff moving forward
17 with it, they wanted it on an accelerated schedule, so
18 a lot of stakeholder involvement.

19 MEMBER BANERJEE: So you did not feel that
20 the best estimate, this uncertainty, met the goal of
21 risk informing this rule.

22 MEMBER APOSTOLAKIS: No, because they
23 still have to make the assumptions so the --

24 MEMBER CORRADINI: The simultaneous LOOP,
25 the simultaneous double ended guillotine.

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1 VICE CHAIR WALLIS: But that's a separate
2 question, isn't it? Whether or not they make sense to
3 have LOOP is a separate question. You could do away
4 with that for a risk informed basis.

5 MR. RUBEN: In fact we are, Dr. Wallis.
6 We're working on --

7 VICE CHAIR WALLIS: This is different than
8 the entire 50.46 we're looking at.

9 MR. RUBEN: Dr. Graham, we have an
10 initiative underway to do exactly that. There's a BWR
11 Owners Group initiative associated with removing the
12 LOCA/LOOP requirement just as a required concept in
13 general and we're reviewing the topical. We're about
14 halfway done on that effort and we will likely follow
15 it by making a rule change or a GDC change.

16 MR. DINSMORE: And I guess when industry
17 says something's a show-stopper in this case we look
18 carefully at it. But if we decide that we can't come
19 to an agreement then it would just stop the rule. But
20 we tried to move forward as fast as possible.

21 MEMBER APOSTOLAKIS: Isn't this an obvious
22 thing, I mean, that they should always do the
23 evaluation prior to implementing the change? I never
24 understood why you have to say that. It's in 1.174.
25 Right?

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1 MR. DINSMORE: But this is every change in
2 --

3 MEMBER APOSTOLAKIS: And there was already
4 a comment on it.

5 MR. DINSMORE: The proposed rule required
6 a risk evaluation of all changes to the facility prior
7 to implementing the change which means again if you
8 were going to raise your curbs and your parking lot
9 you would have to do a --

10 MEMBER APOSTOLAKIS: I see. So it's
11 clear. All right. That's trivial though.

12 VICE CHAIR WALLIS: It's the all that
13 you're --

14 MEMBER APOSTOLAKIS: Yes, all.

15 VICE CHAIR WALLIS: The prior isn't the
16 new thing. It's the all changes that's --

17 MR. DINSMORE: I should underline both of
18 them, yes. We were aware of that when the rule went
19 out, but the comment that came back of course is this
20 does not credit current change control processes and
21 is unnecessary burdensome and then the final rule
22 that's going --

23 VICE CHAIR WALLIS: Now wait a minute. In
24 the risk evaluation suppose you raise this temperature
25 from 2200 to 2300 or something, that doesn't appear in

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1 a risk analysis, does it? The risk analysis doesn't
2 have anything to do with these criteria that you have
3 in ECCS rule.

4 MR. DINSMORE: Many of the risk --

5 VICE CHAIR WALLIS: Doesn't take account
6 of that.

7 MR. DINSMORE: Many of the risk
8 evaluations would have been just not applicable, but
9 it would have had to have been done. There was a lot
10 of comments about it. We agree that most of them are
11 going to be very simple, but we still have a paperwork
12 problem of getting it all done.

13 VICE CHAIR WALLIS: But we've had this
14 before. You have saw two parallels. You have risk
15 which is a very innovative and good thing to do and
16 you have these other systems where you calculate
17 things like 2200 degrees more or less and there seems
18 to be no coupling between them. They're separate
19 things and you can change one completely without
20 influencing the other and sometimes it influences and
21 sometimes it doesn't because the thermal hydraulics
22 and the uncertainties in it are not in the PRA.

23 MEMBER APOSTOLAKIS: The problem is and I
24 believe the issue came up last June when you guys were
25 discussing the safety margin thing that the

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1 quantitative safety margins are not in the PRA.

2 VICE CHAIR WALLIS: Right.

3 MEMBER APOSTOLAKIS: And there seems to be
4 some resistance to doing that, right, judging from
5 what was discussed?

6 VICE CHAIR WALLIS: But suppose we raise
7 the temperature of the fuel to 2500. What would the
8 PRA -- How would the PRA respond to that?

9 MR. DINSMORE: Unless it changes success
10 criteria, it wouldn't respond at all.

11 VICE CHAIR WALLIS: It wouldn't respond at
12 all. It doesn't have a way of responding to it. So
13 your check and balance that Michael Corradini was
14 talking about supposed that you predicted 2500 or
15 something, the risk is going to catch that. Is risk
16 going to catch that?

17 MR. DINSMORE: It probably wouldn't meet
18 your success criteria for your PRA which is to keep at
19 2200.

20 MR. RUBEN: But let me -- This is Mark
21 Ruben again. It would depend on what severe accident
22 criteria the particular PRA included. Sometimes they
23 use the current 2200 limit. Sometimes they use the
24 uncoverary (phonetic) of the core. Sometimes they use
25 time and temperature or two-thirds high on some BWRs

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1 for example. So it varies.

2 But the PRA bobbling is not changing as a
3 result of this rule. The best that we can currently
4 model the impact of risk of any change including the
5 thermal hydraulic changes because there are TH models
6 in the PRAs. They're by assessment models but they're
7 TH models. We're not changing anything in that and so
8 the actual risk impact due to a higher peak clad
9 temperature as it would impact meeting the PRA success
10 of severe accident failure or success on the path, the
11 eventuary (phonetic) path is properly reflected. So
12 if 2500, you still meet the sufficient core cooling
13 requirements in the PRA, you're right. No impact. If
14 you don't meet them, there's an impact.

15 VICE CHAIR WALLIS: So you have sort of
16 two parallel criteria for core cooling which sometimes
17 seem on different planes. I think this is one of the
18 problems of the whole regulation. It would be very
19 nice to have one integrated method that did both
20 things properly.

21 MEMBER APOSTOLAKIS: It's very hard
22 though.

23 VICE CHAIR WALLIS: I know.

24 MEMBER APOSTOLAKIS: It's very hard.

25 VICE CHAIR WALLIS: But ingenious people

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1 could probably devise a way to do it. Some of those
2 guys in famous universities near the coast.

3 MEMBER BANERJEE: Which coast?

4 VICE CHAIR WALLIS: Either coast.

5 MEMBER KRESS: The coast of the
6 Mississippi River.

7 MEMBER APOSTOLAKIS: We need to
8 collaborate that. Yes, PRA models really, they're
9 redundancy. Their part of defense in depth refers to
10 redundancy. The part that refers to safety margins is
11 not. Indirectly, it is of course. I think Steve
12 answered that. The success criteria determines how
13 many LOOPS you need and so on but in general it isn't.
14 So changes in the margin are not in the PRA.

15 VICE CHAIR WALLIS: So if you use a
16 different heat transfer coefficient then the light of
17 new research and it turned out the temperatures went
18 up, they wouldn't appear in a PRA at all.

19 MEMBER APOSTOLAKIS: No, but that's why
20 they have two sets. One is all the equipment is
21 available. Look at the thermal hydraulics. You pass
22 that. Then you start playing with the failures of the
23 equipment and then you have something like 1.174 to
24 handle that. Okay.

25 MR. DINSMORE: So the final rule, I was

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1 going to say a risk evaluation is required prior to
2 implementing potentially risk significant changes.

3 VICE CHAIR WALLIS: Independently.

4 MR. DINSMORE: And a periodic risk
5 evaluation is required to assist the cumulative effect
6 of all changes. Now when we were evaluating this
7 comment and developing the response to the comment, we
8 decided that the goal would be to eliminate redundant
9 regulatory controls wherever possible and to minimize
10 additional requirements to the extent possible.

11 MEMBER APOSTOLAKIS: Now let me -- This
12 cumulative effect, and maybe, Tom, you can help here,
13 I went back to the Regulatory Guide 1.174 and I also
14 remember the debates we had in this room when we were
15 discussing it. Maybe you were part of it. But I
16 remember explicitly getting a hold of it and saying
17 according to this regulatory guide, they can come
18 every Monday with a new change, proposed change, and
19 it will be evaluated, the change against the criteria
20 of the guide. And somewhere in the guide it says that
21 the staff should also consider the cumulative effect
22 of changes without saying what "consider" means.

23 Now it seems to me we are going beyond
24 that and we're saying no. The actual cumulative risk
25 is what we're going to use in our decision making.

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1 MR. DINSMORE: We have a slide that
2 directly addresses that issue.

3 MEMBER APOSTOLAKIS: All right.

4 MR. DINSMORE: About two slides down. I'm
5 sure --

6 MEMBER KRESS: I think you're right,
7 George.

8 MEMBER APOSTOLAKIS: Because the original
9 intent was not to take the cumulative delta risk and
10 compare it to the 10^{-5} . It just said consider and
11 that was left up in the air.

12 MR. DINSMORE: If we can get through how
13 you --

14 MEMBER APOSTOLAKIS: Yes. All right. You
15 have a slide. That's fine.

16 MR. DINSMORE: This slide is still about
17 how you identify what changes are going to require
18 risk informed evaluation prior to implementation and
19 what changes you might have to do with your periodic
20 update. So if we start up on the --

21 MEMBER APOSTOLAKIS: Excuse me. I
22 understand now we have 50.46(a) and 50.46(b) and you
23 are following that new terminology, so this is indeed
24 (a). (a) was acceptance criteria in the new thing,
25 isn't it?

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1 MR. DINSMORE: The existing 50.46(a) will
2 be renumbered as 50.46(b).

3 MEMBER APOSTOLAKIS: Right.

4 MR. DINSMORE: And this will be the new
5 50.46(a).

6 MEMBER APOSTOLAKIS: So this is (a) now?
7 This is the new (a)?

8 MR. DINSMORE: This is the new proposed
9 rule.

10 VICE CHAIR WALLIS: The new rule is
11 50.46(a).

12 MR. DINSMORE: I should have put the (a)
13 in.

14 MEMBER APOSTOLAKIS: It's there but I'm
15 just wondering whether it's --

16 MR. DINSMORE: This is the new rule.

17 MEMBER APOSTOLAKIS: The new rule.

18 MR. DINSMORE: This is the staff's
19 response to the industry's comment that the scope of
20 the facility changes requiring a risk analysis is way
21 too broad and it would cover everything and we just
22 couldn't deal with it. So the way we looked at it is
23 we started out if the changes -- the question is is
24 the change going to covered by regulations and if it
25 is going to be covered by regulations normally all

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1 regulations have pieces in them with criteria that
2 allow you to make the change without making a
3 submittal. 50.59 is the most famous one. If you go
4 through 50.59 and you pass it, you do not have to make
5 a submittal. Other ones are the fire regulations and
6 all these criteria are along the lines of either the
7 change maintains an acceptable level of safety or it
8 does reduce the effectiveness of the equipment or the
9 procedures.

10 So industry claimed and we eventually
11 decided that yes if you actually go through one of
12 these change processes and it's determined that you
13 could make this change without prior NRC approval, the
14 likelihood that you're making a risk significant
15 change is very, very small.

16 So the first thing we decided was people
17 who go through regulatory processes and those
18 processes permit them to make the change without a
19 submittal, they don't have to do a risk analysis on
20 that change. But what happens then if they do need a
21 submittal, they're going to have to make a risk
22 informed evaluation and that's what they would submit.

23 Now if you start off with the top change
24 governed by regulations, then, no, it's not governed
25 by the regulations. Then the next question would be

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1 if the change affects an SSC within the scope of the
2 maintenance rule. Now we chose the maintenance rule
3 because the maintenance rule examined the nexus
4 between safety and SSCs and it was pretty good at
5 identifying all those SSCs at the plant that you rely
6 on to mitigate all these different initiating events.

7 So if it's not in the scope of the
8 maintenance rule, then we figured that again it would
9 be a very small chance that anything that you changed
10 on this component would affect safety. So you could
11 go ahead and implement it. If it is within the scope
12 of the maintenance rule, then you should do this risk
13 informed evaluation.

14 Now the population of stuff that's not
15 governed by regulations but within the scope of the
16 maintenance rule is probably going to include the
17 changes that we were somewhat worried about which is
18 changes that the new rule permitted you to do such
19 that they were no longer within the scope of the
20 regulations, but might affect safety significant
21 equipment. So we're confident that we picked up that
22 population of changes with this little process. If
23 it's within the scope of the maintenance rule, you
24 have to do a risk informed evaluation. Now if it
25 meets the small criteria, the cumulative small

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1 criteria, I guess I should repeat this one when Dr.
2 Apostolakis comes back, if it meets the cumulative
3 small criteria or it does not meet it, then you can't
4 implement it. You would have to either bundle it with
5 some other change which would bring your total back
6 down or you'd have to postpone it. If it does meet
7 the small criteria, then the last question is it meets
8 a very small criteria which is mainly just a reporting
9 required criteria.

10 VICE CHAIR WALLIS: Now is this small and
11 very small defined in any way?

12 MR. DINSMORE: Yes, they are defined using
13 the values out of the Reg Guide 1.174.

14 VICE CHAIR WALLIS: Okay. That's what --
15 Okay.

16 MR. DINSMORE: The little chart. Right.
17 And if it meets the very small criteria, you don't
18 even have to put it in the report. You just implement
19 it.

20 Now on top of all this, every two
21 operating cycles, there's a roll-up of all the
22 changes. They have to bring -- They have to update
23 the PRA to reflect the current operating configuration
24 and design of the plant and they would redo a
25 calculation at that time and then they would come up

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1 with a risk increase which would include everything.

2 So we thought that the process set up here
3 it relies a good bit on the current regulations
4 because there are places you can rely on them and it
5 simplifies their process and it uses mainly what
6 information is already available to them. So it seems
7 to be a pretty reasonable way to go through.

8 MEMBER KRESS: Is there any way in this
9 rule that we can treat power uprates differently?

10 MR. DINSMORE: Unless we put it right in
11 the rule, I doubt it.

12 MEMBER KRESS: It's because 1.174 doesn't
13 deal very well with power uprates.

14 MEMBER APOSTOLAKIS: It does not.

15 MEMBER KRESS: That's about the only thing
16 it doesn't deal with very well and if we could just --

17 VICE CHAIR WALLIS: It doesn't measure
18 loss of margin in any way at all, does it?

19 MEMBER KRESS: Well, it says you might
20 maintain margin but it's very vague about what you
21 mean by that.

22 MR. RUBEN: This is Mark Ruben again. We
23 currently have guidelines and methodology for
24 assessing power uprates and risk space. It's a non-
25 risk informed submittal and we follow Appendix G of

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1 SRP 19 which is we make sure adequate protection is
2 assured. But we do that by essentially doing a 1.174
3 type analysis and comparing it to 1.174 guidelines and
4 criteria and there's a document, a review guidance
5 document, that was put together by the EPU folks that
6 includes essentially the approach that's used to
7 evaluate EPUs.

8 The same process will be used here with
9 the new thermal hydraulic and success criteria and
10 operator timing changes that fall out of the
11 implemented change that's now allowed by 50.46(a). So
12 --

13 MEMBER KRESS: See, the trouble with all
14 of those things is they don't properly address site
15 risk and power uprates is a site risk issue not a
16 reactor design issue and that's the problem I have
17 with it.

18 VICE CHAIR WALLIS: The problem I have is
19 the only thing that's ever showed up so far in power
20 uprates risk analysis is operator action time.
21 Nothing physical has showed up at all.

22 MR. RUBEN: I could provide --

23 VICE CHAIR WALLIS: I wonder if this is
24 going to be the case with this new rule too. Is there
25 anything that's going to show up in the risk analysis?

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1 Risk is supposed to capture things when you've gone
2 too far with the thermal hydraulics or something. Is
3 it going to catch anything? I'm not sure it will.

4 MR. RUBEN: Dr. Wallis, there have been
5 some rare cases on EPU power PRA evaluations where
6 there have been some minor changes and success
7 requirements like you need an extra feed pump being
8 available and that change in success criteria is put
9 directly into the PRA model and calculated. So
10 you're absolutely right. Virtually all the changes
11 have been timing changes because the amount of uprate
12 they've done hasn't challenged the previous success
13 criteria and required equipment response. If they
14 make additional uprates that now impact the original
15 assumptions and requirements of what success is, that
16 will be directly assessed in the risk evaluation
17 portion. But the changes done to date have resulted
18 in very little significant change in risk or
19 significant changes in success criteria but there have
20 been some.

21 CHAIR SHACK: Yes, Brown's Ferry had to
22 change the success criteria is the one I can think of.

23 MEMBER SIEBER: That happens because you
24 don't evaluate margin and if CDF is your criterion, it
25 doesn't make any difference whether it's a little core

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1 or a big one. The source term is irrelevant. So PRAs
2 really don't tell you much about EPUs.

3 MR. RUBEN: We do look at both CDF and
4 LERF changes.

5 MEMBER APOSTOLAKIS: But that's just a
6 frequency of release.

7 MR. RUBEN: You go to a level three now.

8 MEMBER SIEBER: Right. Doesn't tell you
9 how bad it is.

10 MEMBER APOSTOLAKIS: Or even a level two,
11 Mark.

12 MR. RUBEN: Right.

13 MEMBER APOSTOLAKIS: At level two, you
14 could calculate the quantity released.

15 MR. RUBEN: Yes.

16 MEMBER APOSTOLAKIS: But level two minus
17 one step. That's the frequency of a release, any
18 release, as long as it's large.

19 MR. RUBEN: It's the frequency would be
20 large early release under the definitions we've been
21 using for several years.

22 MEMBER APOSTOLAKIS: Right.

23 MR. RUBEN: So the releases that are later
24 than or smaller than that criteria are not reflected
25 in the calculation, but that's the underpinnings of

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1 1.174.

2 MEMBER APOSTOLAKIS: Correct, but the
3 frequency can stay the same and the large part can
4 increase. Right?

5 MR. RUBEN: That's absolutely true and
6 there will be a small impact on that from an EPU. We
7 looked at, I believe, it was a Swiss study that
8 actually assessed it quantitatively and it was roughly
9 proportional to the increase in power. But sort of
10 the approach that we're taking is a large release is
11 a large release. It's a very undesirable event and
12 that's why we have guidelines for its increase.

13 MEMBER APOSTOLAKIS: So the argument then
14 appears to be that the guideline we have is already a
15 conservative thing. That no matter how large it is
16 it's bad. That's why we have a 10^5 delta LERF limit.

17 MR. RUBEN: I don't know if I would call
18 it conservative rather than just say meeting it
19 provides enough assurance of public protection. But
20 the conclusion also was that if we meet these
21 surrogate risk metrics we would meet the safety goals
22 quantitative health objectives as --

23 CHAIR SHACK: This comes back to metrics
24 of risk informed regulation. Let's move on here.

25 MEMBER APOSTOLAKIS: Did you want to ask

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1 that?

2 MEMBER CORRADINI: I just -- I didn't
3 understand what allows you to go left on your branch
4 there to implement where the answer is no. You said
5 it and I guess I didn't write it down.

6 MR. DINSMORE: Which one? The submittal
7 required?

8 MEMBER CORRADINI: Yes, submittal
9 required. No.

10 MR. DINSMORE: That's when you can make
11 this change according to the regulation within making
12 a submittal.

13 MEMBER APOSTOLAKIS: They're both yes.
14 That's what's confusing. Yes.

15 MR. DINSMORE: Submittal required, yes.
16 Yes, you need a submittal that goes down. No, you
17 don't need a submittal that goes --

18 MEMBER CORRADINI: And the reason you
19 don't need a submittal is because?

20 MR. DINSMORE: Because you fulfilled the
21 acceptance criteria in that regulation to make a
22 change without submitting a change.

23 MEMBER MAYNARD: Both of those various
24 regulations that control changes.

25 MR. DINSMORE: Right. Past 50.59, there's

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1 a bunch of them.

2 MEMBER APOSTOLAKIS: So you enter the
3 diagram up there which says change governed by
4 regulations.

5 MR. DINSMORE: That's the first question,
6 yes.

7 MEMBER APOSTOLAKIS: That's one you enter.

8 MR. DINSMORE: Thank you. It took us
9 months to develop this.

10 (Laughter.)

11 MEMBER APOSTOLAKIS: Are there any changes
12 that are not governed by the regulation?

13 MR. DINSMORE: Sure. Yes, changes to
14 safety significant equipment that's -- or to
15 maintenance rule equipment which some of the secondary
16 side pumps and things like that is in the maintenance
17 rule.

18 MR. RUBEN: Some of it is very important
19 like some of the old PRAs, start-up feedwater pumps
20 especially the diesel driven ones, if there are AC
21 independent ones out there. They are real important
22 in risk space. Sometimes they're in the PRA model.
23 Sometimes they're not. But on an old, high baseline
24 risk PRAs are pretty important and that's captured by
25 the maintenance rule, but it's not a safety related

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1 system so it has no criteria.

2 MEMBER MAYNARD: George, I --

3 MEMBER APOSTOLAKIS: But it captured by
4 the regulations.

5 MEMBER MAYNARD: George, I would have
6 probably titled that upper lefthand diamond different
7 because I agree. I think all changes are really
8 governed by regulation.

9 MEMBER APOSTOLAKIS: All changes are
10 governed by regulations.

11 MEMBER MAYNARD: I think they're talking
12 about the regulations that deal with change as opposed
13 to --

14 MEMBER APOSTOLAKIS: Right.

15 MEMBER SIEBER: 50.59.

16 MEMBER APOSTOLAKIS: The wording could be
17 different. Okay. Where are we?

18 MR. DINSMORE: This one should go pretty
19 quick. This is the second comment, identification of
20 changes that require prior staff review and approval.
21 The proposed change said if you have it submitted
22 according to your current regulatory requirements or
23 if it increased risk by more than a very small amount,
24 then you had to submit it for prior staff review. The
25 comment was the same, does not create a change process

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1 and is very burdensome.

2 The final rule --

3 VICE CHAIR WALLIS: They are all process
4 items, aren't they? They're not technical questions.

5 MR. DINSMORE: Right. The final rule got
6 rid of it because what determines what you submit is
7 the current change control process. So it was quick.
8 Now we're starting to slow down a bit probably.

9 This one has to do with tracking of risk
10 increases. The proposed rule said that the amount by
11 which CDF and LERF increased over time must be
12 estimated and tracked. The industry came in and said
13 it should be sufficient to estimate and track the
14 overall CDF and LERF overtime. The final rule is
15 unchanged so that you still need to track the amount
16 by which CDF and LERF increase.

17 VICE CHAIR WALLIS: What's the difference
18 there?

19 MEMBER KRESS: In one case, you have to
20 subtract. The difference is you can do other changes
21 that reduce CDF and LERF but those wouldn't be
22 included in.

23 MR. DINSMORE: No, that would all be in
24 there. The difference is that you have to subtract.

25 VICE CHAIR WALLIS: So it's a big thing to

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1 ask industry to do really. Come on.

2 MEMBER CORRADINI: I don't think I get it.

3 VICE CHAIR WALLIS: I'm kidding.

4 MEMBER CORRADINI: It can't be that
5 simple.

6 MR. DINSMORE: The difference is what
7 you're going to submit, what you're going to be
8 looking at. Are you going to be looking at the total
9 CDF and LERF or are you going to be looking at the
10 difference?

11 MEMBER KRESS: The delta.

12 MR. DINSMORE: The delta. If you only
13 track the total CDF and LERF and you submit that, let
14 me go through this just a little bit that might help
15 you.

16 VICE CHAIR WALLIS: It doesn't matter what
17 you submit because you can easily subtract. The
18 question is what do you do with it once you get it.
19 You can subtract too.

20 MR. DINSMORE: Right.

21 VICE CHAIR WALLIS: Is the decision based
22 on the total or the increase?

23 MR. DINSMORE: The decision is based on
24 the increase.

25 VICE CHAIR WALLIS: So you can easily

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1 subtract. So there's no big deal on this slide.

2 MEMBER APOSTOLAKIS: Wait a minute. This
3 is not related to a particular request. This says at
4 any point in time you should have the estimate of
5 delta CDF from all past changes and delta LERF.
6 That's what this says and you should know it. If we
7 ask you, you should give us the answer in two minutes.

8 MR. DINSMORE: And periodically.

9 MEMBER APOSTOLAKIS: Yes.

10 MR. DINSMORE: Or periodically, not every
11 second.

12 MEMBER APOSTOLAKIS: Right. It's not tied
13 to any particular request. It just is a cumulative.

14 MR. DINSMORE: Right.

15 MEMBER APOSTOLAKIS: What it doesn't say
16 is what to do with it.

17 MR. DINSMORE: Right. That's the next
18 slide.

19 MEMBER APOSTOLAKIS: Okay.

20 MR. DINSMORE: But the reason it's in the
21 rule it says what we want them to track is the
22 increase over time is because the rule requires an
23 acceptance criteria to clarify for the staff, licensee
24 and public what will be acceptable and what will not
25 be acceptable and the staff has no guidance on what is

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1 an acceptable overall CDF and LERF, but we do have
2 guidance on what is an acceptable risk increase and
3 what is not an acceptable risk increase. So quite
4 simply, we retain the requirement in the rule to
5 estimate the parameters that we have a criteria for.

6 MEMBER APOSTOLAKIS: So the goal of 10^{-4}
7 for CDF is not considered an acceptable.

8 MR. DINSMORE: All it does is if your
9 total is above 10^{-4} , your acceptable increased drop
10 from 10^{-5} to 10^{-6} .

11 MEMBER APOSTOLAKIS: Right. So you don't
12 proceed at an unacceptable -- That's fine. I think
13 that's fine.

14 MR. TSCHILTZ: This is Mike Tschiltz from
15 NRR. I think maybe a helpful analogy to use here is
16 that you have a checking account with a risk balance
17 in it and once you've made changes that increase risk
18 a certain percentage, any change that you make to the
19 plant following that needs to decrease risk to gain
20 back the balance in your checkbook. So it's not
21 facilitating changes to the facility that would allow
22 them to increase risk to 10^{-4} threshold. There's some
23 incentive there in the rule to make changes that
24 reduce risk as well when you're making changes.

25 MEMBER APOSTOLAKIS: We can debate that a

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1 little bit later, but the question is whether the
2 acceptability of risk that this rule will promulgate
3 will be different from what's in the regulatory guide
4 that we've been using for eight years now.

5 MR. DINSMORE: Which brings me to the next
6 slides which is probably the gates of Hades.

7 MEMBER APOSTOLAKIS: Good. Let's go to
8 the next slides.

9 MR. DINSMORE: See. I have it all set up
10 for you. Acceptance criteria, an amount by which risk
11 increases. Proposed rule, the amount by which CDF and
12 LERF increase is compared to the acceptance criteria
13 in the rule that states the total increases in CDF and
14 LERF are small and the overall risk remains small.
15 Small is defined using the 1.174 guidelines.

16 The comment we got from industry was don't
17 put the acceptance criteria in the rule and rely on
18 Reg Guide 1.174 guidelines for controlling risk
19 increases over time. I guess that's what you're
20 discussing here. I'm going to read this a bit I'm
21 afraid.

22 As with the previous slide, a rule
23 requires acceptance criteria to clarify for the staff,
24 licensees and public what will be acceptable and what
25 will not be acceptable. I'll discuss this comment

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1 that they had in two parts. First, the proposal that
2 we do not put acceptance criteria in the rule. The
3 rule relies on our risk informed framework to permit
4 changes to the facility that would not otherwise be
5 permitted by the deterministic regulations of being
6 replaced. A risk informed process including
7 acceptance criteria must be included in the rule to
8 provide a regulatory footprint establishing
9 alternative regulatory requirements that provide
10 confidence that inappropriate facility changes with
11 significant adverse risk implications are not
12 implemented. So we really do believe you need an
13 acceptance criteria in the rule.

14 The second part of the comment is to rely
15 on Reg Guide 1.174 for controlling risk increases over
16 time. Reg Guide 1.174 provides a framework
17 establishing a risk informed process and provides
18 guidance on what an acceptable increase in risk is,
19 but Reg Guide 1.174 is always augmented by application
20 specific guideline documents once an application that
21 might be used in multiple sites is identifying. These
22 application specific guidance documents define how the
23 guidelines are to be applied to changes made over
24 time.

25 In developing this 50.46(a) rule, the

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1 Commission decided to apply the risk informed change
2 control process to all plant changes and eventually we
3 chose the simplest and most straightforward solution
4 to deal with changes made over time and that is to
5 simply apply the acceptance guidelines to all changes
6 made at the facility after implementation of the rule.

7 MEMBER APOSTOLAKIS: But again, I'll come
8 back to my earlier comment that when we were debating
9 the 10^{-5} for CDF and 10^{-6} for delta LERF it was made
10 very clear to us that these were referring to
11 individual changes not the cumulative changes. And
12 the cumulative changes in CDF and LERF were supposed
13 to be considered by the staff and that was vague. It
14 seems to me this is a significant change now that you
15 have to keep to track of all the changes and make sure
16 that they're below 10^{-5} . Maybe if you do that, then
17 the 10^{-5} should become $5(10^{-5})$. I don't know.

18 MR. DINSMORE: It is a change in the scope
19 for this application, but each of these application
20 reg guides addresses changes made over time. I have
21 excerpts from them all.

22 MEMBER APOSTOLAKIS: Addresses means what?

23 MR. DINSMORE: Addresses, for example --

24 MEMBER APOSTOLAKIS: There is a 10^{-5}
25 limit?

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1 MR. DINSMORE: Yes. It tells them what
2 changes can be combined or what changes must be
3 combined and compare it to that 10^{-5} . If you look in
4 service testing, it says the cumulative impact of all
5 risk informed IST program changes, initial approval
6 plus later changes should comply with the acceptance
7 guidelines. There's an OMN code case out which allows
8 them to do it on their own actually. The aggregate
9 risk impact of changes to the IST program shall be
10 evaluated by the owner.

11 MEMBER APOSTOLAKIS: Now when you say
12 "total" here, Steve, what do you mean because I can
13 understand in the ISI for example. Yes, all these are
14 related to a particular program and they are bundled.
15 That's fine. But when you say "total" you mean all
16 changes in the plant no matter whether they are
17 related to 50.46(a) or not?

18 MR. DINSMORE: The "total" here means
19 total, yes, because --

20 MEMBER APOSTOLAKIS: It's different
21 though, isn't it?

22 MR. DINSMORE: It's a different
23 population. We tried -- When we wrote the SECY and
24 sent it up, the SECY said all changes that arise from
25 this new rule. That was our population. That was

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1 very consistent with all these other things. So then
2 the decision was made that that's not how we're going
3 to do it and so we actually sat down again and tried
4 to figure out how can we define populations and it
5 just was atrocious. It was like the tentacle search.
6 We couldn't get anywhere and especially within the
7 schedules.

8 VICE CHAIR WALLIS: So you're responding
9 to something the Commission decided. Is that what
10 you're doing?

11 MR. DINSMORE: We're adapting --

12 VICE CHAIR WALLIS: You said the decision
13 was made. Who made this decision?

14 MR. DINSMORE: The Commission made this.

15 MEMBER APOSTOLAKIS: So the Commission is
16 saying that no matter what your CDF is now all changes
17 forever to the plant cannot exceed 10^{-5} .

18 MR. DINSMORE: They didn't say it that
19 bluntly.

20 MEMBER APOSTOLAKIS: That's what it means.

21 MR. DINSMORE: No. Well, they said apply
22 the risk -- All changes that the plant after 50.46(a)
23 has been implemented should be risk informed.

24 MEMBER APOSTOLAKIS: That's very different
25 from what you just said.

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1 MR. DINSMORE: Well, if you didn't have
2 any population groups, if you just said every single
3 change you can come in on your own and every single
4 change can be defined by the licensee to be whatever
5 it is, has no influence on what he's changed in the
6 past or the future, I don't think that's consistent
7 with 1.174.

8 MEMBER APOSTOLAKIS: In 1.174, there was
9 an understanding that you will not accumulate so many
10 changes that eventually you reach the goal of 10^{-4} and
11 I understand that. And in fact as you said, as you
12 reach that goal and start exceeding it, it drops down
13 by an order of magnitude. But this is different from
14 saying that now you'll have to go to ISI, to your IST,
15 to the tech specs and everything and find the whole
16 delta CDF, which one, add them up and make sure that's
17 less than 10^{-5} . I mean we keep talking about
18 regulatory stability, but this is a major blow to risk
19 informing the regulations, isn't it?

20 MR. DINSMORE: I disagree with that, but
21 this --

22 MEMBER APOSTOLAKIS: You think it's a
23 minor blow.

24 MR. DINSMORE: I think it simplifies it.

25 MEMBER APOSTOLAKIS: It changes the rule,

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1 the rules -- the game, not the rules.

2 MR. DINSMORE: It changes the population
3 of which you're applying this to. It simplifies it in
4 that you don't have to keep track of all your little
5 changes. All you have to keep track of is what you
6 your total CDF is. The ones that --

7 MEMBER APOSTOLAKIS: Delta CDF, your delta
8 LERF CDF.

9 MR. DINSMORE: Well, the total because
10 then you can subtract the original one.

11 MEMBER APOSTOLAKIS: Yeah, but the idea is
12 that you have to keep track of the total delta CDF and
13 total delta LERF and then the way I understand the
14 slide, is compare it to the acceptance guidelines of
15 the regulatory guide.

16 MR. DINSMORE: Right.

17 MEMBER APOSTOLAKIS: That's a significant
18 change from the original intent of the regulatory
19 guide, it seems to me.

20 MR. RUBEN: If I could supplement
21 slightly, the previous version that was sent up to the
22 Commission that resulted in the SRM included these
23 kinds of risk acceptance metrics but as Steve said,
24 restricted just to items that were enabled. But when
25 the Commission came back, they didn't change -- it

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1 didn't request a change to the risk acceptance
2 metrics. What they said was all changes should be
3 incorporated into the risk assessment process and
4 evaluated. So that's what we've done. And they took
5 out a few reporting requirements and things of that
6 nature, but this was explicitly sent up to them and
7 the only change which related to this issue was
8 everything should be included, not just --

9 VICE CHAIR WALLIS: I'm very surprised.
10 This is making risk informed regulation tougher to do.
11 I mean, I -- did the Commission understand what they
12 were doing when they did this?

13 MEMBER APOSTOLAKIS: Maybe it's a matter
14 of interpreting their words and I'd like to see the
15 SMR. Do we have it, Eric? We'll get it. Because
16 this is pretty -- in my mind, it's a significant
17 change.

18 MR. TSCHILTZ: Well, I think, this is Mike
19 Tschiltz.

20 MEMBER SIEBER: On the other hand, it
21 offers an advantage, you know.

22 MEMBER APOSTOLAKIS: What advantage is
23 that?

24 MEMBER SIEBER: Every once in awhile
25 you've got to do some good things that improve your

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1 CDF and that allows you to do some of these other
2 things.

3 VICE CHAIR WALLIS: Maybe that was the
4 idea.

5 VICE CHAIR WALLIS: But it seems to me we
6 can't do these things on the fly.

7 VICE CHAIR WALLIS: Maybe that was the
8 idea that you can decrease the CDF which then lets you
9 increase it somewhere else. That makes some sense.

10 MR. TSCHILTZ: Yes, you know, that was
11 part of our thinking, to incentivize safety
12 improvements at the plant, not just allow facilities
13 to parse their changes to allow acceptable increases
14 in risk all the way up to the CDF guidelines in 1174.
15 Also the other thing, I think, that was part of the
16 Commission's thinking was that 50.46A is a voluntary
17 rule and the price of entering into this realm is that
18 you basically risk inform the operations at your
19 facility and you risk inform the changes that you make
20 so you're entering into a new regime here for the way
21 you run and operate your plant.

22 MEMBER APOSTOLAKIS: Well, I mean, Dr.
23 Wallis complained at the beginning that you guys focus
24 too much on process and I am focusing on process now.
25 Regulatory Guide 1.174 has been revised once. It

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1 seems to me that if we want to make such a major
2 change, we should revise it again and have a debate on
3 that and not do it as, you know, as a minor detail
4 when we are revising something else, risk informing
5 something else because that's where it belongs. It
6 belongs to the fundamental framework of risk informing
7 the regulations. And 1.174 has been the major guide
8 that has set that framework. So I don't know that
9 this is -- and I'd like to see the Commission's SRM to
10 see whether they meant something else. Maybe it's a
11 matter of interpretation of what they meant and this
12 is one interpretation. Or maybe, as Graham said, the
13 Commission did not fully realize what they were
14 requesting.

15 CHAIR SHACK: To move on here, George, you
16 know, I think we've identified the issue and, you
17 know, we can debate the issue but this is what the
18 rule now says.

19 MEMBER APOSTOLAKIS: I'm objecting to it.

20 CHAIR SHACK: Yes, right.

21 MEMBER APOSTOLAKIS: It was clear.

22 CHAIR SHACK: That didn't require
23 clarification, right.

24 MR. TSCHILTZ: Just one point --

25 MEMBER APOSTOLAKIS: And I appreciate what

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1 you're saying. I mean, there is value to what you're
2 saying but I just don't think that this is the way it
3 should be done.

4 MR. TSCHILTZ: One comment on this though,
5 that the industry in our public meetings on this issue
6 doesn't find this to be an unacceptable approach to
7 them. There's been no feedback that this is
8 unacceptable in any way according to the industry and
9 then --

10 CHAIR SHACK: Well, they want a total CDF,
11 I heard a different story.

12 MR. DINSMORE: Well, they want a total but
13 when they --

14 CHAIR SHACK: Well, and if a total is 10^4
15 that's a big difference between limiting my increase
16 to 10^{-5} .

17 MR. DINSMORE: They wanted to report the
18 total but --

19 CHAIR SHACK: We didn't get any comments
20 that --

21 MR. DINSMORE: As Mike said, during the
22 discussions in all the meetings the industry didn't
23 have a heartache with this. I think they think that
24 if --

25 CHAIR SHACK: You think they understand

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1 it, right?

2 MR. DINSMORE: I'm sure at least some of
3 them do. The bundling was very popular and if you
4 keep your bundling and then the change is made to it
5 and --

6 VICE CHAIR WALLIS: Well, I'm with George.
7 When you risk inform regulations, you ought to know
8 what risk informing means and you ought to meet
9 certain standards. If one of them is RG 1.174, you
10 need to know what that is. You can't interpret it
11 differently when you start risk informing different
12 regulations.

13 MEMBER APOSTOLAKIS: It makes a big
14 difference in the acceptability because if you keep
15 track of the total CDF, that goes on the horizontal
16 axis of the diagram, right? So for each change, you
17 still have the 10^{-4} , $^{-5}$ but you move a little bit to
18 the right, which really doesn't make any difference
19 because it's a flat line. Only when you exceed the
20 10^{-4} it makes a difference. However, in your
21 interpretation, it's very different now, because I
22 have a CDF here but now the total delta CDF has to be
23 below 10^{-5} , which is a hell of a difference.

24 VICE CHAIR WALLIS: Well, you have a curve
25 instead of a --

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1 MEMBER APOSTOLAKIS: I think the industry
2 want a total CDF, because they know you move a little
3 bit to the right but a little doesn't make any
4 difference.

5 MR. DINSMORE: But they didn't object
6 strenuously to this.

7 MEMBER APOSTOLAKIS: Well, then we object,
8 I object.

9 CHAIR SHACK: We'll hear from industry.
10 We can find out whether they object. Let's move on.

11 MEMBER APOSTOLAKIS: Well, that's not a
12 criterion anyway.

13 CHAIR SHACK: No, it's not. We're just
14 looking for information, George. We're gathering
15 information. We've gathered some, we're going to
16 gather now.

17 MEMBER APOSTOLAKIS: Hopefully, we'll
18 speak with sufficient clarity and volume.

19 MR. DINSMORE: We've got a couple big
20 ones. Maybe I'll go through this one real quick
21 unless there's a lot of interest. This just as to do
22 with -- this just has to do with the different
23 reporting requirements. Originally, in the proposed
24 rule, they should report if there is a significant
25 reduction in the capability and what it's changed to

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1 now is if they exceed this 10^{-5} on total cumulative,
2 they have to report steps in the schedule to bring the
3 facility back into compliance and this essentially
4 gives us the information that we need when we need it,
5 which is if the criteria is exceeded, what are you
6 going to do?

7 So I'll go fast. This is the last one.

8 MEMBER APOSTOLAKIS: But again, there is
9 another comment that I want to make here. We spend
10 all this time talking about quantitative part and the
11 periodic updates and so on. However, in the rule
12 itself, there is a major way out of this when I says
13 to the extent that risk assessment methods other than
14 PRAs are used to develop quantitative or qualitative
15 estimates of changes to CDF and LERF in the risk
16 involved, a licensee shall justify the other methods.

17 So I don't understand how risk assessment
18 methods other than PRAs are used to develop
19 quantitative estimates.

20 MR. DINSMORE: Well, they could take
21 seismic margins analysis and use that factors to --

22 MEMBER APOSTOLAKIS: It's not part of the
23 PRA, or qualitative estimates of changes, how can you
24 have a qualitative estimate of delta CDF?

25 MR. DINSMORE: Negligible.

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1 MEMBER APOSTOLAKIS: Negligible?

2 VICE CHAIR WALLIS: Less than what?

3 MR. DINSMORE: Well, if you made a change
4 and you calculated these things and it was, I don't
5 know five 10^{-8} and then they the guy said, "Well, your
6 radiation monitor on the wall might break", is that --
7 it's going to have a negligible -- I mean, we've seen
8 these. I can't think of one off the top of my head,
9 but we've --

10 MEMBER APOSTOLAKIS: So PRA then here
11 means specifically --

12 MR. DINSMORE: fault trees and event
13 trees.

14 MEMBER APOSTOLAKIS: And when you do
15 margins you don't look at fault trees and even trees?
16 You do, right?

17 MR. DINSMORE: We have a success path.

18 MEMBER APOSTOLAKIS: I don't know. I
19 think this business of referring to qualitative
20 estimates of --

21 MR. DINSMORE: We can try and go back to
22 the ISME standard and see if there's any way to --

23 MEMBER APOSTOLAKIS: Okay.

24 MR. TSCHILTZ: I think part of the issue
25 there was that if this would also incentivize

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1 licensees who didn't have a full scope PRA because
2 their qualitative assessments would need to be
3 bounding and bounding and conservative and they would
4 be losing the benefit by not having a full scope PRA
5 that was in accordance with the standard that let them
6 more accurately quantify these risks.

7 MEMBER APOSTOLAKIS: But the -- I mean, as
8 you know, there has always been a debate about whether
9 you should really reap the benefits of risk informed
10 regulations without a good risk analysis. And I know
11 that Commissioner McGaffigan has said that a good PRA
12 is the price you have to pay to be risk informed and
13 get all the benefits.

14 MR. TSCHILTZ: And I think this follows
15 along with that philosophy because you're basically
16 going to be penalized by your conservative analysis in
17 there without a full scope PRA.

18 MEMBER APOSTOLAKIS: No, when you have a
19 conservative analysis, I appreciate that but when you
20 say that some licensees don't have a full scope PRA or
21 they are excluding external events and so on and we
22 still want them to have the benefits, I'm having a
23 problem with that. Why don't they have a good Level
24 1 PRA? They should. If they want to enter this pace,
25 they should. I mean, we were using these arguments in

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1 1997 and `8 when we were --

2 CHAIR SHACK: George, we're running late.
3 Let's move on.

4 MEMBER APOSTOLAKIS: Well, but it's
5 important. I mean, we can't just --

6 MR. RUBEN: I would just note, the staff
7 certainly agrees with you. The issue that Mr.
8 Dinsmore was mentioning comes into effect where
9 they're Perry bottle goes beyond Level 1 in a complete
10 sense. There are non-quantitative methods that are in
11 the various ASPI standards or draft standards that
12 allow margins for bounding approaches. Whether those
13 are acceptable for an individual application to us is
14 something that we have to judge on a case-by-case
15 basis in the application. But for example, most
16 people use seismic margins and you just have to
17 identify a couple success paths for safe shutdown.

18 And so you don't have a quantification out
19 of that but you can make some bounding claims through
20 the Kennedy method that we've been applying for a
21 number of times. I think we've mentioned it to you.
22 We can back calculate in an approximate seismic risk
23 contribution. But the uncertainties are very
24 different and the same is true for fire for people who
25 use the fire analysis. It's usually a very

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1 conservative evaluation. I mean, you just add all the
2 numbers together, you get -- you can get a misleading
3 perspective but the methods are allowed in the
4 baseline risk -- excuse me, risk standards.

5 MR. DINSMORE: Okay, go.

6 CHAIR SHACK: Go.

7 MR. DINSMORE: The last issue is operating
8 restriction when in a configuration not demonstrated
9 to meet the ECCS criteria, ease of acceptance criteria
10 for breaks bigger than TBS. And let me take a quick
11 minute and explain that one. PWRs will most likely be
12 permitted to raise power because of the smaller design
13 basis LOCA. Because single failure criteria and the
14 simultaneous loss of offsite power are not required
15 for breaks greater than TBS, it is likely that some
16 facilities may credit both LPCI trains to demonstrate
17 mitigation of the largest breaks.

18 The question immediately arises is, what
19 do we do about operation when for example, one of the
20 LPCI trains is out for maintenance? Assuming that no
21 other non-safety-related equipment can be used as a
22 LPCI, when one LPCI train is out, that facility would
23 be operating in a configuration not demonstrated to
24 meet the ECCS acceptance criteria. Did I explain that
25 well enough?

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1 MEMBER CORRADINI: For breaks greater than
2 TBS.

3 MR. DINSMORE: For breaks greater than
4 TBS, right.

5 MEMBER BANERJEE: That was a public
6 comment?

7 MR. DINSMORE: Well, okay, the proposed
8 rule prohibited operation of this configuration, said
9 you couldn't do it. If you take -- if you need both
10 LPCI pumps, if you need both LPCI pumps, you take one
11 out for maintenance, you either have to put other
12 equipment that can deal with it or you could reduce
13 your power.

14 VICE CHAIR WALLIS: But generally, you
15 have to operate at the lower power.

16 MR. DINSMORE: You'd have to operate, so
17 that was the proposed rule.

18 VICE CHAIR WALLIS: You mean, you have to
19 shut down or you have to operate at lower power?

20 MR. DINSMORE: Lower power.

21 VICE CHAIR WALLIS: You go back to your
22 per-power uprate.

23 MR. DINSMORE: You'd have to go back to
24 you could demonstrate that you could mitigate them.

25 VICE CHAIR WALLIS: Okay.

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1 MR. DINSMORE: So the public comments,
2 restriction was not commensurate with safety
3 significance of the configuration and could increase
4 risk by reducing permitted on-line maintenance.

5 MEMBER BANERJEE: Where did this comment
6 come from?

7 MR. DINSMORE: Pretty much everybody.
8 This was one of the show stopper comments, one of the
9 three.

10 VICE CHAIR WALLIS: So how bad can this
11 configuration be? Can you take out both pumps?

12 MR. DINSMORE: Well, you couldn't take out
13 both pumps because you would violate your less than
14 TBS tech specs and you couldn't take one out -- one
15 pump out indefinitely because you would violate your
16 -- but you could definitely get into this situation.

17 Now the final rule at this point in time
18 is different than from the one which is on the web.
19 The one on the web says, operation of this
20 configuration not to exceed seven days. The one that
21 we got this week or that we developed recently is
22 operation in this configuration not to exceed 14 days
23 per year. Now we chose 14 days because it's
24 consistent with related guidelines on initiating event
25 frequencies. It's sufficiently long to allow most

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1 maintenance activities at a longer period of time
2 would not be consistent with maintaining the
3 capability to successfully mitigate the full spectrum
4 of LOCAs.

5 And on the next slide is the guidelines
6 that are similar but no perfect. No guidance directly
7 addressing the system exists but some related does
8 exist. Reg Guide 1.177 approach -- which we use
9 essentially to develop risk informed allowed outage
10 times.

11 MEMBER APOSTOLAKIS: Water?

12 MR. DINSMORE: I've got some, thank you.
13 This reg guide has an acceptance criteria for
14 integrated conditional core damage probability less
15 than five times E^{-7} . If you had a $1E^{-5}$ per year
16 frequency, for a LOCA that has no mitigation, you can
17 meet that ICCDP if you had an AOT of 18 days. The
18 SRP Chapter 221 and 222 identify design basis events
19 that need to be mitigated as those events with a
20 frequency greater than 10^{-7} per year. Now if you had
21 a one time 10^{-5} per year frequency event that could
22 exist for four days during the one-year period before
23 exceeding an annual frequency of $1E^{-7}$.

24 Now, again these guidelines do not
25 directly address our situation. During the allowed

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1 outage time developed under Reg Guide 1.177, all
2 design basis events can still be mitigated unless
3 other independent failures occur. During operation I
4 this configuration, however, mitigation is lost
5 without any additional failures.

6 The 10^{-7} per year guideline in the SRP was
7 developed to identify external events to the plant
8 that need not be included in the design basis. So
9 after a fair amount of discussion, we selected the
10 time interval consistent with the AOT interval that's
11 14 days, which is consistent with 18, because
12 configuration is temporary as it is during AOTs, but
13 included the SRPs per year constraint because there is
14 not available mitigative capability which is not
15 permitted by the AOT extension but which is permitted
16 by the SRP.

17 MEMBER MAYNARD: Can I understand the 14
18 days per year, that's cumulative 14 days per year?

19 MR. DINSMORE: Yes, sir.

20 MEMBER MAYNARD: Okay, what happens if you
21 exceed that? Do you shut down for the rest of the
22 year or how do you reset that?

23 MR. DINSMORE: No, you'd have to either
24 avoid further maintenance that might put you in that
25 situation or reduce power to where you can demonstrate

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1 or there would be several options.

2 MEMBER APOSTOLAKIS: If I do nothing, if
3 I don't request any change to my plant and this rule
4 now goes into the books, would there be any
5 configurations that violate the ECCS acceptance
6 criteria?

7 MR. DINSMORE: Probably not because you'd
8 be able to meet them unless you make changes to --

9 MEMBER APOSTOLAKIS: The whole idea of the
10 current rule is that it's a bounding rule, either
11 there are no configurations or --

12 MR. DINSMORE: Well, this only kicks in if
13 you're in a position, an unanalyzed condition where
14 you --

15 MEMBER APOSTOLAKIS: Or if you request a
16 change that leads to some sequences violating the
17 criteria but they're of low frequency. You still don't
18 want to be in those configurations? Let's say I
19 request something. Can I still request a removal of
20 equipment? I remember that was prohibited in the
21 earlier version.

22 MR. DINSMORE: It's not prohibited by the
23 rule.

24 MEMBER APOSTOLAKIS: It's not prohibited
25 now. So let's say I remove something and my risk

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1 criteria are met, acceptance guidelines are met,
2 everything is met. But now there are some
3 configuration -- some sequences, some configurations
4 where I violate the deterministic criteria. Then I
5 could be in one of those for up to 14 days; is that
6 what it is? Intentionally, because some of these are
7 also unintentional. They involve random failure,
8 right? I can't do much about them.

9 MR. DINSMORE: Yes, intentionally --

10 MEMBER APOSTOLAKIS: So intentionally, I
11 can be in one of those for up to 14 days.

12 MR. DINSMORE: Those being that you took
13 something else so you can't --

14 MEMBER APOSTOLAKIS: Yeah.

15 MR. DINSMORE: Yes.

16 MR. TSCHILTZ: Let me just clarify that
17 and that is, say for example, you uprated power so for
18 a large break LOCA you need both LPCI trains to
19 mitigate and your existing tech specs are less than
20 the TBS allowed you to take one pump out for three
21 days, that would govern your outage of the LPCI pump.
22 You would allow -- you'd be allowed to keep that pump
23 out of service for three days and by existing tech
24 specs you would then have to shut down after that.

25 So in many cases, I think existing tech

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1 specs will govern. For equipment that's not safety-
2 related equipment and equipment that's not in the tech
3 specs this will govern over that equipment and we
4 received a lot of public comment about well, if we're
5 going to credit -- licensees are going to take credit
6 for non-safety related equipment, they don't want to
7 have to put it in the tech specs.

8 So this was a way to provide an accounting
9 for the availability of that type of equipment that
10 was being credited to mitigate the greater than TBS
11 but not necessarily in tech specs. So it covers both
12 that equipment not in tech specs and tech specs.

13 MEMBER APOSTOLAKIS: If I -- I mean, it's
14 interesting that now we don't require -- now we allow
15 the removal of equipment at least in principle.

16 MR. DINSMORE: There might be a caveat in
17 there about the security.

18 MEMBER APOSTOLAKIS: Right, but if I were
19 to remove something would the requirement of
20 maintaining the defense in depth philosophy say no,
21 don't do that?

22 MR. DINSMORE: It might if you could --

23 MEMBER APOSTOLAKIS: But it's not clear
24 that it would always do.

25 MR. TSCHILTZ: Well, this -- I think this

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1 situation, the Commission told us to, I think, balance
2 the unavailability of this equipment with its safety
3 significance, so this was our attempt to do this, to
4 realize that this was a fairly low frequency event and
5 that there needed to be some balancing to allow for
6 other activities at the plant that would put them in
7 a configuration where they may not be able to mitigate
8 for short periods of time this very unlikely event.

9 So if you were to strictly follow defense
10 in-depth principle, during that short period of time
11 there is not defense in-depth.

12 MR. RUBEN: The one thing -- Mark Ruben
13 again, the one point I would add is that it's not
14 necessarily the result of any break into the TBS zone
15 that you would not mitigate. Say your TBS is 11
16 inches, 12 inches, with the power uprate and assuming
17 a double edge guillotine break, the success criteria
18 may be two LPCI pumps. That's an offset break. If you
19 look at a 14 or 15-inch break or equivalent break
20 area, you could very well still have mitigation
21 success but we're only calculating it at the TBS and
22 at the bounding limit. So somewhere you cross the
23 line, we don't know where.

24 VICE CHAIR WALLIS: How about maintenance?
25 You have two accumulators. You need them for the very

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1 big breaks, don't you, the accumulator is a large
2 break LOCA. Suppose that the valves and things
3 deteriorate so that they don't function so well. Is
4 there any obligation to fix them up if you're still
5 sort of probabilistically are doing well enough on the
6 large breaks with them in their bad state?

7 MR. DINSMORE: Well, you have to be able
8 to mitigate up to the double ended guillotine with
9 everything working.

10 VICE CHAIR WALLIS: Mitigate though but
11 less stringently with less probability, right?

12 MR. DINSMORE: Well, if you needed both of
13 them and one of them keeps failing, you'd run into
14 this 14 days after awhile.

15 VICE CHAIR WALLIS: But you see what I'm
16 getting at. I mean, they could deteriorate to the
17 point where you meet the new criteria but you don't
18 meet the old ones.

19 MR. TSCHILTZ: The criteria you're
20 referring to is that you --

21 VICE CHAIR WALLIS: The new ones that are
22 going to be in the reg guide.

23 MR. TSCHILTZ: The reg analysis and the
24 not having to withstand single failure --

25 VICE CHAIR WALLIS: Right, all that sort

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1 of thing, right.

2 MR. DINSMORE: -- and crediting safety,
3 from that perspective yes.

4 VICE CHAIR WALLIS: All right, and you
5 don't need them. Maybe you only need one accumulator.
6 I don't know but -- so you could just let one
7 deteriorate to the point where it doesn't work.

8 MR. DINSMORE: Or take it out of tech
9 specs or -- Ralph, I think has done some analysis to
10 look at this.

11 MEMBER CORRADINI: I mean, that's what I
12 read it to be the case. I guess that's the way --
13 unless I misunderstood your whole discussion, there
14 could be a whole raft of things that just kind of are
15 unnecessary. They just start appendages that start
16 frittering away.

17 MR. DINSMORE: As long as it satisfies the
18 criteria in the rule, they can do it.

19 MR. TSCHILTZ: Just realistically, from
20 the standpoint of the fact that this is an issue
21 that's going to be periodically reviewed by the staff
22 and the back-fit rule doesn't apply and if there's
23 information that would change the determination of the
24 TBS, I think there's an incentive for licensees not to
25 rip out equipment. There may be incentives to take it

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1 out of tech specs but not to take it out of a
2 facility, not have as stringent of surveillance
3 requirements on it. At least that -- from the
4 discussions that we've had with the industry on it,
5 that would be the type of things that they are looking
6 for is not have such stringent surveillance tests,
7 maybe not have it specifically in tech specs but the
8 equipment would still be left at the facility.

9 MEMBER APOSTOLAKIS: So one would then --
10 one could use 50.69 to do this, use some -- let's say
11 I have now a piece of equipment that is safety related
12 and has all the special treatment requirements imposed
13 on it, then I can come to you and request that these
14 be moved to risk category 3 in the 50.69 thing using
15 importance measures and all that because this rule
16 allows me to do that?

17 MR. DINSMORE: I don't think there's much
18 of a connection. I mean, this rule would allow you --

19 MEMBER APOSTOLAKIS: Why not? I'm going
20 to change the status from safety related --

21 MR. DINSMORE: Well this wouldn't -- okay.

22 MEMBER APOSTOLAKIS: Then I'm invoking the
23 other rule now.

24 CHAIR SHACK: I mean, this would be
25 safety related but not safety significant if it was

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1 only needed for a large break LOCA.

2 VICE CHAIR WALLIS: Right, right.

3 MEMBER APOSTOLAKIS: This rule allows me
4 to do that in principle but now how to do it, I'll
5 have to go to 50.69 and I take the importance measures
6 and show that it's not risk significant even though it
7 is now safety related so it goes from Risk 1 to Risk
8 3. And I remove some of the special treatment
9 requirements. Is that a conceivable --

10 MR. DINSMORE: If you could make something
11 non-safety related because of this rule, then it would
12 be --

13 MEMBER APOSTOLAKIS: This rule just allows
14 me to do it. It doesn't say how to do it.

15 MR. DINSMORE: Yeah.

16 MEMBER APOSTOLAKIS: So then I would go to
17 another rule that tells me how to do it.

18 MR. DINSMORE: Right, we haven't
19 considered avalanching.

20 MEMBER APOSTOLAKIS: You haven't what?

21 MR. DINSMORE: We've considered tentacles
22 but not that avalanching effect.

23 MEMBER BANERJEE: Will this rule you're
24 proposing to apply to the advanced reactors that are
25 coming in as well?

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1 MEMBER APOSTOLAKIS: That's coming up.

2 CHAIR SHACK: Yeah, we're going to have to
3 move on. We're running out of our margin here.

4 VICE CHAIR WALLIS: Will it allow you to
5 have less water --

6 MEMBER APOSTOLAKIS: Will we have any
7 redundancy left?

8 VICE CHAIR WALLIS: Will it allow you to
9 have less water available for cooling the core because
10 you don't need to pour it in. It goes out the large
11 break. Will it enable you to have a smaller IRWST
12 tank and things like that? You don't need them any
13 more because you're so big. Would it enable you to do
14 that, have less water available?

15 MEMBER BANERJEE: Yeah, it has also
16 implications for AP 1000 and --

17 MR. TSCHILTZ: You still need to be able
18 to mitigate the large break LOCA.

19 VICE CHAIR WALLIS: Only with a lower
20 probability and without all these other things going
21 wrong.

22 MR. TSCHILTZ: From a practical sense, I
23 don't know why anybody would change the size of the
24 tank. They'd have to replace it with another tank
25 that would have to supply water to a large break LOCA.

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1 VICE CHAIR WALLIS: Well, I'm just sort of
2 saying you might put -- keep less water in there.

3 MEMBER BANERJEE: It was sort of on the
4 border for the large break LOCA the IRWST system for
5 the AP1000.

6 CHAIR SHACK: We'll take a break now for
7 10 minutes since we're running kind of tight here.

8 (Whereupon, a recess was taken at 11:03
9 a.m.)

10 CHAIR SHACK: We're back into session.
11 We're running low on time here.

12 MR. DUDLEY: Okay, again, I'm Richard
13 Dudley. I work in the Division of Policy and
14 Rulemaking. Briefly I'd like to discuss the
15 applicability of 50.46A to future reactors. The
16 proposed rule and as -- which the Committee saw, did
17 not apply, did not allow 50.46A to be applied to
18 future reactors. It was limited to existing BWRs and
19 PWRs because these were the reactors from which the
20 expert elicitation curves were developed and these
21 were the reactors that we fully understood how 50.46A
22 would impact them.

23 The Commission, however, gave us direction
24 to solicit public comments on whether this proposed
25 rule should be applicable to future reactors and we

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1 did that. We put that in the Federal Register as one
2 of the specific questions on which we were soliciting
3 public feedback. And as you might -- well, as you
4 know now, industry commentators came back unanimously
5 in favor of applying 50.46A to future light water
6 reactors that are similar to current light water
7 reactors.

8 In reviewing the industry comment, we
9 looked at some future designs, AP100, USEPR, ESBWR and
10 we looked at them and thought, well, they might
11 potentially be similar and there might be ways that
12 you could apply 50.46A to these future designs in a
13 manner that's consistent to how it would be or will be
14 applied to existing BWRs and PWRs.

15 MEMBER ARMIJO: Just a question. You
16 didn't mention ABWRs. Are they included as future?

17 MR. DUDLEY: I really couldn't answer
18 that. Are they certified? ABWRs are certified?

19 MEMBER ARMIJO: Yes, it's a certified.

20 MR. DUDLEY: The problem with a certified
21 design is that you can't change it and if an ABWR
22 wanted to come back in and change for recertification
23 or something like that, I would think they would
24 certainly have the same flexibility as these other
25 facilities. AP 1000 also, I believe, is certified.

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1 MEMBER CORRADINI: Certified meaning by a
2 current rule? I don't understand what the
3 certification change is into all of this.

4 MR. DUDLEY: Design certification has been
5 issued and it was done as a rulemaking so that design
6 is approved but frozen as a basis of that rulemaking.
7 So they can't really change those designs without
8 going back into a rulemaking or a licensing process.

9 VICE CHAIR WALLIS: Can we get back to the
10 question of water. It appears that if you relax these
11 requirements for large breaks you might not need so
12 much water. Now, AP 1000 is vulnerable to some
13 seismic considerations because of the huge water tank
14 that it has on its roof. And if they don't need so
15 much water, they don't need so much water up there.
16 They can change a lot of things about the whole design
17 which would make it more attractive or more --
18 withstand seismic better. It has those sorts of
19 effects, doesn't it?

20 MR. DUDLEY: There are significant
21 effects. The tentacles of this sort of a decision are
22 widespread. We're not here today to tell you that it
23 -- that AP 1000, USEPR, ESBWR are similar. All we're
24 saying is that they are potentially similar and --

25 VICE CHAIR WALLIS: And you're going to

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1 let them use a TBS.

2 MR. DUDLEY: No.

3 VICE CHAIR WALLIS: You're not?

4 MR. DUDLEY: No, what we're going to do is
5 we're going to allow in the final rule licensees who
6 believe they are similar to come in with an
7 application and explain to us in great detail why
8 they're similar, what aspects are similar and on what
9 basis they think they are similar. And we're also
10 going to allow those licensees in the final rule to
11 propose a TBS for their design that would result in a
12 similar effect as the current design specific TBS'
13 that have been specified in 50.46A for PWRs and BWRs
14 which are different. So we're going to allow
15 licensees to make their case and propose their TBS.

16 The rule does not say that that means they
17 can apply it. It means that if the NRC agrees that
18 they are similar after completing a design specific
19 review, of their basis for why they're similar and if
20 the staff agrees with their proposed TBS --

21 VICE CHAIR WALLIS: Well, you don't know
22 the criteria for a status in the TBS already. How can
23 you apply it to something else. I mean, the whole
24 sort of -- they're only similar on the basis of the
25 expert elicitation? Is that the basis? What else is

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1 there to justify it?

2 MR. DUDLEY: We -- again, licensees come
3 in, they make their case. The staff has to approve
4 number one, that the concept is indeed similar, and
5 number two that the TBS that they propose is --

6 VICE CHAIR WALLIS: Yeah, it's obviously
7 similar.

8 MR. DUDLEY: We have developed --

9 VICE CHAIR WALLIS: I mean, if they have
10 expert elicitation, it looks like the same kind of
11 piping, they're probably going to get approval.

12 MR. DUDLEY: Right. Well, we've developed
13 some general similarity characteristics. And these
14 are the ones that we've looked at. We're going to
15 have to -- licensees will have to make a case why --
16 that LOCA frequency versus pipe size for their
17 facility is similar to or bounded by the curves in the
18 expert elicitation. Licensees should probably give us
19 -- similarity would depend on the overall piping
20 configuration. Maybe some piping configurations are
21 such with maybe say a manifold and a lot of small
22 pipes, maybe a single pipe rupture is not -- would not
23 be a similar application.

24 Maybe you need to look at the rupture of
25 the manifold and maybe you get no credit because since

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1 the manifold could rupture, that's your double ended
2 guillotine break. We could conclude on the basis of
3 piping configuration that the facility design, a new
4 reactor design was not similar.

5 We also need to look at core --

6 VICE CHAIR WALLIS: Let's go back to this
7 -- I'm sorry, but this LOCA frequency is based on
8 piping configuration, isn't it? If the pipe is
9 longer, it has a higher frequency of failure; is that
10 right?

11 MR. DUDLEY: Well, I believe Rob Tragoning
12 has looked at those things. I believe that length of
13 the pipe is not so important. It has to do more with
14 numbers of elbows and numbers of welds.

15 VICE CHAIR WALLIS: Oh, places where it's
16 more likely to break?

17 MR. DUDLEY: Yeah, so, you know, those
18 will all be issues that are looked at. And it won't
19 be a decision made by any single individual. There
20 will be a multi-disciplinary review team put together
21 with systems folks and engineering folks and chemistry
22 and --

23 VICE CHAIR WALLIS: Now, the third bullet
24 is very interesting because I haven't really seen that
25 applied to the present rule at all.

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1 MR. DUDLEY: Well, what we're --

2 VICE CHAIR WALLIS: Why should you apply
3 it to new reactors?

4 MR. DUDLEY: What we're worried about is
5 that a licensee could come in with a new design and
6 design their facility with a containment that's not
7 large, robust and substantial as the containments that
8 we're comfortable with now. And those large, robust
9 containments give us significant margins for
10 protection against severe accident and we would look
11 very -- with great concern over a new facility design
12 that came in with an insubstantial containment that
13 would not give good protection and margins against
14 severe accidents.

15 And we might not -- again, that might be
16 another criterion we would use to determine that they
17 were dissimilar or not similar and wouldn't be allowed
18 to use 50.46A.

19 CHAIR SHACK: You need to move on.

20 MEMBER CORRADINI: Bill, one more
21 question.

22 CHAIR SHACK: Okay.

23 MEMBER CORRADINI: I guess I'm confused
24 because the containments are not -- unless I might be
25 wrong about this, so you correct me, but containments

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1 are not designed off of for severe accidents. They
2 may have been invented for that but all their criteria
3 for performability are essentially LOCA based.

4 MR. DUDLEY: LOCA, steam line break, other
5 design basis accidents.

6 MEMBER CORRADINI: Okay, and what I guess
7 I'm trying to unravel here is that so you're going to
8 look at things beyond the design base to determine if
9 these geometries are -- or these new plants are such
10 that you can consider them similar?

11 MR. DUDLEY: These are the factors that
12 we've been able to develop in a short period of time.
13 It may be when we're doing this multi-disciplinary
14 design specific review we uncover a new factor that is
15 also important and has a bearing on the decision. We
16 would not be constrained by the rule to applying any
17 group of factors. We can use whatever factors,
18 significant criteria we think we need to make this
19 determination.

20 MEMBER CORRADINI: Can I just follow up
21 with one other thing?

22 MR. DUDLEY: Yes.

23 MEMBER CORRADINI: The reason I asked it
24 back to the ECCS is because I'm just thinking out loud
25 and I could be wrong about this; if I had a power

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1 uprate and it had more -- no, never mind, I've
2 answered my own question. Thank you.

3 MR. DUDLEY: Okay, and as we -- as we gain
4 experience with this sort of thing, we'll have better
5 guidance and as soon as we get -- we will include
6 guidance to the extent that we can in the regulatory
7 guide, but we have to recognize that for reactors that
8 you haven't seen, you can't -- there is a real limit
9 to the accuracy of the criteria that we can develop
10 now and that we may have to very much rely on criteria
11 that we determine as a result of looking at the new
12 design.

13 MEMBER BANERJEE: I guess the most useful
14 thing about this rule would be -- one useful thing
15 certainly that they could -- if they knew it would
16 apply, design to meet the rule and get a lot of margin
17 out of it, credit out of it, you can see how this
18 could be applied to the new designs, if they knew it
19 would be applied.

20 MR. DUDLEY: A vendor or a licensee
21 starting with a clean sheet of paper has the maximum
22 flexibility. They can make the maximum amount of
23 changes from adopting 50.46A. Yet the staff's basis
24 for approving the existing 50.46A is that some of the
25 changes that licensees can make are limited by other

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1 factors. So we would not think that a new licensee
2 could come in with a blank sheet of paper and just run
3 wild with this thing and make tremendously different
4 changes. The --

5 MEMBER BANERJEE: But the major benefits
6 of this could come with the new generators of
7 reactors.

8 MEMBER APOSTOLAKIS: I mean, the whole
9 thing here rests on 1.174 and I don't see how that
10 could be applied to a new reactor. They would really
11 have to do something else, because all the changes, I
12 mean, you're asking them to keep track of the changes
13 and compare them to guidelines that --

14 VICE CHAIR WALLIS: No, George, they would
15 apply to the design of the ECCS itself.

16 CHAIR SHACK: Risk informed changes.

17 MR. DUDLEY: The risk informed acceptance
18 criteria.

19 MEMBER BANERJEE: For example, for the AP
20 1000, it could significantly impact the IRWST system,
21 how it's set up.

22 MEMBER CORRADINI: But I think what George
23 is saying though is true. Now, they've invented a
24 third category of accidents that's not a design base.
25 It's not a severe accident. And it's essentially

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1 controlled by both a design basis-like set of
2 calculations and a risk calculation that's
3 differential. And you have nothing to differentiate
4 against.

5 MEMBER APOSTOLAKIS: That's right, for the
6 new design, you don't have a base line.

7 MEMBER MAYNARD: But you do have a
8 baseline for certified design. Don't you have a
9 baseline for the certified designs? They may not be
10 the --

11 MEMBER APOSTOLAKIS: The ones that have
12 already been certified, you do but even that is not a
13 complete PRA because a lot of things are missing.

14 MEMBER MAYNARD: Okay, but it is a
15 complete sheet of paper.

16 MEMBER SIEBER: There's a lot of things
17 you don't know yet.

18 MEMBER APOSTOLAKIS: Yeah, exactly.
19 That's why they're missing, yeah, until you go to the
20 COL stage and so on. So I think it will take a little
21 more thinking how to apply this to a new design
22 because the rule right now refers to existing LWRs
23 that have been licensed. We have estimates of the CDF
24 and we are changing things and compare it with
25 acceptability limits and so on. But for a new design,

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1 you don't have any of that.

2 MR. DUDLEY: You make a good comment in
3 that the risk acceptance criteria in the existing rule
4 based on current reactors and if new reactors are much
5 safer, we would probably need different risk
6 acceptance criteria, would we not?

7 MEMBER APOSTOLAKIS: Also -- I'm sorry.

8 CHAIR SHACK: Let's move on.

9 MR. DUDLEY: It seems to me that we might
10 -- that's a good comment. Okay.

11 MEMBER APOSTOLAKIS: Finally, you got a
12 good comment.

13 MR. DUDLEY: Gary Hammer is going to talk
14 about the BWR transition break sense.

15 MEMBER APOSTOLAKIS: So this is the part
16 of the agenda that was supposed to be done an hour
17 ago.

18 CHAIR SHACK: Yes, yes.

19 MR. HAMMER: Good morning, I'm Gary
20 Hammer. We've been working on the TBS selection over
21 the last couple of years and we developed several
22 criteria that we wanted to use in order to make a
23 conservative selection. There was some discussion
24 earlier about the TBS becoming a design basis limit
25 and that's an important consideration because if

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1 you're doing that, then you do want this to be a
2 conservative limit because everything below that is
3 within the design basis and like setting all other
4 design basis limits, you want to consider
5 uncertainties and things like that.

6 But we started with the expert elicitation
7 estimates as a starting point at the 10^{-5} per reactor
8 year frequency and I think we made adjustments to
9 account for uncertainties and sensitivities within the
10 elicitation itself. There were uncertainties that the
11 elicitation panel estimated for their own estimates
12 and then there were sensitivities in how you aggregate
13 that data and we've had discussion with you fellows
14 before on some of those things.

15 VICE CHAIR WALLIS: This 10^{-5} came from
16 the Commission, didn't it?

17 MR. HAMMER: Yes.

18 VICE CHAIR WALLIS: Thank you.

19 MR. HAMMER: That was guidance from the
20 Commission. And then we --

21 MEMBER APOSTOLAKIS: Actually did the
22 Commission ever say whether this was intended to be a
23 mean value or they just gave you a value?

24 MR. HAMMER: I can't exactly remember.

25 MEMBER KRESS: It was a mean value.

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1 MR. HAMMER: I think we did start with a
2 mean value and then we looked at -- because we had
3 estimates for means and we have estimates for 95th and
4 all of those numbers.

5 MEMBER APOSTOLAKIS: But the ranges that
6 you called later really come from the fact that you
7 look at the mean and the 95th percentile and say this
8 is a range.

9 MR. HAMMER: Right.

10 MEMBER APOSTOLAKIS: I'm not sure that the
11 Commission intended this to be 95th percentile, but I
12 don't remember what it was.

13 MR. HAMMER: Like I said, the TBS becomes
14 a design basis limit. So that's the way we looked at
15 it was that we would consider significant
16 uncertainties and other things. On the third bullet,
17 there were other things that we also wanted to
18 consider, failure of mechanisms that the elicitation
19 did not or could not specifically consider such as
20 seismic loads, heavy load drops, other things that
21 tended to be plant specific, even things like active
22 LOCAs like stuck-open valves and things like that
23 where you could get significant types of LOCAs.

24 Then we wanted to look at what are the
25 actual configurations in the plants. You know you

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1 have these pipes that are very big pipes in the main
2 coolant LOOP and then you have smaller pipes attached
3 to those. Is there some logical demarcation that we
4 should consider with regard to that? Thinking about
5 the possibility what if you completely fail a pipe,
6 what does that represent and what does that look like?

7 Then we wanted to ultimately come up with
8 something that we felt like had regulatory stability
9 because the rule as it's proposed has in it a built in
10 mechanism where the NRC could change the TBS after
11 being reevaluated and we could impose that without
12 going through the backfit process in order to make
13 licensees adjust to the new TBS. So rather than go
14 through that process and have some iterative thing
15 where, no, we set it too high, no, we set it too low,
16 and so to speak make an unstable choice, we would
17 rather make something that was more conservative to
18 add some stability.

19 Okay. This is specifically about the
20 elicitation, a little more information about that.
21 When you consider the 95th percentile which we wanted
22 to do to address some uncertainty in the estimates and
23 then look at the different sensitivities in the way
24 the data is aggregated, for BWRs you come up with
25 approximately a range of numbers from 13 inches to 20

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1 inches in diameter. That would be a circular opening
2 equivalent and that considers like I said the 95th
3 percentile and then we looked at the geometric and
4 arithmetic --

5 VICE CHAIR WALLIS: Can I ask you about
6 that? I mean it may be reasonable that the attached
7 pipe will break but it's probably unreasonable on the
8 same basis to assume a 20 inch break in a main pipe.
9 It would be a different phenomenon, isn't it?

10 MR. HAMMER: But the estimates, Graham,
11 were a composite of all of these things.

12 VICE CHAIR WALLIS: Right.

13 MR. HAMMER: And so without further
14 parsing it --

15 VICE CHAIR WALLIS: They still have to
16 consider this partial break of the main pipe?

17 MR. HAMMER: Yes.

18 VICE CHAIR WALLIS: Because you might go
19 further and say the main pipe doesn't break at all but
20 you have to consider these attached pipes breaking.

21 MR. HAMMER: Right. Yes, we -- Your point
22 is well taken. Wells are typically circumferentially
23 oriented. So in order to get a break of this size --

24 VICE CHAIR WALLIS: You break a whole
25 pipe.

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1 MR. HAMMER: You would most likely break
2 it all the way around circumferentially and get that
3 kind of a break. So that was the reason why we wanted
4 to focus on the attached pipes. But the elicitation
5 estimates were also inclusive of these partial breaks
6 that you're talking about. So all that's mixed in and
7 it's kind of hard to separate.

8 MEMBER ARMIJO: In this elicitation, what
9 was a dominant mechanism that would cause these
10 failures? What did they use as the mechanism that
11 would trigger these failures?

12 MR. HAMMER: I see Rob has stepped to the
13 microphone. He's the expert.

14 MR. TRAGONING: Yes. Rob Tragoning from
15 Office of Research. A couple of pieces of
16 clarification.

17 MEMBER APOSTOLAKIS: We can't see you,
18 Rob. Can you move a little bit?

19 MR. TRAGONING: That's a function of the
20 microphone. I could have sat there, but I figured it
21 was safer behind everyone.

22 (Laughter.)

23 MR. TRAGONING: To clarify Professor
24 Wallis' comment about the partial breaks, again when
25 we did the elicitation it was primarily based on flow

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1 rate. You could have a full circumferential break of
2 a large reactor pipe and give you the equivalent flow
3 rate of a 20 inch double ended guillotine type break.
4 It would depend on how the pipes would separate and
5 the configuration and things like that. So when we
6 say partial it's good to keep in mind that we're
7 really saying partial with respect to being a double
8 ended guillotine break which is the worst possible
9 scenario for any given size piping.

10 And the second question to pick up over
11 here --

12 CHAIR SHACK: Didn't the elicitation also
13 conclude that, say, a six inch diameter break was more
14 likely to come from the failure of a six inch pipe
15 than is a six inch partial break in a 20 inch pipe?

16 MR. TRAGONING: In general, except for
17 BWRs where there was concern with BWRs with a lot of
18 the main LOOP piping where that piping had not been
19 replaced and even though there had been mitigation
20 measures that had been applied that the panel
21 universally recognized as being generally effective,
22 they still believed that even though they were
23 effective one of the major risk drivers for the BWR
24 frequency estimates were partial failures of the main
25 recirculation LOOP piping. However for PWRs and then

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1 smaller BWR breaks, that general rule of thumb or it's
2 more likely to have a complete break of a smaller line
3 than a partial break of a bigger line held true and
4 that that was usually the biggest risk contributor.

5 MEMBER ARMIJO: That doesn't answer my
6 question. My question --

7 MR. TRAGONING: I know. That was meant to
8 address Professor Wallis' question. So let me try to
9 address your question next in terms of what failure
10 mechanisms we looked at. We really -- I would argue
11 we looked at a whole suite of failure mechanisms in
12 that when we identified what we would be looking at we
13 identified through the various experts what were all
14 possible degradation mechanisms. Now these were
15 mechanisms that had been explicitly seen in operating
16 experience and some which had not been seen in the
17 operating experience but some of the experts felt
18 based on the materials, the conditions, the operating
19 parameters, that they were at least possible. So some
20 of the mechanisms just to list a few and we looked
21 certainty at intergranular stress corrosion cracking,
22 thermal fatigue, flow accelerator corrosion, PWSCC,
23 regular vibratory fatigue, typical overload mechanisms
24 which is a standard failure just due to again a water
25 hammer type of event and fabrication defects, weld

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1 repair defects, all those types of things that can
2 induce and that we have seen in the past have led at
3 least to failure precursors if not actual failures in
4 the past.

5 MEMBER ARMIJO: My question was what was
6 the dominant mechanism. Was there a dominant
7 mechanism?

8 MR. TRAGONING: For Bs or for Ps?

9 MEMBER ARMIJO: We're talking about Bs.

10 MR. TRAGONING: For Bs, the two dominant
11 mechanism were that largely came up were again
12 concerns related to IG SEC and general thermal
13 fatigue, that they were still the big risk drivers
14 even though again and I think the BWR Owners Group
15 pointed out in some of their comments that there has
16 been mitigation mechanisms that have been put in place
17 over the years to deal with both of those issues and
18 the experts certainly recognize that and accounted for
19 that. But they said even with those mitigated
20 mechanisms that they still were the dominant risk
21 drivers even though the frequencies were somewhat
22 reduced compared to historical 57.50 estimates.

23 MEMBER ARMIJO: My issue is that the
24 amount of credit provided for a lot of mitigation and
25 I haven't read the elicitation report. I'm going to

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1 do that, but it seems to me that there should have
2 been a huge benefit from the changes in the various
3 mitigation steps that were taken particularly the
4 water chemistry and I wanted to know how big a credit
5 was given for hydrogen water chemistry as well as the
6 other mitigation. Was it trivial? Was it
7 significant? It sounds like it was trivial credit.

8 MR. TRAGONING: No, not at all. It wasn't
9 trivial credit at all. There's a number of mitigation
10 measures that have been put in place for IG SEC and
11 including hydrogenated water chemistry, mechanical
12 stress improvement, BWR Owners Group though I'm sure
13 in lightness on can go into much more detail into all
14 of these.

15 But we discussed all of the mitigation
16 measures and I think 57.50 used a factor in that study
17 of a factor of 20 accounting for mitigation
18 mechanisms. If you compare the BWR LOCA frequency
19 estimates at the largest break size which is greater
20 than four inches, these frequencies are a factor of
21 three lower than the 57.50 estimates given a somewhat
22 similar operating experience base. So I would argue
23 that that factor of three is largely attributed to
24 additional credit from mitigation mechanisms that have
25 been put in place and we did actual probabilistic

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1 fraction mechanic studies to help anchor the
2 elicitation results which looked at the effect of --
3 We didn't look at the mitigation mechanisms, but we
4 looked at a few. For instance, we ran explicit cases.
5 Even though we used normal water chemistry, we ran
6 them with and without weld overlays to look at the
7 effect of that particular mechanism.

8 We had operating experience. We looked at
9 pre 1983 operating experience which certainly had a
10 prevalence of indications with respect to IG SEC and
11 then we looked at post 1985 operations experience
12 which also factors in the effect of mitigation and
13 when we gave the experts that service data, we made
14 sure that everyone was aware of all the differences,
15 all the things that had happened post 1985 and I can
16 tell you that all the experts that used that
17 information essentially based their estimations on the
18 post 1985 service data which again also implicitly
19 account for mitigating factors that have been put in
20 place since then.

21 MEMBER ARMIJO: Okay. I don't want to
22 belabor it but the most powerful that I think the BWR
23 has is the hydrogen water chemistry and that wasn't
24 introduced -- that was introduced after 1985. So I'd
25 like to -- I'll find out more how much operating

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1 experience you have since that time because the
2 mechanism basically of IG SEC gets turned off with the
3 right water chemistry. It's not a slight improvement.
4 It's a yes/no. It no longer can occur. So I want to
5 find out more about whether the experts had any
6 information to assess the mitigation by hydrogen water
7 chemistry.

8 MR. TRAGONING: Again, we printed out
9 precursor events as a function of time post 1985. So
10 that trending analysis was certainly available.

11 MEMBER ARMIJO: Okay.

12 MEMBER BANERJEE: I just have a question
13 about was such a study ever done a decade ago or two
14 decades ago. Are there any documented studies of this
15 nature done earlier than this last study?

16 MEMBER APOSTOLAKIS: You mean the
17 frequency of --

18 MEMBER BANERJEE: Yes.

19 MR. HAMMER: Frequency of occurrence of
20 breaks. Yes, there was WASH-1400 back as far as 1976
21 that estimated break frequencies.

22 MEMBER BANERJEE: And was there one which
23 did something similar like this expert elicitation and
24 things?

25 MR. HAMMER: Yes. Help me, Rob. I think

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1 expert elicitation was used in some seismic studies at
2 one point.

3 MR. TRAGONING: Yes. LOCA frequencies
4 have never been calculated for use by the agency using
5 this method. There were two prior studies that Gary
6 mentioned, WASH-1400 and the NUREG CR 57.50. But both
7 of them based their estimates on the available
8 operating experience data at the time and then 57.50
9 made various adjustments especially with respect to
10 BWRs to account for the fact that they wanted to
11 account for the effectiveness of the mitigation
12 measures that had been put in place again starting in
13 post 1985.

14 MEMBER BANERJEE: So if you compared these
15 studies, what were the most significant differences
16 between, say, the most recent one and this one that we
17 are talking about?

18 MR. TRAGONING: In terms of what?
19 Quantitative or qualitative?

20 MEMBER BANERJEE: In terms of probability
21 of failure for different sizes and things like that.
22 I'm talking a broad brush. I'm trying to understand
23 what has caused these differences. I mean it's
24 somehow related to Sam's question as well.

25 MR. TRAGONING: Essentially -- Let me use

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1 57.50 because that's the latest prior study to this
2 one. Essentially the elicitation, the medium break
3 mean frequencies were higher for the expert
4 elicitation than they were in 57.50 by a factor of two
5 or so.

6 MEMBER BANERJEE: The most recent study is
7 higher.

8 MR. TRAGONING: Just for medium breaks.
9 Things less than -- Partial breaks or breaks less than
10 three inches in effective diameter. For the large
11 break greater than four inches and higher, they are
12 about a factor of three or more lower than 57.50. And
13 57.50 did not discretize (sic) and go beyond six
14 inches. We explicitly looked at frequencies all the
15 way to effectively a double ended guillotine break.
16 So it's not really fair to make direct comparisons
17 with 57.50 because their biggest break size was
18 essentially greater than a four to a six inch break.
19 If I compare just the break size, it's a factor of
20 three lower.

21 MEMBER BANERJEE: This 57.50 now, all
22 these experts, would they have predicted Alloy 600
23 cracking?

24 MR. TRAGONING: We --

25 MEMBER BANERJEE: In that last expert

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1 elicitation?

2 MR. TRAGONING: You mean 57.50?

3 MEMBER BANERJEE: Right.

4 MR. TRAGONING: 57.50 was not an expert
5 elicitation.

6 MEMBER BANERJEE: It wasn't? Well, take
7 one. Would they have predicted Alloy 600 cracking?

8 MR. TRAGONING: 57.50 was based on
9 precursor operating experience information that was
10 available up to 1995 essentially when that study was
11 done.

12 MEMBER BANERJEE: But these studies, the
13 expert elicitation is there because in some way
14 they're supposed to have some predictive capability.
15 Right?

16 MR. TRAGONING: Yes.

17 MEMBER BANERJEE: Otherwise, it's not
18 science. We have to predict things. Did anybody
19 predict Alloy 600 cracking before?

20 MR. TRAGONING: You're asking me to go
21 back to the 1995. I mean Alloy 600 cracking is --

22 MEMBER BANERJEE: Whatever.

23 MR. TRAGONING: When the elicitation was
24 done, I mean it was certainly known at the time.

25 MEMBER BANERJEE: Yes, but before it was

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1 known. Was it predicted?

2 MR. TRAGONING: I could have been.

3 MEMBER BANERJEE: It could have been.

4 MR. TRAGONING: I think a materials person
5 would have expected Alloy 600 to crack based on its
6 experience in steam generator tubing.

7 MEMBER BANERJEE: It could have gone into
8 the prediction of the frequency of the break.

9 MR. TRAGONING: And 57.50 was a statistics
10 based one with an extrapolation on diameter, an
11 empirical correlation to let you extrapolate on
12 diameter which is a backdoor expert elicitation for
13 the effective diameter. But it really wouldn't have
14 included Alloy 600 very much. But I think we're going
15 to have to move on a little bit here.

16 MR. HAMMER: Yes. I may point out that,
17 Rob, you're going to come back and make a presentation
18 specifically on the elicitation in a couple of weeks.

19 MR. TRAGONING: Yes.

20 MEMBER BANERJEE: Oh really. Where at?
21 To us?

22 MEMBER APOSTOLAKIS: Haven't we heard
23 about it already?

24 MEMBER SIEBER: No.

25 MR. TRAGONING: We've talked about it a

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1 lot, but I think the thing we haven't discussed, the
2 thing that we need to come back to discuss, is we've
3 gotten public comments. So we haven't been back to
4 the committee to discuss the public comments and the
5 resolution of those comments.

6 MEMBER APOSTOLAKIS: That would be a
7 subcommittee meeting again.

8 MR. TRAGONING: That would be -- I think
9 it's -- I believe it's planned as a subcommittee
10 meeting.

11 MR. THORNSBERRY: It's been floating along
12 with the regulatory guide. When the regulatory guide
13 comes, we're planning on looking at the expert
14 elicitation all at the same time which was going to be
15 last we've heard was in the spring.

16 MEMBER APOSTOLAKIS: Wow.

17 MEMBER ARMIJO: Is that going to be this
18 subcommittee or is it going to yours?

19 MEMBER APOSTOLAKIS: Your subcommittee or
20 mine?

21 MR. THORNSBERRY: It will be a combined
22 one probably between the PRA subcommittee and this
23 one.

24 MR. TRAGONING: That's what we've done in
25 the past.

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1 MEMBER BANERJEE: Can we have the report
2 well in advance at least?

3 CHAIR SHACK: You have the NUREG -- or at
4 least a draft.

5 MEMBER APOSTOLAKIS: The main report we
6 have. Right?

7 MR. THORNSBERRY: Yes, it's available. If
8 you don't have one, I'll get you one.

9 VICE CHAIR WALLIS: What does the public
10 have to say about an expert elicitation? An expert
11 elicitation is a product of the experts and the public
12 has nothing to do with it.

13 MEMBER APOSTOLAKIS: Wait a minute. I
14 think there is a misunderstanding here. When you
15 assemble a group of experts, basically what you want
16 to know is what is the current state of the art. I
17 don't think you should be using what is predictive.
18 They're coming in there. They're looking at all the
19 available evidence and they're saying this is what we
20 know now. Now whether we're surprised three months
21 later, these are the guys who take care of it. That's
22 why they take the mean, the 95th percentile, and they
23 add margin.

24 MEMBER BANERJEE: They should triple it
25 then. Right?

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1 MEMBER APOSTOLAKIS: Whatever. Triple.
2 Quadruple. It's up to them. But the experts are
3 telling you this is what the state of the art is now
4 and if you disagree with us, tell us where you
5 disagree and they go through PR reviews. They go
6 through all. So in that context, it seems to me that
7 it's a very reasonable thing to do. Otherwise, you
8 don't really know the state of the art.

9 I mean they had a guy there who had
10 participated very actively in the Swedish collection
11 of data. All that was there in the expert
12 elicitation. They had people who used probabilistic
13 fraction mechanics. Other people used operating
14 experience. It was really an amalgamation of
15 everything that's available.

16 MEMBER BANERJEE: Yes, the problem taking
17 rare events.

18 CHAIR SHACK: We have to move on.

19 MEMBER APOSTOLAKIS: That's the problem
20 and that's why NRR adds margin.

21 MEMBER BANERJEE: And unfortunately these
22 rare events --

23 MEMBER APOSTOLAKIS: But it's not the
24 fault of the experts or anything. I mean this is what
25 we know now.

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1 VICE CHAIR WALLIS: Or we think we know.

2 MEMBER APOSTOLAKIS: In that context, it
3 makes sense. When are we going to hear from the
4 owners group?

5 CHAIR SHACK: If we let these guys finish.

6 MR. HAMMER: I'll try to do that.

7 CHAIR SHACK: During lunch.

8 MEMBER APOSTOLAKIS: We know what they're
9 going to say.

10 MR. HAMMER: So at any rate, those were
11 the frequency ranges, the sizes, the size range, 13 to
12 20 inches. And we looked at the piping in BWRs,
13 typical BWRs and those sizes are approximately the
14 sizes of the largest attached feedwater and residual
15 heat removal lines inside of containment which connect
16 with the reactor coolant system. They're Class 1
17 piping and they're typically 18 to 24 inches and then
18 if you look at the ID which we're really using since
19 the rule is based on the inside diameter dimension for
20 the TBS, you get something that's even closer, 16 to
21 21.5 inches in inside diameter.

22 And then if you look at breaks that would
23 be much larger than that or let's just say larger than
24 these, you would have to break a significantly larger
25 pipe, that being the large recirculation piping which

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1 has a significantly lower frequency of occurrence. So
2 it looked like that was a reasonable demarcation to
3 us.

4 And we, like I said, looked at the pipes
5 and there you see a survey that we did of the various
6 pipe sizes with the databases that we had available to
7 us and you can see there the feedwater and the RHR are
8 similar in size. One may be a little bigger than the
9 other, but they all come up in that size range.

10 We did receive some public comments on the
11 BWR TBS. We received a comment from Dr. Hochreiter at
12 Pennsylvania State University who did his own study of
13 the -- quite a large report that he submitted to us
14 which indicated in his view point that the break
15 frequencies appeared to be larger than the expert
16 elicitation estimates and he also premised some of his
17 estimates on what he thought was reasonable which was
18 that leaks really should be treated as breaks because
19 a leak is going to lead to a break eventually.

20 We looked at his study. We didn't think
21 that the break frequency did look like it was
22 significantly greater than the expert elicitation. So
23 we couldn't go along with that and regarding whether
24 or not leaks should be treated as breaks, we've held
25 a position for some time that you have to have

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1 significant additional degradation before a leak
2 actually becomes a break.

3 MEMBER BANERJEE: So a leak is not
4 considered a break and is not put into your frequency?

5 MR. HAMMER: Ask that again. What?

6 MEMBER APOSTOLAKIS: A leak is not a
7 break, is it?

8 MEMBER BANERJEE: You don't consider in
9 your database where you derive the frequencies for
10 different break sizes. Leaks are taken out of that
11 database? Somebody told me it was statistical what
12 you did. Right?

13 MR. HAMMER: Right.

14 MEMBER BANERJEE: So leaks are not breaks
15 then.

16 MR. HAMMER: That's true.

17 MEMBER BANERJEE: How do you distinguish
18 between a leak and a break?

19 MR. HAMMER: I think there's a cutoff.
20 Can you help me with that a little bit?

21 MR. TRAGONING: Yes. We did consider
22 leaks because leaks are precursors to failures. So
23 they were -- In fact, that's a very important thing.

24 MEMBER BANERJEE: Oh, they are. I'm
25 confused by what he's saying.

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1 MR. TRAGONING: But the threshold for the
2 elicitation was we only considered failures that would
3 result in a flow rate loss of primary coolant of
4 greater than 100 GPMs which has been typical small
5 break LOCA thresholds that we've used historically
6 here in the agency. So breaks that would be less than
7 that, either a smaller diameter line or a partial
8 failure of a bigger line that will give you less flow
9 rate were not considered to be LOCAs in this exercise.

10 MEMBER BANERJEE: Were not put into the
11 statistical analysis.

12 MR. TRAGONING: The database again --

13 MEMBER BANERJEE: The database contained
14 it but it did not enter the statistical analysis that
15 you did.

16 MR. TRAGONING: They were treated as
17 precursors but they're not treated as LOCAs.

18 MEMBER BANERJEE: Just to give me an idea,
19 what was the frequency of these precursors compared to
20 the smallest break that you considered?

21 MR. TRAGONING: You would have to look at
22 the degradation mechanism, but the frequency of
23 precursor might be, and this is off the top of my
24 head, a couple orders of magnitude higher.

25 MEMBER BANERJEE: We would be very

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1 interested to see this report and maybe Hockreiter's
2 comments as well.

3 MEMBER CORRADINI: I don't understand the
4 comment as you summarize it, I guess.

5 MEMBER APOSTOLAKIS: Yes. This doesn't
6 make sense to me either. Break frequencies appear to
7 be larger than expert elicitation estimates. Which
8 frequencies are these?

9 MR. HAMMER: He developed a relationship
10 similar to the expert elicitation curve that his curve
11 was above ours. In other words, he picked --

12 MEMBER APOSTOLAKIS: So his estimates?

13 MR. HAMMER: Right. He came up with his
14 own estimates of what those datapoints are.

15 MEMBER BANERJEE: And I guess he
16 considered leaks as breaks and if their frequencies
17 were two orders of magnitude higher it made a
18 significant difference.

19 MR. HAMMER: It makes a significant
20 difference in how --

21 MEMBER BANERJEE: Yes. It depends on
22 where you put the cutoff in some way as well. All
23 right. It will be interesting to look at the whole
24 thing.

25 MEMBER SIEBER: We have Hochreiter's

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1 report. Right?

2 MR. HAMMER: Yes. We have the PSU study
3 if you'd like to --

4 MEMBER SIEBER: Yes, I think we reviewed
5 this a couple of years ago.

6 MEMBER BANERJEE: I think we should get
7 everything.

8 MEMBER APOSTOLAKIS: They considered in
9 the expert -- As I remember, they showed us a table
10 what they had as a continuum of flow rates.

11 MR. HAMMER: Right.

12 MEMBER APOSTOLAKIS: And then they
13 discritized (phonetic) those to define small, medium
14 and large and so on.

15 MR. TRAGONING: Including below the
16 threshold. Dr. Banerjee, that information is in the
17 report.

18 MEMBER BANERJEE: Yes.

19 MR. TRAGONING: And I would suggest --
20 When we come back and discuss --

21 MEMBER BANERJEE: Have the precursor
22 frequencies and everything.

23 MR. TRAGONING: And I think what might be
24 effective because there is a number of new members
25 when we plan for this meeting or this next

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1 subcommittee meeting, we'll meet with Dr. Shack and
2 Dr. Apostolakis and figure out the right level of
3 background material that we need to revisit to make
4 sure everyone's brought up sufficiently up to speed.

5 MEMBER BANERJEE: Right, and in particular
6 we'd like to see the reports in advance. Maybe --

7 MEMBER APOSTOLAKIS: The report is
8 available.

9 MEMBER BANERJEE: Well in advance.

10 MR. TRAGONING: The report has been
11 available for a year.

12 MEMBER APOSTOLAKIS: Has been available
13 for a long time. So maybe, Eric, you can provide
14 that.

15 MEMBER BANERJEE: And the names of the
16 experts and everything.

17 MEMBER APOSTOLAKIS: Yes.

18 MR. TRAGONING: On the report. It's on
19 the report.

20 MEMBER APOSTOLAKIS: What they ate for
21 lunch, Sanjoy, is there.

22 MEMBER BANERJEE: You have know this is a
23 very serious matter.

24 MR. TRAGONING: It's a fairly detailed
25 report. So after perusing that if there are questions

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1 we can --

2 MEMBER APOSTOLAKIS: I do believe though,
3 Rob, that calling it expert opinion elicitation is a
4 misnomer and I saw that in the quadripartite meeting
5 with the foreign advisory committees. Some other name
6 would probably be more appropriate like an assessment
7 of the state of the art or something like that.

8 MR. TRAGONING: Okay.

9 MEMBER APOSTOLAKIS: Because people think
10 when you say the experts, hey, Mike what do you think?
11 10^{-4} . Good. And I put it on. That's not what
12 happened. That was a very detailed evaluation.
13 People did analyses. It was not just a I think it's
14 this and I think calling it expert opinion elicitation
15 does not do justice to it.

16 VICE CHAIR WALLIS: Expert evaluation
17 then.

18 MEMBER APOSTOLAKIS: Evaluation of the
19 expert of the state of the art.

20 (Off the record discussion.)

21 CHAIR SHACK: Can we move on?

22 MEMBER APOSTOLAKIS: No, but that has been
23 a problem, a continuing problem.

24 CHAIR SHACK: That's a problem. I agree.

25 VICE CHAIR WALLIS: Let's move on though.

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1 It's been accepted. So let's move on.

2 MEMBER KRESS: Get the report and read it
3 and we'll feel better.

4 MEMBER BANERJEE: And it's never gone to
5 the National Academy or the NRC or anything.

6 MEMBER APOSTOLAKIS: There was a PR review
7 that was done.

8 MEMBER BANERJEE: Oh, they did that?

9 MEMBER APOSTOLAKIS: Yes.

10 MEMBER SIEBER: Yes. That was the first
11 class job.

12 MEMBER APOSTOLAKIS: It was a pretty
13 expensive proposition.

14 MR. HAMMER: And we have some comments
15 from the BWR Owners Group who's with us here today who
16 will come on a little later.

17 So I'm going to summarize what we --

18 PARTICIPANT: They may not get a chance.

19 MR. HAMMER: They felt like, if I
20 understood the comment correctly and they can explain
21 further, that we shouldn't consider it a feedwater
22 piping and that the size should be based on a 16 inch
23 diameter circumferential opening in the residual heat
24 removal line and they wanted to apply that uniformly
25 to all BWRs which was a little different way than what

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1 we had done because we had felt like we wanted to
2 consider all of the attached pipes because we felt
3 like a likely way for the break to occur is with a
4 complete break of that size pipe. So we gave
5 consideration to all the pipes in that frequency range
6 which appeared to be these two pipes, feedwater and
7 RHR, without regard to which one may be more limiting
8 in the LOCA analysis.

9 We should note that we were also, in
10 selecting the largest feedwater and RHR pipes, that 18
11 to 24 inch range that you get when you select those
12 two, you will bound the complete break of a smaller 12
13 inch recirculation pipe and the 12 inches is of course
14 smaller, having a larger frequency of occurrence than
15 either of these. So we wanted to bound that and if
16 you break that 12 inch pipe you get a double ended
17 discharge. So if you do the math, 1.4 times 12, you
18 get something like 18.

19 Another comment from the BWR Owners Group
20 was that we didn't give proper credit for the
21 mitigation programs. We had significant discussion
22 about that a little earlier. I'm just going to skip
23 over that. And that's it.

24 MEMBER APOSTOLAKIS: Wow. You managed to
25 take us to the end.

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1 (Off the record comments.)

2 MR. BUNT: Thank you all. I want to thank
3 you all for letting us come. I'm Randy Bunt, the
4 current BWR Owners Group Chairman and we have two
5 other experts here that will be talking for most of
6 the rule, Tony Browning who is our Committee Chairman
7 for the Option 3 which is the other proposed rule that
8 we have that's been mentioned several times this
9 morning and Fran Bolger from GE who does our thermal
10 hydraulic issues.

11 I'm going to briefly go over the
12 introduction and then turn it over to these gentlemen
13 to talk in detail. One is that we are pleased that
14 the rulemaking has gone as far as it has and that we
15 are getting toward the end or conclusion. However, we
16 also want to bring about that the way it's currently
17 written there will be very little BWRs that will take
18 advantage and use this rule. So we think that the
19 effectiveness will not be as expected from the rule.
20 We do feel some very minor changes could be applied and
21 it would be effective and be implemented by most of
22 the BWRs. Tony.

23 MR. BROWNING: This is Tony Browning.
24 Again, I'm representing the BWR Owners Group Option 3
25 Committee as Chairman. That's the group that put

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1 together the topical report that was referred to
2 earlier by Dr. Shack on separation of LOOP and large
3 break LOCA where we've done extensive work already in
4 both risk and thermal hydraulic space to demonstrate
5 the benefits of that program.

6 Today we're going to talk primarily about
7 the thermal hydraulic analysis. It's good to hear
8 that we're going to have an opportunity maybe perhaps
9 to come back in the near future and discuss the
10 materials issues in more depth. Because of the
11 brevity of what we're going to talk about today, we're
12 going to cut out that part of the presentation and
13 defer it to another day and give most of the time to
14 Fran to talk about the thermal hydraulic work that
15 we've done which is new work that the staff has not
16 seen yet.

17 Again, we're recommending to make this a
18 useable rule for the BWR so that we do need to lower
19 the TBS and what I want to say here is that we're not
20 very far apart. I mean we're not miles apart between
21 what the staff has recommended and what the owners are
22 looking at. We're incrementally getting closer to
23 each other and we just need to nudge a little more
24 closer and one of the things we want to consider --

25 VICE CHAIR WALLIS: What are we reviewing?

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1 Are we reviewing the staff TBS or your TBS or you have
2 a choice on TBS?

3 MR. BROWNING: We are proposing -- The
4 staff's TBS is on record. We have commented on that
5 rule. We've provided alternative language that's been
6 reviewed earlier.

7 VICE CHAIR WALLIS: Are you going to
8 propose a number?

9 MR. BROWNING: Yes, we do. All right. We
10 believe that that definition does several things.
11 One, it removes what we consider to be unnecessary
12 conservatism that's been applied to the elicitation,
13 some of the things that Dr. Armijo was referring to
14 earlier about proper credit for hydrogen water
15 chemistry, thermal fatigue, etc., and again we'll talk
16 about those on another day.

17 Demonstration of safety benefits, one of
18 the things that we've taken to heart is some of the
19 guidance that the ACRS made earlier back to the staff
20 and to the Commission that says look carefully at the
21 TBS and make a proper balance between what you decide
22 in this rule and that you can get true safety benefit
23 out of it. We've taken that to heart. We've tried to
24 look at carefully and say in order to derive what we
25 consider to be enough safety benefit to make this

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1 implementable for boilers on a cost/benefit basis, we
2 need to drive this TBS a little bit lower and we'll
3 show that result in a second.

4 And also to be frank, the plain language
5 standard comes into play here. We've struggled in the
6 owners group trying to understand this definition of
7 TBS, how it would be applied not having seen the reg
8 guide yet. There are a number of things that come
9 into play here. The "or" between the feedwater or RHR
10 piping, one of the things that we'll talk about
11 shortly is there's a presumption apparently on the
12 staff's part that RHR piping in a plant is all one
13 size. That's not the case which introduces one level
14 of confusion.

15 When you talk to analysts such as Fran
16 trying to compare a feedwater pipe break to an RHR
17 pipe break, you get radically different results. So
18 there we're trying to balance out again what are you
19 trying to optimize here. Are you looking at it from
20 a fraction mechanic's perspective or because this is
21 50.46 in the LOCA rule, are you really trying to skew
22 it to the thermal hydraulic side and try and get a
23 conservative result?

24 VICE CHAIR WALLIS: Do you have a measure
25 of these safety benefits?

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1 MR. BROWNING: Yes, we do.

2 VICE CHAIR WALLIS: Is it in terms of CDF?

3 MR. BROWNING: No, it's in terms of delta
4 PCT.

5 VICE CHAIR WALLIS: How is that related to
6 safety?

7 MR. BROWNING: Because we're going to
8 maintain the existing margins and we'll talk about
9 that.

10 VICE CHAIR WALLIS: Oh, you haven't gotten
11 any benefit. You just haven't gotten any loss.

12 MR. BROWNING: The topical report that's
13 on the docket covers a number of these same changes
14 and while we could debate the incremental improvement
15 in safety that may be derived there under the PRA
16 analysis that was done, there are some other factors
17 that go into that that make those numbers look rather
18 small that need to be considered.

19 VICE CHAIR WALLIS: Safety benefit to me
20 means something better than you had before.

21 MR. BROWNING: Correct. An improvement in
22 overall ability of diesel generators is the first
23 thing that comes to mind.

24 VICE CHAIR WALLIS: But that -- Yeah,
25 okay. That's not a safety measure. That's just

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1 something which might influence safety. Is it 10^8 or
2 something on CDF? Did I hear that from my chairman
3 here?

4 MR. BROWNING: Yes. But there are some
5 other things about that evaluation that need to be
6 taken into consideration one of which was that we made
7 an assumption in that PRA that all large break LOCA
8 LOOPS went straight to core damage with a factor of
9 one and then we worked backwards from that point. So
10 when you see 10^{-8} it's really -- the improvement in
11 safety is a bigger number than that if you took it on
12 its own merit and said while there is a probably that
13 some large break LOCA LOOPS would still continue to be
14 mitigated, that that was a conservatism that we did in
15 that calculation.

16 VICE CHAIR WALLIS: But if it were a
17 safety benefit 10^{-4} , 10^{-5} or something, we might jump
18 up and cheer. But if it's 10^{-8} I have a little
19 difficulty knowing what to do.

20 MR. BROWNING: Risk neutral. How about
21 that?

22 VICE CHAIR WALLIS: Well, that's very
23 different from benefit.

24 MR. BROWNING: Well, safety benefit can be
25 manifested in a number of ways other than CDF.

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1 MEMBER APOSTOLAKIS: But, it's also true,
2 Graham, that not -- that all the risk informed changes
3 that have been approved in the past were not done
4 because it was a safety benefit. We just said that
5 the penalty you pay on the safety side is so small
6 that it's worth granting them the flexibility or --

7 VICE CHAIR WALLIS: Okay, but I keep
8 hearing about safety benefits. If there's going to be
9 an argument, there needs to be an argument.

10 MEMBER APOSTOLAKIS: You're right, you're
11 right but it doesn't have to be a clear safety benefit
12 to grant this. You're just eliminating unnecessary
13 burden is another way of putting it. That's not true?

14 MR. BROWNING: Yes.

15 MEMBER APOSTOLAKIS: Oh, I thought you
16 said it's not true.

17 MR. BROWNING: No, no, it's perspective.
18 Again, as we've talked about before, both the NUREG
19 and the proposal were published for comment. The
20 owner's group has commented both times and again,
21 that's why we're here again today is to continue that
22 dialogue. One of the things that bothered us about
23 the elicitation result was that this apparent lack of
24 credit, our opinion, of mitigation of these failure
25 mechanisms that were brought out in the elicitation of

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1 IGSCC, FAC and thermal fatigue.

2 One of the things that's not recognized,
3 of course, is that we've formed the BWR vessel
4 internals program in 1994 which is in great measure
5 been to deal with these material issues and has
6 successfully done so and the operating experience
7 today has proven that. We have over 20 years of
8 operating experience with a lot of these mitigation
9 features in place with no further evidence of further
10 degradation. We're not here to challenge the
11 elicitation on its own right but we do want to point
12 out our opinion there's excess conservatism been
13 applied and we'll show you that in a second.

14 MEMBER APOSTOLAKIS: Is it really lack of
15 credit or lack of sufficient credit because Rob just
16 told us that they did take into account.

17 MR. BROWNING: Sufficient credit. One of
18 the things that we've noticed as we've gone through
19 this process is what we refer to as the evolution of
20 the TBS. First, you started out with the elicitation
21 of the mean values of trying to find a break size that
22 was equivalent to roughly $1E^{-5}$ which is what the
23 Commission proposed and you get a range of break sizes
24 out of the elicitation of roughly six to 14 inches.
25 You apply the 95th percentile to that and it raises it

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1 obviously the numbers up to the 13 to 20-inch ranges
2 which we've been discussing, but then the staff came
3 along and said, "Okay, now we're going to apply these
4 uncertainties to these failure mechanisms that weren't
5 considered such as seismic, heavy loads, those other
6 things and then they skewed it to the upper end of the
7 20 inches."

8 Now, this is where we start to deviate
9 from the staff's opinion a little bit. So then they
10 went on and said, "Okay, now we're going to modify the
11 rule language and say it's going to be the larger of
12 feedwater or RHR piping inside containment." Well,
13 when we look at it, the typical BWR 4 which comprises
14 most of the fleet of operating BWRs in this country,
15 the TBS for those plants will be 24 inches which is
16 outside the range of what's been proposed. We're
17 saying, "You gone too far, you've pushed it too far.
18 We need to come back closer to where the elicitation
19 drove us including proper consideration for these
20 uncertainties".

21 Again, when we commented on the rule, we
22 proposed alternative language. We just didn't
23 criticize. We said, "Here's what works for us and
24 we're prepared to come in and demonstrate why we
25 believe this is an effective rule". And what we asked

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1 for was an equivalent size to the internal diameter of
2 a 16-inch Schedule 80 pipe which, as we were all
3 trying to get to, is what was the break flow and a
4 break size of 1.177 square feet and we proposed it to
5 be in the residual heat removal system on the shutdown
6 cooling suction pipe which is from our experience
7 doing LOCA analysis is the worst location in the
8 research system and where to put it is on the suction
9 side of the pump.

10 CHAIR SHACK: That's roughly, what, like
11 a 13-1/2 inch break?

12 MR. BOLGER: About 14, I would say.

13 CHAIR SHACK: Fourteen one inch on a
14 Schedule 80.16. Yes, that's about right.

15 MR. BOLGER: Right. 1.77 square feet.

16 MR. BROWNING: Our considerations were a
17 fixed size and a fixed location, something that was
18 clear and understandable to everybody, no
19 interpretation. It was the benefits, again we
20 considered --

21 MEMBER BANERJEE: Excuse me. I just
22 wanted to ask you if it was a feedwater line break is
23 it a more difficult accident to cope with.

24 MR. BROWNING: Actually just the opposite.
25 It's one of the easier ones.

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1 MEMBER BANERJEE: So you could have
2 either. Right?

3 MR. BROWNING: As long as --

4 MEMBER BANERJEE: What would be the
5 difference?

6 MR. BOLGER: This is Fran Bolger from GE.
7 The way the rule is written in the interpretation is
8 that let's say the largest pipe is 24 inches and
9 happens to be a feedwater pipe, that that 24 inch
10 would then be applied to the recirc line as the size
11 of the break on the recirc pipe.

12 MEMBER BANERJEE: Oh, I see.

13 MR. BROWNING: It's not the actual break
14 of the feedwater pipe.

15 VICE CHAIR WALLIS: The amount of debris
16 that it makes depends on where it is, not how big it
17 is, particularly for PWR, but you also have debris
18 from insulation and stuff.

19 MEMBER BANERJEE: But BWRs are not
20 particularly challenged by the --

21 VICE CHAIR WALLIS: But they are. They're
22 the only ones that had problems --

23 MEMBER BANERJEE: The debris is a separate
24 issue but I'm saying with regard to the break itself.

25 MR. BOLGER: We'll discuss what's the

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1 limiting breaks in the BWRs in the next few slides.

2 MEMBER BANERJEE: All right.

3 MEMBER APOSTOLAKIS: So essentially what
4 you're saying then is that if you use the 10^{-5} guidance
5 from the Commission as a mean value, you get the range
6 of six to 14 inches and you are adding two inches for
7 things that they haven't thought of.

8 CHAIR SHACK: No. It's 14 because the six
9 to 14 is break size as whole size. So these internal
10 diameters is 14.

11 MEMBER APOSTOLAKIS: Right. And he's
12 making it 16.

13 CHAIR SHACK: No. A 16 inch diameter pipe
14 with a 14 inch hole.

15 VICE CHAIR WALLIS: Sixteen inch is the
16 outside diameter or the nominal diameter.

17 (Several speaking at once.)

18 VICE CHAIR WALLIS: It's not even exactly
19 16 inches.

20 MEMBER APOSTOLAKIS: Wait a minute. It
21 says equivalent in size to internal diameter of a 16
22 inch Schedule AD pipe.

23 MEMBER CORRADINI: A schedule AD pipe is
24 not 16 inches inside though, George.

25 MEMBER APOSTOLAKIS: Oh.

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1 MEMBER CORRADINI: It's a thick pipe.

2 CHAIR SHACK: It's a thick pipe.

3 PARTICIPANT: It's the opening that
4 counts.

5 MEMBER CORRADINI: It's 1.177 square feet.

6 CHAIR SHACK: But it's close to the upper
7 end.

8 MEMBER CORRADINI: Right.

9 MR. BROWNING: And what we were trying to
10 get to was really, Dr. Apostolakis, the mid range of
11 the 95th percentile is really what was driving our --

12 MEMBER BANERJEE: I guess the implications
13 of this will become clear when you talk about the
14 thermal hydraulic analysis because I don't understand
15 the implications at the moment.

16 MR. BROWNING: Right and that's why we're
17 here to talk about that and again we'll belabor the
18 term "safety benefit" but as shown by the current
19 Appendix K methods, we didn't go off and use best
20 estimate. We used current Appendix K modeling and the
21 metric that we were using was no significant increase
22 in current peak clad temperature from the DBA or we
23 were not going to cut into that model. And what we're
24 going to show is that with the properly sized TBS we
25 can delay ECCS injection which is a cumulation of both

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1 slowing down the diesel generator and you could also
2 use it for valve stroke time on ejection valves and
3 also to look at reduced requirement for the hardening
4 of certain ECCS loads which is also a benefit to the
5 diesel generator. We're not proposing that we remove
6 any ECCS pumps. We make them manually initiated.

7 VICE CHAIR WALLIS: This is no
8 considerable increase in current PCT for pipes with a
9 size below a certain amount?

10 MR. BROWNING: Right. Where we started --

11 VICE CHAIR WALLIS: This last one
12 describes only for pipes below the pipe size you've
13 selected, is that right?

14 MR. BROWNING: We will show you shortly.

15 MR. BOLGER: That's correct.

16 MR. BROWNING: We're going to cut right
17 into the chase here and let Fran take over on how we
18 can start to this analysis and then you can see how we
19 went through the process.

20 VICE CHAIR WALLIS: Or you could go back
21 to the pipe size you want by saying what the pipe size
22 has to be in order not to get above the ECC criteria.

23 MR. BROWNING: Correct.

24 VICE CHAIR WALLIS: Then you could justify
25 that.

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1 MR. BROWNING: Right, and you'll see that
2 shortly.

3 MEMBER BANERJEE: That's more or less what
4 you're doing. Let's see.

5 MR. BOLGER: Just a brief introduction on
6 the GE safer process or methodology, we employ kind of
7 a dual methodology where we use Appendix K assumptions
8 as a bounding analysis and then we also do an upper
9 bound analysis. Most plants are limited by the DBA
10 large break. There are some plants that are limited
11 by small breaks and generally they are less than 0.1
12 square foot. Just to note that for breaks on the
13 discharge size, the break area is limited by the
14 nozzles on the jet pump as well as on the I of the
15 pump.

16 As far as intermediate breaks, I just
17 wanted to note that the benchmarking of the safer
18 process has been oriented toward DBA type large
19 breaks, guillotine size and we feel we would need to
20 do benchmarking over our code against track which is
21 part of our standard track methodology. When we
22 develop our upper bound outers, we compare safer
23 against track.

24 MEMBER BANERJEE: Track G, right?

25 MR. BOLGER: Track G. That's correct.

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1 All right. With respect to what is the limiting
2 break, the main steamline and the feedwater line
3 breaks are not limiting for BWRs. In these type of
4 breaks, the break location is above the core. The
5 core is only covered briefly. We quickly restore the
6 level and the resulting PCTs are less than what we see
7 for the small breaks which are these less than 0.1
8 square foot type breaks. So they would not be
9 limiting with any definition of the TBS.

10 VICE CHAIR WALLIS: With the present
11 assumptions or with the relaxation of the assumptions?

12 MR. BOLGER: Even with relaxation of ECCS
13 systems or changing of diesel start times, these
14 breaks would not become limiting.

15 The first thing we'll talk about is ECCS
16 injection delay and later we're going to talk about
17 system relaxation or basically reoriented some ECCS
18 systems. With respect to when are the systems needed
19 to inject, if the break is a small type break, it
20 takes longer for the plant to depressurize. Before
21 the low pressure system to come into play, the
22 pressure has to be low enough for the pressure for
23 misses of valves or for the pumps to be able to
24 perform and so if you have small breaks and even some
25 of these "intermediate size" breaks it takes awhile

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1 for the plant to depressurize. So these delay times
2 become somewhat irrelevant when you're getting great
3 than two minutes.

4 Large breaks inject in less than one
5 minute. PCT as you would expect will decrease as the
6 TBS size is reduced and the figure of merit here is
7 how much can we relax the ECCS start times. So what
8 we're saying is if what time of start times do we need
9 to improve the reliability of the diesel and if we can
10 get things in the order of one to two minutes for the
11 start times that will improve the reliability of the
12 system. So that's going to be our basis of
13 quantifying an optimal transition break size is.

14 On this next slide, it looks pretty busy
15 and it's a number of different plants. These are all
16 BWR 4 type plants. These plants have a 28 inch recirc
17 pipe size which is roughly 26 inch inside diameter.
18 Their attached RHR piping is approximately 24 inches
19 and there are a number of plants, even large or
20 smaller sized plants that have these type of
21 dimensions.

22 Now what we're showing here is an estimate
23 of what injection delay would correspond to a
24 reduction in the break size. Now you see that line on
25 the chart, the heavy green line, is what would be the

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1 transition break size with a 24 inch RHR pipe and you
2 see from that if you're looking for an increase in
3 your injection delay of in the order of, say, going
4 from 20 to 60 seconds, the majority of the plants are
5 about in line there. But if you really like to
6 increase the delay time up to, that's in the order of
7 almost two minutes the break size as defined, the 24
8 inch break size, won't even do it.

9 VICE CHAIR WALLIS: This delay time simply
10 means the diesels are now more reliable if you have
11 more time to start them. It doesn't mean that they
12 won't start.

13 MR. BOLGER: Maybe somebody else wants to
14 comment on this, but the diesels if you give them more
15 time to warm up --

16 VICE CHAIR WALLIS: They're more reliable.

17 MR. BOLGER: They're more reliable.

18 VICE CHAIR WALLIS: But they're pretty
19 darn reliable now, with the fast start, so it isn't
20 that much of an incentive to make them --

21 MR. BROWNING: Well, there's an incentive
22 on maintenance.

23 VICE CHAIR WALLIS: Yeah, but it's not
24 that big a deal.

25 MR. BROWNING: Well, maybe to you. Yeah,

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1 talk to my mechanics out in the field that have to
2 maintain them to this pristine level --

3 VICE CHAIR WALLIS: Yeah, but it's not
4 hundreds of millions of year or something like that.

5 MR. BROWNING: But still it's significant,
6 they're finicky machines. They're -- you know, to
7 maintain them to this peak performance, I mean, we're
8 truly talking about peak performance.

9 VICE CHAIR WALLIS: But, I mean, their
10 average performance is damn good too, so you don't
11 really have to rely on that peak --

12 MR. BROWNING: Well, but we're not allowed
13 to degrade to that point.

14 VICE CHAIR WALLIS: Well, yeah.

15 MEMBER SIEBER: The time is so short that
16 the opportunity to miss the time is real.

17 VICE CHAIR WALLIS: But the thing is, if
18 you're allowed in your calculations to give them the
19 60-second or two-minute delay, if you did get a DBA,
20 you would start them quicker, wouldn't you, and they
21 would probably start quicker. It's not as if they
22 wouldn't function.

23 MR. BROWNING: No, you're right, but what
24 we're talking about here --

25 VICE CHAIR WALLIS: What are you buying

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1 really. I don't quite see --

2 MR. BROWNING: -- in physical reality is
3 we're going to go change the way these machines run.
4 They will always run to this standard. They will take
5 30 seconds to ramp up.

6 VICE CHAIR WALLIS: So you won't start
7 them fast then even if you want to?

8 MR. BROWNING: We wouldn't want to.

9 VICE CHAIR WALLIS: Why not if you need
10 them?

11 MR. BROWNING: Not to that standard and
12 that's what we're trying to demonstrate here is you
13 don't --

14 MEMBER BANERJEE: No, but suppose you
15 really had a doubled ended guillotine break, forbid,
16 yeah --

17 MEMBER SIEBER: Then you would want to
18 start that.

19 MEMBER BANERJEE: Then wouldn't they just
20 come on? They wouldn't. So this is not just to deal
21 with reducing testing, maintenance, whatever and still
22 having them there to come on as quickly.

23 MR. BROWNING: They will come onto this
24 standard. They will come up to speed in 30 seconds
25 idle and then you'll start loading pumps on.

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1 MEMBER SIEBER: You're going to change the
2 sequence or settings.

3 MR. BROWNING: Exactly.

4 MEMBER BANERJEE: So you're actually going
5 to change that.

6 MEMBER SIEBER: Yeah, it won't happen any
7 faster than what that sequence is set at.

8 MR. BROWNING: And the difference is, is
9 because above the transition break size, I don't have
10 to postulate the loss of offsite power, so I'm not
11 relying on the diesel generator for the double ended
12 guillotine break any longer.

13 VICE CHAIR WALLIS: That's the thing, we
14 should do away with this LOOP and then you wouldn't
15 have this problem.

16 MR. BROWNING: I'm sorry?

17 VICE CHAIR WALLIS: If we did away with
18 this LOOP requirement, you wouldn't have this problem.

19 MR. BROWNING: That's one aspect, yeah,
20 that's --

21 MEMBER BANERJEE: But you can imagine that
22 there's some terrible situation where there's a
23 seismic event knocks out the power and makes a big
24 break or whatever and at that point these diesels
25 wouldn't come on then, really. What you're saying is,

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1 you've sequence it differently.

2 MR. BROWNING: Right.

3 MEMBER BANERJEE: So it wouldn't -- it's
4 not just a question of maintenance.

5 MR. BROWNING: Right, so the metrics that
6 we use to demonstrate mitigation capability are
7 different. For example, I won't use Appendix K
8 methods to demonstrate that mitigated capability.
9 I'll go straight to Track G and take advantages of the
10 more realistic correlations that are built into Track
11 G of the --

12 MEMBER BANERJEE: We should to that anyway
13 by never mind.

14 MR. BROWNING: That is a potential
15 opportunity but Track G is currently not licensed by
16 the Commission to do these calculations. So that, to
17 me as a licensee, that option is a future thing that's
18 potential but it doesn't exist today. And I'm
19 commenting on a rule making that's about to go into
20 the books soon.

21 VICE CHAIR WALLIS: Well, what is the
22 advantage in reliability in terms of numbers in going
23 from quick start to slow start? Is it going from 98
24 percent to 95 or 95 to 98 or 98 to 99 or what?

25 MR. BROWNING: That's one of the things

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1 that Dr. Shack referred to earlier in the topical that
2 we have on the docket already and we pretty much
3 polled -- I won't use the word, "expert elicitation"
4 but polled our diesel generator experts and we arrived
5 at a figure of roughly 10 percent improvement over
6 current reliability.

7 VICE CHAIR WALLIS: But they're going from
8 what efficiency to what efficiency?

9 MR. BROWNING: It was pretty much -- do
10 you remember the numbers?

11 MR. BUNT: It was one failure in three and
12 a half years to one failure in five years.

13 VICE CHAIR WALLIS: Of how many starts?
14 One failure and how many starts?

15 MR. BROWNING: I don't remember. It was
16 in the upper 90 percentile.

17 VICE CHAIR WALLIS: So you're already in
18 the 90s. I don't think it's a big deal.

19 MR. BROWNING: Ninety-fifth to 98th
20 percentile.

21 VICE CHAIR WALLIS: That's not a big deal.
22 That's no big deal going from 95 to 98.

23 MEMBER BANERJEE: Was this the only
24 advantage you get or are there also some other things?

25 MR. BROWNING: Once we're allowed to do

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1 some of these things -- Sorry. One of the things that
2 we've also looked at that's not on the table here
3 that's in the LOOP/LOCA topical is the dedication of
4 RHR pumps to suppression of the coolant because we all
5 know from PRA studies that BWRs are more vulnerable to
6 decay heat removal scenarios than they are to LOCA
7 injection scenarios.

8 MEMBER SIEBER: Right.

9 MR. BROWNING: We have a plethora of pumps
10 that can inject water into a vessel and boilers. We
11 have more water than we need for almost every
12 conceivable scenario. We would like to optimize that
13 and that's one of the things we talk about in the
14 other topical is let us move some of the RHR pumps
15 away from this primary mission of LPCI injection over
16 to decay heat removal where they're more useful to us.
17 And that's one of the things that we would derive as
18 a benefit out of this rulemaking mainly because of the
19 fact that we get rid of the single failure criteria.

20 MEMBER BANERJEE: Does this also impact
21 your sump screen blockage situation?

22 VICE CHAIR WALLIS: They don't have sump.

23 MR. BROWNING: It's already been dealt
24 with.

25 MEMBER BANERJEE: No, I'm saying that in

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1 a real way if you have a smaller break you must
2 generate less debris. Right?

3 CHAIR SHACK: Well, no. You're going to
4 have three pipe sizes as I understand the real world
5 here. You're going to have a break size for dynamic
6 loads, a break size for debris generation and a break
7 size for ECCS.

8 MR. BROWNING: That's pretty close to the
9 rule where we have it now which we've talked about
10 that too and a different break size for containment
11 analysis.

12 MEMBER BANERJEE: So you don't get --

13 VICE CHAIR WALLIS: It would be nice if
14 these rules got simpler.

15 MEMBER BANERJEE: -- from your debris
16 generation you're saying.

17 MR. BROWNING: We've not looked at debris
18 generation for this rule.

19 CHAIR SHACK: Let me just understand this
20 calculation.

21 MR. BROWNING: We're not going to go back
22 and take out our old strainers.

23 CHAIR SHACK: You take a TBS and above
24 this size you assume no LOOP and that's how you do
25 this calculation. Is that the way it's done?

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1 MR. BOLGER: Not the calculation on the
2 screen but the calculation that will be done when this
3 rule is implemented. Is that the question?

4 CHAIR SHACK: How is this calculation --
5 Exactly what am I calculating here?

6 MR. BOLGER: This calculation here is
7 based on what the current analysis meth process is
8 which is the DDA break, double-ended guillotine break.
9 As you reduce the break size --

10 CHAIR SHACK: So you're even taking the
11 LOOP here then?

12 MR. BOLGER: Yes, we're taking the LOOP.

13 CHAIR SHACK: Suppose I got rid of the
14 LOOP and I left the break at 20 inches. Where would
15 you end up?

16 VICE CHAIR WALLIS: You wouldn't need the
17 diesels.

18 MEMBER CORRADINI: Start time issue --

19 CHAIR SHACK: Just goes away. You need
20 the diesel for the break below the 20 inches and
21 that's what I want to know.

22 MEMBER BANERJEE: You'd need the same as
23 the lefthand side.

24 MR. BOLGER: The amount of time you save
25 with not requiring the diesel, what do you think?

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1 Maybe ten seconds?

2 MR. BROWNING: I think if you showed the
3 --

4 MR. BOLGER: You might have more systems
5 available.

6 CHAIR SHACK: -- graph I'd find out that
7 I had about 50 seconds by just getting rid of the
8 LOOP. Is that what you're telling me? If I get rid
9 of the LOOP above 20 inches, I would get the 50
10 seconds.

11 VICE CHAIR WALLIS: Why do you need the
12 diesels if you don't have a LOOP?

13 CHAIR SHACK: Because I need them for
14 everything 20 inches and below.

15 VICE CHAIR WALLIS: Why?

16 MEMBER MAYNARD: You still have to be able
17 to cope with loss of offsite power.

18 CHAIR SHACK: The LOOP is going to have --
19 I'm going to only get rid of the LOOP above the TBS.

20 MEMBER MAYNARD: Right.

21 VICE CHAIR WALLIS: But you can get rid of
22 -- Oh, I see.

23 CHAIR SHACK: I'm just wondering once you
24 get rid of the LOOP do we really have a fight between
25 16 and 20 inches?

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1 VICE CHAIR WALLIS: I thought you were
2 talking about getting rid of the whole idea of
3 simultaneous LOOP and break. If you did that, you
4 wouldn't need the diesels at all, would you?

5 CHAIR SHACK: No. I still have a big
6 difference between 16 and 20, LOOP or no LOOP here.
7 I go from 50 seconds to 80 seconds.

8 MR. BROWNING: If I may, one of the things
9 that you don't see on this graph is this is only
10 looking at ECCS delay. It doesn't factor in us
11 removing an RHR pump to dedicate it to decay heat
12 removal. When you do that, then you effectively take
13 that green line and shove it to the left. But when
14 you start removing ECCS pumps off the equation, the
15 mitigative capability below the TBS starts to get
16 compounded and because we consider that to be a
17 benefit of the rulemaking, that's another
18 consideration. So to get both the injection delay and
19 the ability to not auto-start ECCS pumps, RHR pumps in
20 ECCS mode, but to dedicate them to decay heat removal,
21 you have to get the transition break size to the left.

22 VICE CHAIR WALLIS: So how would you
23 explain --

24 MR. BOLGER: And we're going to show some
25 data on that system changes as well.

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1 MEMBER ARMIJO: Are those the two big
2 benefits that you're looking for?

3 MR. BROWNING: Yes.

4 MEMBER ARMIJO: Those are the two big
5 benefits that you're looking for and your goal is to
6 get that by moving that green line down to around 16
7 inches?

8 MR. BROWNING: And I think we're all in
9 agreement at least from the thermal hydraulic side
10 that we all understand that the boilers behave in PCT
11 space in a bathtub and what we're talking about was
12 we're trying to finagle down to the trough. We just
13 want to make sure that we're down on the trough and
14 the 24 inches that's the current rule is not in the
15 trough. It's up on the high side towards the double
16 ended guillotine break and we don't see these kind of
17 benefits at a 24 inch break.

18 VICE CHAIR WALLIS: How do you explain to
19 the public? I mean I understand this of 95, 98
20 percent more reliable diesels, but what does this
21 effect have on nuclear safety?

22 MR. BROWNING: I would say the right way
23 to couch is we've tried to construct the benefits that
24 we want to derive in the industry without
25 significantly eating into the current margins.

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1 VICE CHAIR WALLIS: Well, does it change
2 public risk in some way by doing this? I mean, is
3 there any benefit to the public risk by changing this
4 diesel start time and --

5 MR. BROWNING: Diesel generator
6 reliability is one aspect. I think, Dr. Wallace, if
7 when we look at it in risk perspective, the benefit to
8 the public is an enhancement in BWR decay heat
9 removal over the current capability.

10 MEMBER ARMIJO: Have you quantified that
11 in any way or can you --

12 MR. BROWNING: We did it in the PRA study
13 for the LOOP/LOCA topical.

14 VICE CHAIR WALLIS: And what do you gain?

15 MR. BROWNING: As we've heard earlier,
16 it's not huge.

17 VICE CHAIR WALLIS: It's not huge at all,
18 is it?

19 MR. BROWNING: Well, and again, that's an
20 artifact of how that analysis was constructed because
21 we took a substantial penalty for all large break LOCA
22 LOOPS going straight to core damage with a frequency
23 of one. And then we worked backwards incrementally
24 from that. So that's why you see such a small number
25 for that improvement in core damage frequency from

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1 that aspect is because we took such a heavy penalty at
2 the front end and it was just the artifact of how the
3 analysis --

4 VICE CHAIR WALLIS: Have you tried to
5 explain this in a public meeting to members of the
6 public about what you're gaining by doing all this in
7 their benefit?

8 MR. BROWNING: I would say, again, their
9 benefit is, you know --

10 VICE CHAIR WALLIS: Have you tried to do
11 that, though? I mean, all this talk seems to be with
12 industry, all this negotiation is with industry. Have
13 you tried to sit down with some representative members
14 of the public and explain to them why this is helping
15 them in some way?

16 MR. BROWNING: I would say through a
17 number of public forums, yes. I would say that
18 probably the most vocal member of the public that
19 we've encountered so far has been Professor Hochreiter
20 from Penn State but we've had entertained dialogue
21 with him.

22 MEMBER CORRADINI: But he seems to be in
23 the other direction, unless I'm off base. Unless I
24 misunderstood his comments, he thinks that the break
25 frequency is higher and he includes leaks as if they

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1 behaved as breaks. Am I misunderstanding his comment,
2 though?

3 MR. BROWNING: On those aspects I can't
4 comment but in past forums he's been a very strong
5 advocate for more going to the existing rule and using
6 best estimate LOCA methods without certainty.

7 VICE CHAIR WALLIS: But you know something
8 that --

9 MEMBER APOSTOLAKIS: Again, I'm a little
10 confused here.

11 VICE CHAIR WALLIS: -- you know some of
12 the public critics.

13 MR. BROWNING: Right.

14 MEMBER APOSTOLAKIS: What are you trying
15 -- I mean --

16 VICE CHAIR WALLIS: You didn't get any
17 input from them?

18 MR. BROWNING: As you've heard earlier
19 from the staff, the public comment on the rule to date
20 is --

21 VICE CHAIR WALLIS: Well, I think their
22 silence is significant. I think that you really ought
23 to solicit some opinion from someone who's not just
24 from industry about this stuff.

25 MEMBER APOSTOLAKIS: We are changing the

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1 rules of the game again. The whole idea of risk
2 informing the regulations was to remove unnecessary
3 regulatory burden, even at the expense of increasing
4 a little bit the CDF and LERF. And now we're asking
5 these people to demonstrate the safety benefit from
6 the change. That's a very big plan.

7 VICE CHAIR WALLIS: That's because that's
8 what they claim. That's because that's what the
9 claim.

10 MEMBER APOSTOLAKIS: Well, maybe they will
11 quit claiming it. I think their main argument, their
12 main argument is that the margin, the margin is not
13 effected significantly. I think that's the main
14 argument.

15 CHAIR SHACK: Well, I also want to get
16 that, so that the main benefit you get out of this is
17 reduced maintenance cost on your diesels.

18 MEMBER APOSTOLAKIS: But that's their
19 problem. It's not ours.

20 CHAIR SHACK: Well, no, I want to know --
21 you know, I want to know the cost and the benefit.

22 MEMBER APOSTOLAKIS: We are not making a
23 decision here based on what their benefit is.

24 VICE CHAIR WALLIS: Whose benefit?

25 MEMBER APOSTOLAKIS: Our -- the owner's

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1 group. Our decision will be is there still sufficient
2 margin.

3 MR. BROWNING: Well, no, I don't take any
4 increases in risk without some benefit, George. If
5 they can --

6 MEMBER APOSTOLAKIS: Well, we are removing
7 unnecessary burdens.

8 MR. BROWNING: But they're reducing costs
9 or benefits, that's fine with me. That's a benefit.
10 I have no problem with that. I just want to know what
11 the benefit is.

12 MEMBER APOSTOLAKIS: If you just want to
13 know, that's fine. But your decision cannot be based
14 on whether they have any benefit. It's their
15 business. We worry only about undue risk to the public
16 that --

17 VICE CHAIR WALLIS: The decision is based
18 on the arguments offered and the arguments offered
19 were safety benefit. Okay.

20 MEMBER APOSTOLAKIS: That's an extra
21 thing.

22 CHAIR SHACK: We've got 10 minutes to go
23 because at 12:45 we're pulling the plug.

24 MEMBER MAYNARD: I agree with George's
25 comments there.

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1 MEMBER APOSTOLAKIS: Thank you. Common
2 sense, I knew would prevail.

3 MR. BOLGER: We did, we talked a little
4 bit about changing the ECC configuration, allocating
5 ECC systems for other duties such as RHR and on the
6 next slide I have some additional analysis which shows
7 you know, what is the impact on the PCT relative to
8 changing the number of system combinations and putting
9 that together with relaxing ECC start times.

10 So the first line here, this is a summary
11 of a number of different calculations that we did.
12 The first one is the standard DBA with -- you know, it
13 has one available low pressure core spray and two
14 available LPCI. Now if we then -- if we then go to a
15 21-inch break size and we also at the same time reduce
16 from two LPCI to one LPCI, we do get a reduction in
17 the PCT. Well, we can push that a little bit further.
18 Let's say we do the same thing which is reduce from
19 two to one LPCI and that one LPCI could be considered
20 available for RHR. Then with that we can also get a
21 50-second increase in the ECC delay and that's a good
22 net positive benefit.

23 Now, we could go even further with that
24 where we go from two LPCIs to none and we only have
25 one -- only one LPCS. Well, in that case, with a 50

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1 percent 50-second ECC delay, we get a large increase
2 in PCT, so we would not want to be there.

3 MEMBER ARMIJO: Is that increase 200 from
4 a 1600 basis or from the --

5 MR. BOLGER: From let's say approximately
6 1600 base.

7 MEMBER ARMIJO: You go up to 1800, well
8 below the 2200.

9 MR. BOLGER: That's right. I mean there
10 is still margin in a lot of these plants from the
11 current PCT to 2200.

12 If we continue, then we go to 18 inch
13 break. Go back to the baseline. We get a large
14 improvement in our PCT. Then we step it up a notch
15 where we go with only one low pressure core spray but
16 50 second ECCS delay, we get a reduction of PCT. So
17 we're better off if we have a TBS at 18 inch and we
18 have a 50 second ECCS delay. We can mitigate that
19 plant with one low pressure core spray.

20 If we can continue to 80 second, then we
21 get in a situation where our PCT increases. We're
22 considering that not a desirable. We're looking to
23 maintain the PCT even though there may be margin at
24 2200, we're looking at an equivalent PCT to what it
25 was prior to implementing the rule.

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1 Looking at a different scenario, one lump
2 LOOP pressure core spray and one LPCI, at 80 second
3 ECCS delay, things stay about the same and if we go to
4 16 inch with the 80 second ECCS delay and one low
5 pressure core spray, we stay about the same. That's
6 so you kind of get an idea of combinations of delay
7 and ECCS system availability.

8 MEMBER CORRADINI: Can I ask you a
9 question here because this is helpful to me at least
10 to see the various combinations? So to go -- Let me
11 just push my point or push a point. To go from 16 to
12 21 the benefit was you already had margin. So if you
13 already had margin, I guess it's line three, three
14 down and then all the way at the bottom, you already
15 have margin. You increase the PCT. The only benefit
16 I see is 30 more seconds of ability to operate. But
17 everything else remains the same. Am I missing
18 something?

19 MR. BOLGER: We went down one more system
20 though. We went from one LPCI to zero LPCI.

21 MEMBER CORRADINI: Okay. Right. And that
22 was my next question. So you took away a system. You
23 gained 30 seconds. What are you going to do with that
24 system?

25 MR. BROWNING: That's the one that we're

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1 talking about dedicating --

2 MEMBER CORRADINI: I missed that. I
3 apologize.

4 MR. BROWNING: That's the one that we're
5 talking about dedicating to decay heat removal because
6 it's no longer required for LPCI injection.

7 MEMBER CORRADINI: And that will buy you
8 additional redundancy on decay heat removal?

9 MR. BROWNING: Correct.

10 MEMBER BANERJEE: But you still get that
11 with the 21 inch, don't you? You get only one LPCI --
12 necessary.

13 MEMBER CORRADINI: That was going to be my
14 point. The only difference between line three and the
15 bottom 16 is 30 seconds.

16 MR. BROWNING: Right.

17 MEMBER CORRADINI: And it still falls
18 within your margin.

19 MEMBER BANERJEE: You probably don't want
20 to take out both LPCIs. Right? If you take out one,
21 that's sufficient for you. All right. So you can get
22 that with the 21.

23 VICE CHAIR WALLIS: Line three gives a
24 large increase in PCT.

25 MR. BROWNING: But they're still within

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1 margin as well.

2 MEMBER BANERJEE: That's well within
3 margin.

4 MR. BOLGER: I thought they explained to
5 us. So I'm just trying to --

6 MEMBER BANERJEE: But you don't want line
7 three anyway. Don't you want to keep one LPCI just
8 for safety? You'd think this good engineering job
9 would keep one.

10 MR. BOLGER: I would think so. You would
11 want to have one LPCI.

12 MEMBER BANERJEE: And forget all this
13 stuff. Right. But I wouldn't get rid of both.

14 MEMBER ARMIJO: Did you do the case of a
15 16 inch break including the LPCS and the LPCI? What
16 was the time?

17 MR. BOLGER: No, we didn't run that case.

18 MEMBER ARMIJO: But it would be closer to
19 the 120 that you were talking about earlier?

20 MR. BOLGER: That would be some kind of a
21 reduction, PCT reduction.

22 MEMBER ARMIJO: Yes, your PCT would be
23 reduced and you'd have --

24 CHAIR SHACK: Or you could up your ECCS
25 delay.

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1 MEMBER ARMIJO: Yes. Right.

2 MR. BOLGER: You know, note this is one
3 plant. Different plants are going to have different
4 TBSs. If you looked that table in the slide that was
5 presented by staff for a BWR 5 with a 24 inch recirc
6 pipe also has a 24 inch feedwater pipe. The TBS size
7 and the DBA size are the same size. Even though you
8 would go from a guillotine break in one case to a
9 single-sided break on the other, in that sort of
10 situation, you would get hardly any improvement
11 because of the TBS.

12 MEMBER ARMIJO: Now twos and threes are
13 just out of the question as far as any benefit?

14 MR. BOLGER: BWR 3s have substantial
15 benefit. You know actually those plants are riding
16 much closer to 2200 than the BWR 4 type plants.

17 MEMBER ARMIJO: Okay.

18 MR. BOLGER: If we go from the guillotine
19 break to an 18 inch break for those plant types even
20 if we go from two low pressure core spray to one low
21 pressure core spray, we still get a large reduction of
22 PCT. So there is a substantial amount of benefit for
23 those plant types. But with the current rule as
24 defined, it would provide that.

25 VICE CHAIR WALLIS: Why would you want to

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1 go to --

2 MEMBER BANERJEE: What is not clear is
3 why? Other than the effect on the diesels, it seems
4 that with the current NRC proposal of the 24 inch
5 whatever, you would still remove one of the LPCIs for
6 your long-term link? You know you don't seem to be
7 limited by that right now.

8 MR. BOLGER: Yes, in some situations, you
9 know, with the proposed rule, you would provide the
10 benefit. In not all plants, you may. Tony.

11 MR. BROWNING: One of the things that you
12 have to consider here is that as Dr. Shack said
13 earlier that this is at the TBS. So we have to comply
14 with offsite power and single failure. So when I
15 start taking, you know, saying I'm going to dedicate
16 the A side of RHR to decay heat removal, I've taken
17 them off the books. They're not available for ECCS
18 and they're effectively gone. So when I start
19 worrying about single failure criterion if I lose the
20 LPCI inject valve, that effectively gets me down to
21 the single core spray tanks.

22 MEMBER BANERJEE: But we are still within
23 the --

24 MR. BOLGER: You're getting lost here on
25 the --

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1 MEMBER BANERJEE: But you're still within
2 your PCT criteria.

3 MR. BROWNING: Right. So that's why we're
4 trying to get down to the single core spray case and
5 see how far out we can get the diesel generator
6 benefit because we still have to consider single
7 failure criterion and not have large increases in PCT
8 over current.

9 MEMBER SIEBER: But is the LOOP in the
10 single failure that drives the plant configuration?

11 MR. BROWNING: Correct, and when you're
12 talking about the double ended guillotine break in
13 today's rule that really drives all the stuff.

14 MEMBER SIEBER: That's right.

15 MR. BROWNING: So it's maximum performance
16 capability because that's what it was ultimately
17 designed to be able to do.

18 MEMBER SIEBER: So right now, you don't
19 have the flexibility to optimize your systems.

20 MR. BROWNING: That is correct.

21 CHAIR SHACK: Okay. I think we're going
22 to have to finish here unless you want to give us some
23 final words.

24 MEMBER APOSTOLAKIS: So all these slides
25 are materials when -- Some other time?

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1 CHAIR SHACK: Do you want to take five
2 minutes and go over the material slides?

3 MR. BROWNING: I think we understand that
4 there's an opportunity to come back and talk about
5 that another day. I think it's probably best that we
6 do so. We can have some more of our technical experts
7 here. We also understand that you disagree.

8 CHAIR SHACK: Yes.

9 MR. BROWNING: But really --

10 MEMBER SIEBER: In the injection work.

11 MR. BROWNING: But I would argue that when
12 you get experts together to discuss rare events
13 differing between 16 and 20 inches is exact science.

14 VICE CHAIR WALLIS: But your point as I
15 get from the bottom line is if we don't go with you,
16 then BWRs won't get any benefit from the rule change.

17 MR. BROWNING: Right.

18 VICE CHAIR WALLIS: That was your starting
19 point.

20 MR. BROWNING: Yes.

21 VICE CHAIR WALLIS: It seems to be a major
22 point.

23 MR. BROWNING: Right. As currently
24 constructed the language in the rule would force most
25 BWRs to consider a transition break size of 24 inches.

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1 VICE CHAIR WALLIS: Which would have no
2 benefit?

3 MR. BROWNING: Which would have not enough
4 benefit to be cost justifiable.

5 VICE CHAIR WALLIS: That seems to be a
6 significant point.

7 MR. BROWNING: And we've made that on a
8 number of occasions.

9 MR. TSCHILTZ: Yes, this is Mike Tschiltz
10 again. I would just like to offer that I think it's
11 particularly important for the ACRS to understand the
12 BWR Owners Group's issues at this point in time and
13 not put it off to a potential meeting in the future
14 just based upon where we are potentially with the
15 schedule for the rulemaking.

16 MEMBER ARMIJO: You know that's why I'm a
17 little bit concerned about the materials issue because
18 if you really believe are susceptible let's say to IG
19 SEC or thermal fatigue in the feedwater, then we
20 really have to talk about it near term. I happen to
21 believe they have a lot more margin than they were
22 given credit for particularly with modern water
23 chemistry and that's the base from which you start
24 developing these failure frequencies. So I don't know
25 when we're going to get to it unless we discuss

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1 materials issue sometimes in the near future, we're --

2 CHAIR SHACK: Let's take 15 more minutes.

3 MEMBER ARMIJO: Yes, I would like to hear

4 --

5 MR. BROWNING: I'll do the best I can in

6 15 minutes and please bear with me. I'm not a

7 technical expert in this area at all.

8 MEMBER BANERJEE: Have the experts here.

9 CHAIR SHACK: That's why I --

10 MR. BROWNING: -- present new information

11 on the thermal hydraulics to the committee and to the

12 staff.

13 MEMBER SIEBER: Before you start, I would

14 point out that those of you who are going to the Fire

15 Protection meeting, the latest we can start that is

16 2:00 p.m. It will be in this room.

17 VICE CHAIR WALLIS: We'll start at 2:00

18 then.

19 MEMBER SIEBER: At 2:00 p.m.

20 MR. BROWNING: You know one of the things

21 that we've been talking about in the materials area of

22 course is intergranular stress corrosion cracking and

23 the thing that we're debating here is what's proper

24 credit for water chemistry improvement, use of better

25 materials and also repair measures for overlays and

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1 then stress improvements.

2 VICE CHAIR WALLIS: Are you thinking that
3 the experts didn't take this into account?

4 MR. BROWNING: We didn't say they didn't
5 take it into account. We're saying did they give us
6 proper credit.

7 MEMBER APOSTOLAKIS: It's the degree to
8 which.

9 MEMBER BANERJEE: I think we need another
10 meeting.

11 MR. BROWNING: And one of the things that
12 we would like to bring up is the factor improvement
13 for hydrogen water chemistry. The elicitation and
14 NUREG CR 57.50 talk about numbers unlike the order of
15 a factor of improvement of 20 is as Sanjoy talked
16 about earlier.

17 We've done our own analysis of it and we
18 think the number looks more like 33, for example,
19 which is a substantial improvement in the factor of
20 improvement for hydrogen water chemistry and when you
21 start taking those things into account, you start to
22 see what we consider to be extra conservatism that was
23 applied to the elicitation mean result and if you want
24 to add on a bias at the end for uncertainties about
25 what we don't know about materials, the next AP 600,

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1 the next PWSCC, whatever it might be, that's fine.
2 But let's make sure that we're not piling conservatism
3 onto conservatism onto conservatism because this is
4 supposed to be a risk informed rule, again, feedwater
5 nozzles, thermal fatigue.

6 So the boiler perspective, these issues
7 have been dealt with quite some time ago and we have
8 lots of operating experience to demonstrate that
9 capability. We're not talking one or two years.
10 We're talking 15, 20 plus years of operating
11 experience that says we've successfully mitigated
12 these materials issues.

13 Again FAC again. Programs are in place.
14 They're robust. We have the mitigation capability to
15 prove it. Some of the things we're talking about
16 here, feedwater piping inside containment for example,
17 not overly susceptible to FAC. The temperature is too
18 high. We inject oxygen back into the feedwater to
19 compensate for hydrogen water chemistry to make sure
20 that we're above the FAC threshold of 30 ppb.

21 We deal with these issues and we believe
22 on our side of the industry that we've dealt with them
23 successfully and when you consider all this additional
24 information, then you might come to the conclusion
25 that there is access conservatism that's been applied

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1 to the base elicitation result and when you remove it,
2 we're not that far apart with the staff on where a
3 proper TBS is. Then when you couch it in terms of
4 thermal hydraulics and where do you start to really
5 see and derive benefit be it safety, be it economic,
6 then you start to get closer down to the TBS that
7 we've proposed.

8 MEMBER BANERJEE: Just a point I want to
9 ask you. The Forsnach plant is an ABB plant. Right?

10 MR. BROWNING: Yes. Correct.

11 MEMBER BANERJEE: And was there cracking
12 in the feedwater nozzles even after they did hydrogen
13 chemistry?

14 MR. BROWNING: Hydrogen water chemistry
15 really wasn't intended to mitigate feedwater nozzle
16 crack.

17 PARTICIPANT: Thermal fatigue.

18 MR. BROWNING: Yes. That's -- 619 kinds
19 of issues of removing crevices, crevice geometry,
20 looking at thermal fatigue.

21 MEMBER BANERJEE: So this was thoroughly
22 unrelated.

23 MR. BROWNING: Right. It's a different
24 phenomenon. It's not IG SEC.

25 (Off the record comments.)

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1 MR. BROWNING: Thank you for your time.

2 CHAIR SHACK: Okay. I appreciate that.

3 At least we heard it.

4 VICE CHAIR WALLIS: We've gained some
5 time.

6 CHAIR SHACK: We gained some time.

7 MEMBER CORRADINI: Are we done?

8 VICE CHAIR WALLIS: Now it says to be
9 announced or something.

10 CHAIR SHACK: To be determined.

11 (Off the record comments.)

12 CHAIR SHACK: The question is do we want
13 to discuss where we want to go in 50.46 now or should
14 we wait until later?

15 MEMBER BANERJEE: I'm just puzzled. I
16 would like to see this thing rationalized.

17 MEMBER APOSTOLAKIS: We have a whole
18 session tomorrow afternoon. Right?

19 MEMBER BANERJEE: Bill Shack can explain
20 everything.

21 (Off the record comments.)

22 CHAIR SHACK: We're finished. We're
23 adjourned. Off the record.

24 (Whereupon, at 12:54 p.m., the above-
25 entitled matter was concluded.)

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