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1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

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4 ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

5 511th FULL COMMITTEE MEETING

6 + + + + +

7 THURSDAY,

8 APRIL 15, 2004

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10 ROCKVILLE, MARYLAND

11 + + + + +

12

13 The full committee met at the Nuclear

14 Regulatory Commission, Two White Flint North,

15 Room T2B3, 11545 Rockville Pike, at 8:30 a.m.,

16 Mario V. Bonaca, Chairman, presiding.

17

18 COMMITTEE MEMBERS PRESENT:

19 MARIO V. BONACA, Chairman

20 GRAHAM B. WALLIS, Vice Chairman

21 STEPHEN L. ROSEN, Member-at-Large

22 GEORGE E. APOSTOLAKIS, Member

23 F. PETER FORD, Member

24 THOMAS S. KRESS, Member

25 DANA A. POWERS, MEMBER

1 COMMITTEE MEMBERS PRESENT: (cont'd)

2 VICTOR H. RANSOM, Member

3 WILLIAM J. SHACK, Member

4 JOHN D. SIEBER, Member

5

6 NRC STAFF PRESENT:

7 LEE ABRAMSON

8 BENNETT BRODY

9 ARTHUR BUSLIK

10 DONALD E. CARLSON

11 STEPHEN DINSMORE

12 FAROUK ELTAWILA

13 HOSSEIN HAMZAHEE

14 DONNIE HARRISON

15 GLENN KELLY

16 MARK KOWAL

17 RALPH LANDRY

18 JAMES LAZEVNICK

19 DAVID LEW

20 STU MAGRUDER

21 EILEEN McKENNA

22 YURI ORECHWA

23 GARETH PARRY

24 MARK RUBIN

25 STUART RUBIN

1 NRC STAFF PRESENT: (cont'd)

2 ROB TREGONING

3 MIKE TSCHILTZ

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

2 (8:30 a.m.)

3 CHAIRMAN BONACA: Good morning. The
4 meeting will now come to order. This is the first day
5 of the 511th meeting of the Advisory Committee on
6 Reactor Safeguards.

7 During today's meeting the committee will
8 consider the following: action plan for
9 implementation of the phased approach to PRA quality;
10 SECY-04-0037, issues related to proposed rulemaking to
11 risk-inform requirements related to large break LOCA
12 size and plans for rulemaking on LOCA with coincident
13 loss of off-site power; options and recommendations
14 for functional performance requirements and criteria
15 for the containments of non-lightwater reactors;
16 criteria for evaluating the effectiveness of quality
17 of the NRC research programs; and preparation of ACRS
18 reports.

19 Dr. El-Zeftaway is the Designated Federal
20 Official for the initial portion of the meeting.

21 We have received no written comments from
22 members of the public regarding today's session. We
23 have received a request from NEI for time to make oral
24 statements regarding SECY-04-0037.

25 A transcript of portions of the meeting is

1 being kept, and it is requested that the speakers use
2 one of the microphones, identify themselves, and speak
3 with sufficient clarity and volume so that they can be
4 readily heard.
5 I will begin with some items of current
6 interest. In front of you you have, in fact, a
7 package of items of interest, and you see there there
8 is -- it includes a Staff Requirements Memorandum,
9 speeches by the Chairman and Commissioners, and
10 congressional correspondence and testimony.
11 With that, if there are no comments or
12 issues on the part of members, I will proceed with the
13 meeting.
14 The first item on our agenda is action
15 plan for implementing the phased approach for
16 improving PRA quality. And Dr. Apostolakis will lead
17 us with that.
18 MEMBER APOSTOLAKIS: Thank you, Mr.
19 Chairman.
20 In a Staff Requirements Memorandum dated
21 December 18, 2003, the Commission approved the
22 implementation of a phased approach to achieving an
23 appropriate quality for PRAs for NRC's risk-informed
24 regulatory decisionmaking. The SRM requested an
25 action plan that would define a practical strategy for

1 the implementation of the phased approach to PRA
2 quality.
3 The Reliability and Probabilistic Risk
4 Assessment Subcommittee met with the staff on
5 March 25th to discuss this plan.
6 The SRM distinguishes between a baseline
7 PRA and the risk-informed decisionmaking elements.
8 The baseline PRA characterizes the actual risk of the
9 facility, in terms of core damage frequency and large
10 early release frequency. These are the words of the
11 SRM.
12 The baseline PRA cannot assess plant
13 changes. Therefore, it's not usually utilized by
14 itself in regulatory decisionmaking. The risk-
15 informed decisionmaking elements help in assessing
16 changes and are more difficult to define.
17 Now, there is a sentence in the SRM that
18 I find intriguing. The risk-informed decisionmaking
19 elements "are by definition issue-dependent and they
20 don't play a role in judging the quality of the
21 baseline PRA."
22 So one of the things I'd like us to
23 discuss today is how this distinction between baseline
24 PRA and risk-informed elements, decisionmaking
25 elements, is made in the plant, and to clarify what we

1 mean by PRA quality.

2 Are we referring to the baseline PRA? Are

3 we referring to the risk-informed decisionmaking

4 elements, but the Commission says they don't play a

5 role in judging the quality of the baseline PRA? This

6 is something that was not discussed last time.

7 MEMBER POWERS: Professor Apostolakis?

8 MEMBER APOSTOLAKIS: Yes.

9 MEMBER POWERS: I continue to get confused

10 when people present PRA information, because it seems

11 to me that what is missing, they present a -- only a

12 subset of what has been asked. I mean, people ask

13 what the -- what is the risk to this plant as a

14 baseline? And they -- they give you a number. And

15 you ask them, is this a mean? And they say yes, but

16 it turns out to be only a point estimate.

17 And you ask them, well, does this include

18 the risk of -- due to fire? And they say no. But

19 we're told that fire is a big risk. I mean, it's very

20 confusing to me.

21 MEMBER APOSTOLAKIS: It is. It is. And

22 I think the idea of these phases is to maybe get out

23 of it progressively. But, yes, I agree with you. I

24 agree with you.

25 So we have this issue that at some point

1 today we should discuss -- the distinction between
2 baseline and the extra work you have to do for making
3 decisions.
4 Now, the phases -- there are four phases.
5 Phase 1 is the application-specific phase, which is
6 really what we are familiar with. It's based on
7 Regulatory Guide 1.174.
8 Then, Phase 2 is called issue-specific --
9 the issue-specific phase. And now all modes and
10 initiating events that would change the decision
11 substantially -- this is a word from the SRM --
12 substantially -- should be included with uncertainty
13 analysis.
14 Now, I'm also confused. It's not clear to
15 me what the distinction is between Phase 1 and
16 Phase 2. I'm sure there is one. This appears to be
17 one of the distinctions -- that all modes and
18 initiating events that could change the decision
19 substantially should be included with uncertainty
20 analysis.
21 MEMBER KRESS: How does one know which
22 modes would influence the decision?
23 MEMBER APOSTOLAKIS: That -- yes, that's
24 a good question. That's another question. How can
25 you know a priori? Yes.

1 But the term "substantially" is something
2 we have to focus on, and I'll come to it a little
3 later.
4 So Regulatory Guide 1.174 in Phase 2 is to
5 be supplemented by a PRA standard for the particular
6 issue, plus a PRA review process.
7 And then there is an example of 50.69
8 which says that full implementation would require a
9 broad spectrum of systems and quantification, which in
10 my mind means Phase 3.
11 But then it says for a system-by-system
12 implementation a Phase 3 PRA is not required, in the
13 sense that you don't need to have all of the
14 initiating events and modes.
15 Now, this system-by-system implementation
16 of 50.69 is something that I don't recall. Maybe I
17 missed something, but that's another thing that I
18 would like to have an answer to.
19 And another interesting statement in the
20 SRM within Phase 2 is that the staff should give low
21 priority, or even return non-conforming applications.
22 Phase 3 is a no-applications phase, and the words "all
23 currently envisioned issues" are in the SRM.
24 It is envisioned that a single baseline
25 PRA -- now we are not talking about the distinction

1 between baseline and issue-specific decisionmaking
2 elements, and I don't know whether that's intentional
3 or not. But there is a clear statement that the
4 single baseline PRA should be fully capable to support
5 these uses.
6 So my question, again, to be discussed
7 today is: what happened to the issue-specific
8 decision-making elements? Are they part now of the
9 baseline PRA in Phase 3? Are they separate? And if
10 they are issue-specific, and we are talking about all
11 currently-envisioned issues, surely we know what they
12 are, because we know what the issues are. So they
13 should be part of the baseline PRA perhaps.
14 Examples are given that are a little
15 confusing, at least to me. 50.46 is mentioned all
16 over the place, and I just don't see how you can do
17 50.46 in Phase 2, or in Phase 1 is out of the
18 question.
19 Okay. Now, the important thing is that
20 Phase 3 -- Phase 2 should be implemented in the near
21 term and Phase 3 by December 31, 2008. Phase 4 is a
22 fully-quantified PRA, which is supposed to be state of
23 the art. We will need consensus standards for low
24 power and shutdown, for external events, and so on,
25 which again raises the question, why wouldn't you need

1 those in Phase 3?

2 The Commission says that we shouldn't

3 really spend much time on Phase 4 right now. We

4 should wait until Phase 3 is in place and is proven.

5 The SRM also wants the staff to discuss

6 the resolution of technical issues, and they mention

7 three -- model uncertainty, external events --

8 earthquakes and others as relevant -- and human

9 performance.

10 Now, the staff uses, the way I understand

11 it from the subcommittee meeting, the availability of

12 standards to determine the phases and the priorities.

13 So this is a critical issue. It's the availability of

14 standards that will guide the staff what kind of

15 priority they should give to a particular application.

16 And an example that is given is that in

17 50.69, where we put SSCs into various categories, if

18 you have a PRA for the power -- at power mode, the

19 standard exists, we have the Regulatory Guide 1.200,

20 and we rely on real -- on peer review, and that will

21 be given high priority.

22 And here comes now something that bothered

23 the subcommittee. If the licensee at the same time

24 submits a fire risk assessment for which there is no

25 standard right now, that will have low priority, just

1 because there is no standard, even though the licensee
2 may have used state-of-the-art methods. And that
3 bothered some members of the subcommittee.
4 Now, coming to the views of the
5 subcommittee members, most did not feel that the
6 technical issues had been addressed adequately --
7 model uncertainty, earthquakes, and other external
8 events -- and human performance. We felt that these
9 are important to all phases, and they should be given
10 high priority.
11 The reliance on the availability of
12 standards to determine the phases and the staff's
13 prioritization of reviews created several concerns.
14 Some members felt that the schedule for completion of
15 Phase 3, which is, I remind you, December 31st of
16 2008, is hostage to the willingness of technical
17 societies and the industry to cooperate in the
18 development of these standards.
19 There was a letter sent to Dr. Travers by
20 the ASME and the ANS where they state, "The schedule
21 defined in the SRM seems rather ambitious." They
22 point out that low power and shutdown standard will be
23 released some time in 2005. The fire standard will
24 not be balloted until at least in 2005. And there are
25 no schedules right now for developing standards for

1 Level 2 and Level 3 PRAs.

2 The societies -- ANS and ASME -- propose
3 to the staff that a committee be formed that will
4 identify the need for additional standards and what
5 these standards should be. And that, of course, will
6 take time.

7 Another question that the subcommittee
8 members raised was -- and it's related to my earlier
9 comment regarding the willingness of societies and
10 industry to cooperate in the development of the
11 standards. What happens if you don't have such
12 cooperation, and you don't have the standards produced
13 as expected? What would the NRC staff do?

14 And then again, the issue of giving low
15 priority to reviewing and analysis, because there is
16 no standard. That is something that the subcommittee
17 members did not like. And NEI sent a letter to the
18 NRC on the 8th of April, and they expressed the same
19 concern.

20 Now, some personal comments. What is
21 missing from all of this discussion -- and I'm not
22 trying to be negative here -- I'm going to stimulate
23 discussion. What is missing is an assessment of what
24 the impact of the various phases would be on the
25 glorified integrated decisionmaking process, which is,

1 of course, in Regulatory Guide 1.174 and everybody
2 likes, including us.
3 On page 7 of the action plan, at least the
4 version that I had, the plan says that all modes and
5 initiating events that could change the regulatory
6 decision substantially should be included. And it
7 sends us to Section 3.1.4, where the word
8 "substantially" presumably is explained. But,
9 unfortunately, it's not explained clearly enough for
10 me to understand it.
11 What benefits, besides prompt NRC reviews,
12 would the licensee have if the licensee -- if we all
13 moved to Phase 3? Would the decisionmaking process be
14 more risk-based? To what extent would it be risk-
15 based?
16 NEI says, of course -- and we agree --
17 that it will never be purely risk-based. And, again,
18 the distinction between the baseline PRA and risk-
19 informed decisionmaking elements is not clear to me,
20 and I didn't see that distinction made in the action
21 plan.
22 So what are we dealing with? Are we
23 dealing with a baseline PRA, all of the PRA, or what?
24 Now, in Section 3.1.2, the draft action
25 plan states that an objective is "for each application

1 type to identify the role that PRA results make in the
2 decision." And I was wondering whether it was a good
3 idea to bury this objective in this section or give it
4 much more prominence, because that's really a major
5 issue that we are really dealing with here.
6 Okay. So the action plan is due to the
7 Commission this coming July, and at the subcommittee
8 -- and we are expected to discuss our views regarding
9 the action plan when we meet with the Commission next
10 month.
11 At the end of the subcommittee meeting, we
12 discussed whether we should write a letter or not, and
13 at that time the members felt -- present felt that
14 maybe we didn't have enough to write a letter, and
15 that we would create at this meeting three or four
16 bullets that would be used when we met with the
17 Commission.
18 I at least have changed my mind. I think
19 we should write a letter at this meeting, after, of
20 course, we hear what the staff has to say and we
21 discuss among ourselves what the letter should say.
22 That's a cleaner solution in my mind; we have enough
23 to say. And then the presentation to the Commission
24 will come naturally from the letter.
25 So with that, I will turn it over to the

1 staff to tell us what they've done and where we're
2 going.
3 Gareth?
4 MR. PARRY: Good morning. I'm Gareth
5 Parry from NRR. With me at the table is Donnie
6 Harrison from NRR, Mary Drouin from Research, and Stu
7 Magruder from NRR. And at the side table we have Mike
8 Tschiltz from NRR and Dave Lew from Research.
9 Okay. So what I will do is I will try and
10 answer some of the questions that George has posed
11 while going through this presentation. We have a lot
12 of viewgraphs. I think we'll probably need to move
13 through some of them fairly quickly. But, clearly, we
14 need to go through what our description of the phases
15 is, which I think is -- perhaps needs a little bit of
16 clarification, and then we'll talk about the
17 implementation issues.
18 I should also say that the draft plan that
19 you have, which was issued a few weeks ago, is in a
20 state of flux. We are changing it. We have -- in
21 particular, we have changed the flow diagram that
22 talks about our process for review when these phases
23 are implemented. And I'll go through that when we get
24 to that point.
25 There's no need for me to introduce the

1 idea of why we're here. As George said, we're here to
2 give you a draft of the response to the SECY.
3 I will, though, go through our definition
4 of PRA quality, because I think it may be worth
5 keeping that in mind. The way we've defined PRA
6 quality in the context of this draft plan is the same
7 as it is in Reg. Guide 1.200, and also in Reg.
8 Guide 1.174.
9 So we defined quality in the context of
10 using a PRA, and it's defined by the appropriateness
11 of -- there are different elements to it. One is the
12 scope. What does the PRA cover? Does it cover
13 internal and external initiating events? Does it
14 cover the full power and low power and shutdown
15 operating modes, for example?
16 There's another element that relates to
17 level of detail, and the third element is technical
18 acceptability, which is really what the standards are
19 addressing.
20 VICE CHAIRMAN WALLIS: Doesn't it really
21 mean that it's sufficient? If you added something, it
22 wouldn't change your decision. You've got enough of
23 a PRA that adding something -- there's nothing left
24 out which would change your decision if you put it in.
25 Isn't that your real definition of "quality"?

1 MR. PARRY: Well, I think you could change
2 your decision in some ways, particularly if you think
3 about applications like 50.69, which is associated
4 with categorizing equipment according to safety
5 significance. I think the more detailed and the more
6 complete PRA the more you can recategorize components.
7 So, in that sense, that's a change of a
8 decision. But I think in terms of whether you're
9 allowing an extension to an AOT or not, you're right,
10 because you want to take the PRA down to the level
11 that you wouldn't want to change that application.
12 MEMBER APOSTOLAKIS: So, Gareth, the first
13 question was, what do we do about this distinction
14 between baseline and risk-informed elements? When you
15 said in the previous slide --
16 MR. PARRY: Right.
17 MEMBER APOSTOLAKIS: -- PRA quality is
18 this, are you referring to the totality of PRA
19 analysis and arguments that will be used in making the
20 decision, including the issue-specific elements?
21 MR. PARRY: I think what that refers to is
22 -- I think we are dealing with the base PRA, the PRA,
23 the decision of the risk from the plant. I think what
24 the SRM is trying to say there is that -- they're
25 trying to avoid the issue of, how do you change the

1 model to address specific applications? Which may not
2 be in the baseline PRA.
3 For example, how do you change the basic
4 event probabilities to reflect the fact that you've
5 changed your graded QA or your QA process? I think
6 all it's doing is making the distinction between
7 understanding the base risk picture of the plant
8 versus changing that picture for a specific
9 application, which is dealt with in other regulatory
10 guides.
11 MEMBER APOSTOLAKIS: It is?
12 MR. PARRY: Yes.
13 MEMBER APOSTOLAKIS: There is a guide that
14 tells us how to change the probabilities of --
15 MR. PARRY: Well, actually, no, it
16 doesn't. It doesn't do that. But it tells you you
17 have to -- you have to have a reason for -- I mean,
18 you have to have a rationale for why you're doing it.
19 And, you know, there are some things which clearly we
20 don't have a standard approach to yet.
21 MEMBER APOSTOLAKIS: Yes.
22 MR. PARRY: And those I think become part
23 of the argument as to how you are changing the model,
24 and why you are -- you think that change is adequate.
25 And I think that's what the SRM is trying to do. It

1 is trying to --

2 MEMBER APOSTOLAKIS: But you are not sure.

3 I mean, that's reasonable -- what you're saying. I

4 mean --

5 MR. PARRY: Well, that's certainly the

6 premise that we've adopted in developing this plan is

7 that the -- the guidance on how to change the PRA

8 model to reflect the change that an application is

9 requesting is -- is to be included in the regulatory

10 guide that's associated with that application. And

11 that's the way we've written the plan.

12 MEMBER APOSTOLAKIS: Well, the plan -- the

13 version that I have is silent on it.

14 MR. PARRY: Well --

15 MEMBER APOSTOLAKIS: You should mention

16 that.

17 MR. PARRY: I think it is in that.

18 MEMBER APOSTOLAKIS: It is?

19 MR. PARRY: Yes, I believe it is. We --

20 MEMBER APOSTOLAKIS: I didn't see it.

21 MR. PARRY: -- don't highlight it. I

22 mean, we just say that -- specifically, we say that we

23 have different elements of guidance, which is the

24 guidance related to the quality of the base PRA and

25 the guidance related to the applications. We'll make

1 that clearer -- that that's where --

2 MEMBER APOSTOLAKIS: Yes, because --

3 MR. PARRY: -- the distinction is

4 addressed.

5 MEMBER APOSTOLAKIS: So you are addressing

6 the baseline.

7 MR. PARRY: Using the baseline in this,

8 yes.

9 MS. DROUIN: Now, I've just made a note,

10 George, that I think we need to go back at the

11 beginning of the plan under the scope and make that

12 clear.

13 MEMBER APOSTOLAKIS: Yes. I think that

14 would be an excellent idea, because, you know, the

15 other question that came to my mind is, when we -- the

16 way -- maybe the SRM should have given an example,

17 because the example you gave was very good -- how do

18 you change the probabilities, you know, when --

19 MR. PARRY: Okay.

20 MEMBER APOSTOLAKIS: -- time available is

21 from 42 to 39 minutes. I mean, it -- because what

22 confused me is that later we say that in Phase 2 or 3

23 -- you know, 3, all -- we use the words "all currently

24 envisioned applications."

25 MR. PARRY: Right.

1 MEMBER APOSTOLAKIS: I said, "Well, if you
2 envision them, why don't you know what you need to
3 do," and include that in the PRA.
4 MR. PARRY: Yes.
5 MEMBER APOSTOLAKIS: I mean, in the
6 quality discussion.
7 MR. PARRY: I think in a sense what that
8 means is that any element of the PRA that you need to
9 use to support the modification of the PRA that you
10 will make for an application is included in the
11 guidance. That's what really it means, which in fact
12 probably means pretty much everything, once we've
13 covered all our applications.
14 MEMBER APOSTOLAKIS: Right. Right.
15 Because when you --
16 MR. PARRY: That's what the intention was.
17 MEMBER APOSTOLAKIS: For example --
18 MR. PARRY: That's not clear enough, okay.
19 MEMBER APOSTOLAKIS: -- in the technical
20 issue that refers to human performance --
21 MR. PARRY: Yes.
22 MEMBER APOSTOLAKIS: -- and you combine
23 that with the model uncertainty issue, and so on,
24 there should be sufficient quality there to allow you
25 to make the changes that you mentioned earlier.

1 MR. PARRY: Right.

2 MEMBER APOSTOLAKIS: Although there are no

3 standard rules how to do that.

4 MR. PARRY: Right, I agree. Yes. That I

5 think is our vision of the case.

6 MEMBER APOSTOLAKIS: Okay. No, that makes

7 sense to me.

8 MR. PARRY: Okay. And as George

9 mentioned, the approach in the SRM is that we -- we

10 should adopt a phased approach to achieving the

11 appropriate quality for licensee PRAs.

12 And the nice thing about this SRM I think

13 is it allows us -- in contrast to perhaps the message

14 that was being given in the March SRM of last year,

15 which called for an all modes, all -- all initiating

16 events PRA that had been reviewed and approved by the

17 staff, before we did any applications, we suggested

18 that -- I think this allows us to move forward with

19 the tools we have currently while progressing towards

20 that aim.

21 Okay. I'll skip over that one.

22 Let me tell you the status of our plan so

23 far. We have a small working group, all of which is

24 actually here at the table and the side table. And we

25 made this draft plan available on 3/15, specifically

1 so that we could talk to you about it and we could
2 talk also to our public stakeholders.
3 So we've had two public meetings, and
4 we've had one meeting with the subcommittee. We're
5 planning a third meeting. It's probably going to be
6 on the 13th of May, not the 12th. And we have had, as
7 George mentioned, a letter from the NEI and also a
8 letter from joint ASME and ANS regarding future
9 standards activities.
10 As George mentioned, the phases in the SRM
11 we believe are differentiated by the availability of
12 the guidance documents. And then, as I just
13 explained, both for using the PRA in regulatory
14 applications and for establishing that the PRAs are of
15 sufficient quality.
16 So that the total suite of guidance
17 documents includes industry consensus standards,
18 industry guidance documents, and regulatory guides
19 which may specific -- such like Reg. Guide 1.177, for
20 example, which specifies a particular approach for
21 doing one of the applications.
22 Our regulatory guides may, in fact, just
23 endorse industry guidance documents, which is -- seems
24 to be the way we are going with 50.69, for example.
25 We will also need guidance documents that are internal

1 to the staff on how to perform our reviews and how to
2 allocate priorities to the various reviews, which is
3 a subject we'll come back to shortly.
4 Okay. I'll go through the definition of
5 the phases, because I think from what George said --
6 I don't think it's quite the way he said it. At least
7 that's not our interpretation.
8 Phase 1 really in a sense represents the
9 status quo, at least it's starting out as the status
10 quo. And I think you'll see when I talk a little bit
11 later that actually Phase 1 is in itself a transition
12 phase to reach Phase 2.
13 And currently the way PRA quality is
14 judged, it's really judged only in the context of --
15 I'm just talking about the base PRA now. It's really
16 only judged in the context of what's needed for the
17 application. So there's no requirement to review the
18 whole thing.
19 But in accordance with the guidance and
20 documents like Reg. Guide 1.174, when you make a risk-
21 informed decision you have to look at all contributors
22 to risk. However, what Reg. Guide 1.174 -- and those
23 that developed from it -- allows is that contributors
24 to risk that are not in the scope of the base PRA can
25 be addressed in a number of other ways.

1 VICE CHAIRMAN WALLIS: Isn't this a bit
2 awkward, this number 2? I mean, you have a core
3 damage frequency of something which you quote for some
4 application. You get another application, you have a
5 different value, because you've included something
6 else in the PRA. So what is the core damage
7 frequency?
8 MR. PARRY: Well, the nice thing about --
9 if you like, the nice thing about Reg. Guide 1.174 is
10 that it allowed you to make some decisions without
11 knowing precisely what that was. Okay? As long as
12 you could demonstrate that the change --
13 VICE CHAIRMAN WALLIS: It's all very
14 logical to you, but how about the public and the
15 public's --
16 MR. PARRY: Well --
17 VICE CHAIRMAN WALLIS: Different core
18 damage frequencies quoted for different purposes.
19 What is it?
20 MR. PARRY: I think that's the purpose,
21 though, of this phased approach is to get us to that
22 state where the PRAs are predictable, and, therefore
23 -- and conform to standards, which would then give, I
24 think, an increased public confidence and also an
25 increased regulatory confidence in the use of the

1 PRAs.

2 MR. HARRISON: Can I add something?

3 MR. PARRY: Sure.

4 MR. HARRISON: On the base PRA, though,
5 just to make it clear -- even when, say, two different
6 applications come from a licensee on two different
7 topics, it's not like they report a baseline CDF given
8 one topic and a different baseline CDF for another
9 topic. They should have the same baseline CDF value
10 for both applications at the same time -- as long as
11 they're at the same time.

12 What we do see is you have a baseline CDF
13 on one application, and then a year or two goes by,
14 the plant makes changes, updates their PRA, and then
15 reports a new CDF in a new application a couple years
16 later.

17 And that usually triggers us to go ask
18 them what changed. So --

19 VICE CHAIRMAN WALLIS: So you have to make
20 a distinction between this baseline and all of these
21 other things, which affected a particular decision.
22 That's part of George's issue, isn't it?

23 MR. HARRISON: Right. This gets at the
24 point of when we judge -- in the context of the
25 application, if I'm doing a diesel generator AOT, my

1 review will focus on the electric power system. It
2 won't necessarily go track down LOCA frequencies and
3 look into those types of questions in the baseline
4 PRA.
5 It will focus on the aspects of the PRA --
6 the review focus is focused on the application topic.
7 But, again, the baseline PRA for two applications at
8 the same time should be reporting the same CDF.
9 VICE CHAIRMAN WALLIS: Right.
10 MR. HARRISON: It's just the delta
11 calculation they do will be for the application and
12 will focus in on those areas.
13 MEMBER KRESS: Let me tell you what
14 problem I have with this slide. If I'm going to use
15 Reg. Guide 1.174 for my decision process, I need some
16 sort of estimate of the full absolute value of CDF and
17 LERF. Now, I can get that estimate by bounding
18 analysis and other ways. But every time we get an
19 application the question is: what do you do about
20 fire contribution to the CDF? What do you do about
21 shutdown low power risk? What do you do about the
22 other missing elements? For example, if the seismic
23 is treated in a qualitative way?
24 And in order to get some measure of what
25 the real CDF and LERF are, I have to have some sort of

1 bounding estimates for those things, and add them in.
2 But it's never done. And you'll -- so you say Phase 1
3 represents the status quo, but the status quo does not
4 really deal properly with the fourth bullet. And
5 that's what bothers me about this slide.
6 MR. PARRY: Well, I think that's why the
7 phased approach is being proposed. I mean, this is
8 the way things are done currently. And I think a lot
9 of them are done by restricting the scope of
10 application, for example, so that you restrict it so
11 that those elements of risk that you haven't modeled
12 are not, in fact, changed.
13 But regardless, this is where we're at
14 right now, and this is where we're trying to move
15 forward from.
16 MEMBER KRESS: Well, I don't think it's
17 where we're at, because I don't think we properly add
18 in those risks to the absolute values.
19 MR. HARRISON: Right. And if you look at
20 Reg. Guide 1.174, in there it has a discussion on
21 seismic margin types or vulnerability type analyses
22 that are used. If you get to a high enough -- it
23 talks about if there's an indication that you might
24 have a higher risk, then you would have to go back and
25 look at more detail.

1 And there are some examples where we
2 actually have, if you will, done an approximation of
3 what the seismic risk might be using some seismic
4 margin and some techniques to try to get at that, or
5 in the fire area what we may do is we'll establish
6 licensee commitments for fire watches and stuff like
7 that to try to control the risk that we know from the
8 fire analysis that may have been done.
9 So we try to either bound or control the
10 base case risk in those situations.
11 MR. PARRY: Actually, I think what you try
12 and do is bound and control the change, the delta.
13 MR. HARRISON: Yes, the delta that would
14 occur.
15 MR. PARRY: And if the base case risk is
16 -- if the delta is small enough, then Reg. Guide 1.174
17 does allow you -- or it does allow the fact that you
18 do not have to assess the complete CDF, and I know
19 that that's --
20 MEMBER KRESS: If you're down in that
21 lower --
22 MR. PARRY: That's in the lower region,
23 right.
24 MEMBER KRESS: -- lower regime you can
25 forget about that.

1 MR. PARRY: Right. And I know that people
2 have -- are uncomfortable with that. But -- but in
3 any case, that is more or less what we do these days.
4 MEMBER POWERS: Let me ask you a question.
5 MEMBER KRESS: Yes, but that presupposes
6 every one of these things will be in that lower
7 regime, and they're not all --
8 MR. PARRY: Well, if they're not -- if
9 they're not, though, as Donnie said, they will get --
10 they will get further scrutiny, and they become more
11 complicated to process.
12 MEMBER POWERS: Let me ask you a question,
13 Dr. Kress. You indicated as the slide indicates that
14 we can use bounding arguments to assess those things
15 that are missing from the scope of the PRA.
16 MEMBER KRESS: Well, that's the way I
17 interpreted the bullet.
18 MR. PARRY: That's one approach.
19 MEMBER POWERS: And I'd like to understand
20 that just a little better, because it seems to me that
21 they're not bounding arguments, they are in fact
22 plausibility arguments.
23 MEMBER KRESS: I would agree with that
24 assessment, yes.
25 MEMBER POWERS: Because --

1 MEMBER KRESS: You know, we say that there
2 have been some estimates of plausibility on fire. It
3 says equal to the -- or greater than the parametric
4 CDF or CDF without it. There have been guesses that
5 the same thing applies to shutdown and low that's of
6 that order. And those are plausibility arguments, and
7 -- but they come out of some sort of assessments,
8 but --
9 MEMBER POWERS: Well, I mean, at least a
10 couple of these things I'm reasonably familiar with.
11 For instance, if you frequently appeal to a scoping
12 estimate that was done for the shutdown risk at
13 Surry --
14 MEMBER KRESS: That's right.
15 MEMBER POWERS: -- I happen to know that
16 that was done quite conservatively and that the
17 operating procedures at Surry have changed since it
18 was done.
19 MEMBER KRESS: Yes.
20 MEMBER POWERS: To where they do shut down
21 and --
22 MEMBER KRESS: And unless they reevaluate
23 that, I would have to be stuck with the original one
24 as my bounding analysis, unless it's reevaluated to
25 see what the effect of the changes are. If I'm going

1 to be conservative about it, which I think bounding --

2 MEMBER POWERS: Well, I guess I'm not

3 asking you to be conservative. I'm asking you to just

4 be realistic and --

5 MEMBER KRESS: Well, if I'm going to be

6 realistic, I have to have a good shutdown PRA to -- it

7 will require a PRA that's realistic and has some

8 certainties that --

9 VICE CHAIRMAN WALLIS: We've got

10 qualitative arguments and plausibility guesses. This

11 doesn't make me feel very confident.

12 MEMBER APOSTOLAKIS: Yes. I think there

13 are two issues here. The first issue has to do with

14 the fact that we -- the staff's presentation has to

15 end by 9:45 or so, because NEI -- NEI will take the

16 floor.

17 The second -- the purpose of today's

18 meeting is to discuss the phases and how we move away

19 from where we are now, not how good Phase 1 is, which

20 I think some of the issues that you are raising --

21 VICE CHAIRMAN WALLIS: Hence the need for

22 the other phases.

23 MR. PARRY: We've established --

24 MEMBER APOSTOLAKIS: Yes, and that's what

25 Gareth keeps saying, that that's why we have the other

1 phases.

2 MR. PARRY: Okay.

3 MEMBER APOSTOLAKIS: So let's see -- but

4 the last bullet there -- keep going. Keep going.

5 MR. PARRY: Okay. All right. That sounds

6 like the right approach.

7 Phase 2 is -- as George mentioned, in the

8 SRM it's called an issue-specific approach. We've

9 rechristened it, if you'd like, an application-type

10 approach, which I think is more really appropriate.

11 In which -- in this phase the base PRA quality is

12 demonstrated by a comparison with an applicable

13 consensus standard for those elements of the PRA that

14 are required for the application.

15 And the -- again, as in Phase 1, we have

16 to address all contributors to risk. But the

17 distinction, as George pointed out, is that now all

18 significant risk contributors should be included in

19 the PRA scope. And significance is defined in the SRM

20 as being determined whether -- by taking it into

21 consideration you could change the decision

22 substantially. That's a nice statement, but it's a

23 little vague. We've recognized that, and one of the

24 tasks in this plan is to define that more clearly.

25 MEMBER APOSTOLAKIS: Okay.

1 MR. PARRY: And we haven't done it yet.
2 We will define it in the process of implementing the
3 plan.
4 MEMBER APOSTOLAKIS: Gareth, would you say
5 what is happening now with respect to risk-informed
6 in-service inspection is a Phase 2 application? Even
7 now?
8 MR. PARRY: Not yet, because --
9 MEMBER APOSTOLAKIS: Why not? Why not?
10 What's missing?
11 MR. PARRY: Well, because the PRAs that
12 are being used as the base have not yet been tested
13 for quality against Reg. Guide 1.200, which, you
14 remember, has only just been released for trial use.
15 MEMBER APOSTOLAKIS: But it's going
16 through a peer review, right? I mean -- okay, 1.200
17 basically endorses --
18 MR. PARRY: Right.
19 MEMBER APOSTOLAKIS: -- the standard, so,
20 I mean, it's not Phase 1, though. It may not be fully
21 Phase 2, but it's not Phase 1 either.
22 MR. PARRY: Well --
23 MEMBER APOSTOLAKIS: And then --
24 MR. PARRY: But what you're saying is --
25 MEMBER APOSTOLAKIS: -- it's an

1 application type, isn't it?

2 MR. PARRY: It's an application type. I

3 think what you're saying is that -- that the only PRA

4 that you need to do ISI is an internal events PRA at

5 full power. If you can make that statement --

6 MEMBER APOSTOLAKIS: Well, we are

7 approving them, aren't we?

8 MR. PARRY: We are, but there are -- but,

9 remember, there are other considerations. It's not

10 just based on that. That's part of the input. We

11 still have to consider the other applications. But if

12 you can convince yourself that the low power and

13 shutdown mode is not relevant, or that fires are not

14 relevant for ISI, which is probably true --

15 MEMBER APOSTOLAKIS: Well, yes, we must

16 have convinced ourselves, because we're approving

17 them.

18 MR. PARRY: Yes. But, again, you're going

19 back to what we're doing now. Okay.

20 MEMBER APOSTOLAKIS: But my question is --

21 or statement -- not everything we are doing now is

22 necessarily Phase 1.

23 MR. PARRY: I think currently it really

24 is.

25 MEMBER APOSTOLAKIS: Well --

1 MR. HARRISON: If I can --

2 MEMBER APOSTOLAKIS: -- let's suppose

3 1.200 was not used. I mean --

4 MR. HARRISON: If I can address the risk-

5 informed ISI piece of that, though. One of the things

6 that's missing is the reg. guide that goes along with

7 risk-informed ISI at some point needs to be updated or

8 revised to reflect what the requirements are for that

9 scope.

10 In other words, if -- right now in all of

11 the SEs there will be a paragraph that's written

12 dealing with external events, saying why those aren't

13 required. That logic needs to be put into the reg.

14 guide. It's a technicality, if you will. Once that

15 gets done and gets approved and gets, you know, cast

16 in stone, then I think you're right. Then we do move

17 into a phase 2 application immediately on that.

18 MR. PARRY: But we're not ready to say it

19 as yet. So I think that --

20 MEMBER APOSTOLAKIS: But it's almost

21 there.

22 MR. PARRY: Yes.

23 MEMBER APOSTOLAKIS: Because basically the

24 standard, which is the Westinghouse and the EPRI

25 approaches, were reviewed and approved by you. And

1 that's what people are implementing.

2 MR. PARRY: Okay. Right.

3 MEMBER APOSTOLAKIS: Okay.

4 MR. PARRY: Okay. So, and this actually

5 gets to your point, really. To achieve Phase 2, then

6 the guidance has to exist for, how do you use the PRA

7 in making the decision? And this includes the

8 definition of the scope of the PRA that you need to

9 make that decision, and then the assessment of the

10 quality of the base PRA for each item that you need.

11 Phase 3 is not so very different from

12 Phase 2 in the sense -- in one sense. It's still

13 based on having the guidance documents and standards

14 to judge the quality of the PRAs. But what Phase 3

15 does -- it rolls everything up for all of the Phase 2

16 applications that you've -- to date, and it rolls them

17 up into one framework.

18 So it would pull together all of the

19 requirements, for example, on PRA quality for all the

20 applications that -- I think what the -- the term that

21 the SRM uses -- currently-envisioned applications --

22 but I think it's really what we currently do and what

23 we anticipate to be doing in the near term rather than

24 -- I currently envision it to be, as somebody pointed

25 out last time, could be ---

1 MEMBER APOSTOLAKIS: Well, if you do --

2 MR. PARRY: -- it's infinite.

3 MEMBER APOSTOLAKIS: If you do 50.46, I

4 mean --

5 MR. PARRY: Yes.

6 MEMBER APOSTOLAKIS: -- you've done the

7 big one.

8 MR. PARRY: Yes.

9 MEMBER APOSTOLAKIS: Everything else will

10 be nothing.

11 MR. PARRY: So, actually, tech spec 4B

12 might be the big one that --

13 MEMBER APOSTOLAKIS: Good.

14 MR. PARRY: And the idea with Phase 3,

15 it's scheduled to be completed by the end of 2008.

16 Now, so I think the goal for the end of 2008 that we

17 would have the regulatory framework in place -- the

18 licensee to say that he's got a Phase 3 PRA, then he

19 has to develop the PRA to meet that regulatory

20 framework and -- which includes meeting the standards,

21 getting it peer reviewed, etcetera.

22 VICE CHAIRMAN WALLIS: When you say

23 Phase 3 is completed, do you mean that will then be

24 the way in which you will do business?

25 MR. PARRY: We'll come to that in the

1 description of the flowchart.

2 MR. MAGRUDER: The policy issues.

3 MR. PARRY: There are some policy issues

4 in there, right. Yes. At least the framework will be

5 in place.

6 Phase 4 -- I don't think we should spend

7 too much time on this, but it really is that stage --

8 that phase when the PRA has been developed to the

9 state of the art. And I think we would define state

10 of the art as being something like capability

11 Category 3 of the ASME standard. It's beyond current

12 good, accepted practice.

13 MEMBER ROSEN: Isn't that a moving target?

14 MR. PARRY: Well, yes. I think that's why

15 it would be very difficult to -- to write guidance for

16 Phase 4. Whereas, Phase 3 it might be -- I mean,

17 Phase 3 guidance could -- it will also be a moving --

18 MEMBER ROSEN: By definition, if all

19 plants are at Phase 4 and I am one plant and find my

20 -- find a new use and improve my PRA in some way,

21 everybody else falls back to Phase 3.

22 MEMBER APOSTOLAKIS: That's a good point.

23 MR. PARRY: Yes. For that application you

24 fall back to Phase 1.

25 MEMBER APOSTOLAKIS: Because you move the

1 state of the art.

2 (Laughter.)

3 MEMBER ROSEN: Phase 4 is an honorary

4 degree.

5 MR. MAGRUDER: But there are other

6 distinctions which we will get to about the staff

7 review --

8 MR. PARRY: Yes.

9 MR. MAGRUDER: -- of the Phase 4 peer

10 review.

11 MR. PARRY: So let me -- okay. Let me

12 talk about the review of the base PRA. Now, this is

13 a little different from what you saw last time. In

14 Phase 1, currently what we do is the review of the

15 base PRA is at the discretion of the reviewer. But

16 what we're expecting is that while we're waiting for

17 Phase 2 to be completed, which means getting all of

18 the standards in place for a specific application, we

19 will still have Reg. Guide 1.200 in place, which

20 endorses currently the standards for internal events.

21 So we would expect that once the trial use

22 is completed and we've modified Reg. Guide 1.200 that

23 that would indeed be used to assess the quality of the

24 phase -- of the base PRA even in Phase 1. So that

25 explains my remark -- what I said earlier that Phase 1

1 is like a transitional phase, really.

2 So rather than -- as far as the staff

3 review goes, the transition from having sort of ad hoc

4 reviews like we do currently to a more systematic

5 review based on Reg. Guide 1.200.

6 MEMBER APOSTOLAKIS: Is it only Regulatory

7 Guide 1.200 that matters?

8 MR. PARRY: Well, that's where -- that's

9 the document where we will endorse the standards. So

10 in that sense --

11 MEMBER APOSTOLAKIS: Oh, so you will keep

12 that in appendices.

13 MR. PARRY: Yes.

14 MEMBER APOSTOLAKIS: Okay, okay. Okay,

15 okay. So it's not in Phase 3 -- they want to handle

16 it in Phase 3 is not the same as they want to handle

17 it in Phase --

18 MR. PARRY: As it is now, right.

19 MEMBER APOSTOLAKIS: Ah. Maybe clarify

20 that a little bit.

21 MR. PARRY: Yes. Yes. So in Phase 2,

22 again, the review of the base PRA will be based

23 primarily on 1.200 for all of the significant

24 contributors to the application. And Phase 3, as I

25 say, is similar to Phase 2.

1 Phase 4 is really different, because the
2 way the SRM is written this requires staff review and
3 approval of the base PRA, which really means getting
4 into debt.
5 Okay. Now, this is the famous diagram,
6 which usually takes a lot of explanation. This has
7 changed a little bit since you saw it last,
8 particularly on the left-hand side. I'll try and walk
9 through it fairly quickly.
10 Okay. This -- we start off with box 1.
11 It says the licensee has identified a specific
12 application. Box 2 says, "Are we in Phase 3 yet?"
13 We're going to assume for the moment that we're not.
14 Well, we're not. So this is a futuristic box.
15 Box 3 asks, "What PRA scope is needed to
16 support the identified application?" And that would
17 be covered in the regulatory guides that address that
18 application. Box 4 is the screening box that says,
19 "Are we in Phase 2 or Phase 1 for that application?"
20 Okay. If we have the guidance in place to
21 assess the quality of all the significant contributors
22 that we think will be needed for that application,
23 then we're in Phase 2, and we come out on the right-
24 hand side of that diagram.
25 Box 2-1 asks, "Do the applicable portions

1 of the base PRA conform to the existing standards for
2 the risk-significant PRA scope?" In other words, are
3 we consistent with the PRA requirements for that
4 application type? If it's yes, we get kicked out to
5 Box -- not kicked out, we go out to Box 2-2, which
6 says you get a high priority review. We're going to
7 have to work on these words. Really, it's a normal
8 review.
9 If, on the other hand, not all the PRA --
10 if the PRA is not of sufficient scope for that
11 application -- okay, so in other words, if the
12 application required a fire PRA, then they don't have
13 -- they have not satisfied the fire PRA standards.
14 Then you come out of that box with a no.
15 No, if the risk-significant contributors,
16 however, are still addressed, they get what we've
17 called a low priority review, because it's going to be
18 more resource-intensive. Okay. A lot of the
19 decisions that we've got on this graph are based on
20 review resources.
21 If, on the other hand, the licensee hasn't
22 even addressed these risk-significant contributors,
23 that gets rejected.
24 MEMBER APOSTOLAKIS: But it's not up to
25 you. I mean, the SRM tells you to do this.

1 MR. PARRY: Well, yes, but when you
2 actually go to the SRM -- well, this is a policy issue
3 we've identified, and I'll --
4 MEMBER APOSTOLAKIS: Yes.
5 MR. PARRY: -- tell you why. I'll tell
6 you why we've identified it. You could just reject
7 it. Okay? The SRM actually says either --
8 MEMBER APOSTOLAKIS: Low priority.
9 MR. PARRY: -- they give it low priority
10 or --
11 MEMBER APOSTOLAKIS: Which is what you
12 have there, yes.
13 MR. PARRY: -- or reject.
14 MEMBER APOSTOLAKIS: Yes.
15 MR. PARRY: The reason we want to keep the
16 low priority in here is really -- it's an optical one,
17 because if we were to reject it outright it would sort
18 of imply that what we've been doing up to date is not
19 appropriate. And I don't think -- we don't believe
20 that what we're doing now is inappropriate.
21 MEMBER APOSTOLAKIS: But you cannot
22 disagree with the Commission's direction that you
23 should give low priority or reject.
24 MR. PARRY: Or reject. And that's -- and
25 we have that --

1 MEMBER APOSTOLAKIS: Yes.

2 MR. PARRY: -- that logic in here. Okay.

3 So that's --

4 MEMBER APOSTOLAKIS: So you guys agree

5 with this?

6 MR. PARRY: Yes. But -- yes.

7 MEMBER APOSTOLAKIS: Or you are doing it

8 because you were directed to do it?

9 MR. PARRY: No, we agree with it also.

10 Both, actually. We think it's a good idea. Okay.

11 MEMBER APOSTOLAKIS: Yesterday I had a guy

12 from MIT presenting something about decision analysis.

13 Okay? And he said -- or it had to do with

14 maintenance. He said we screened the -- we have a

15 priority. The top priority is if the president of the

16 institute wants it, it's done.

17 (Laughter.)

18 For the rest, we use decision analysis.

19 So this is a practical application. Okay.

20 MR. PARRY: Okay. Now, suppose we -- in

21 the situation which we are in with a lot of

22 applications, where we think we would need a fire PRA

23 or a seismic PRA, but as yet we do not have the

24 standards in place to judge them.

25 MEMBER APOSTOLAKIS: Right.

1 MR. PARRY: Okay. So that's Phase 1. So
2 we come out to the left of this box.
3 Box 1-1 asks, "Do the applicable portions
4 of the PRA conform to existing standards?" Does it
5 mean those PRA -- the PRA that we've done, does it
6 conform to Reg. Guide 1.200 guidance? If you say yes,
7 okay, we come down to Box 1-2. This is the one that
8 caused you a lot of -- well, you and industry a lot of
9 heartache.
10 But what it asks is, does the application
11 use a PRA scope that's beyond the current guidance to
12 expand the scope of the application? Let's assume for
13 now the answer is no. Okay. Then, this is a normal
14 Phase 1 review, and it gets the normal priority
15 review.
16 Now, let's go back to that box. What we
17 really were looking for in that box was to say is --
18 if the expansion of the PRA is to purely -- is purely
19 to get more from regulatory requirements, then we
20 would say that that -- we're going to say that that
21 should get a low priority review, based on the
22 additional resources that we would have to spend to
23 review that application, because we currently do not
24 have the standards to judge that. So we would have to
25 do a lot more ad hoc review.

1 An example of this, and the one we used
2 last time, was 50.69. 50.69 -- the guidance for how
3 to do the categorization -- is in NEI 0004. What
4 NEI 0004 allows you to do is if you don't have a fire
5 PRA, you don't have a seismic PRA, then what it tells
6 you to do is then don't recategorize those components
7 that you are relying on to deal with fire and seismic,
8 that contribute to fire and seismic risk. You can
9 only recategorize those things that are associated
10 with internal events risk.
11 Okay. Now, that somewhat restricts the
12 categorization. So if the licensee were to come in
13 with a fire PRA to broaden the scope of 50.69 to
14 increase the chances of recategorizing things as risk-
15 free, that is the type of thing we're talking about
16 here, because it's expanding the scope of the
17 application of 50.69 by bringing in a PRA for which we
18 do not yet have a standard. And that's the reason --
19 that's an example of why we put that box in there.
20 MEMBER APOSTOLAKIS: But you are looking
21 at it from the point of view that the only benefit
22 from this is to the licensee. The licensee wants to
23 expand the scope.
24 MR. PARRY: Right.
25 MEMBER APOSTOLAKIS: But it seems to me if

1 the licensee was willing to spend the resources
2 necessary to do this extra work, that licensee is
3 contributing to the advancement of the state of the
4 art, which creates the foundation for developing the
5 standards you want.
6 MR. PARRY: Yes.
7 MEMBER APOSTOLAKIS: So by having the
8 staff review it and, you know, making comments, and so
9 on, you are contributing to this advancement. And
10 that is a benefit that is not here.
11 MR. PARRY: Well, I think it will be in
12 the sense that pilot applications -- for example, tech
13 spec initiative 4B -- I think we would not apply that
14 rule here, because clearly it's, if you like, a proof
15 of principle of an approach, and that is certainly
16 developing the state of the art for that application.
17 That would not be -- I don't think we'd
18 give that -- well, clearly, we're not going to give
19 that a low priority review for the application that we
20 have, because it's part of the Reg. Guide 1.200
21 pilots. We understand that this appears to be a
22 disincentive for some.
23 MEMBER APOSTOLAKIS: It is.
24 MR. PARRY: Well, not a disincentive.
25 MEMBER APOSTOLAKIS: To what degree, I

1 don't know. But there is a disincentive.

2 MR. PARRY: And that's why we have this as

3 a policy issue.

4 MR. TSCHILTZ: We're trying -- this is

5 Mike Tschiltz. We're trying to address that I think

6 by saying that we would allow pilots before the

7 standards are in place for certain applications.

8 But the problem we have is that if people

9 proceed with using PRAs where there's no standards in

10 existence, we're promoting ad hoc reviews, we're

11 promoting resource-intensive reviews, and we're

12 promoting non-standardization within the industry,

13 whereas we're trying to harmonize things, so we're

14 more consistent, and licensees are more consistent in

15 their approaches to the development of standards.

16 MEMBER APOSTOLAKIS: And I agree with

17 that. But, for example, one solution might be to

18 break up this Box 1-5 into two boxes or three, and say

19 that there may be other reasons that the staff may

20 decide to give it a normal review.

21 MR. TSCHILTZ: Yes. And I think --

22 MEMBER APOSTOLAKIS: If it's of something

23 very innovative -- I mean, the thing about the

24 standards is you don't just declare, "I want a

25 standard on XYZ by next December," without having the

1 technical foundation to develop it, right? So this is
2 where the technical foundation is developed, and you
3 may choose certain things to say, "Boy, this is really
4 new. Who is going to review it?"
5 MR. PARRY: I don't think that's what Mike
6 was saying, that that's what we will --
7 MR. TSCHILTZ: We've discussed that, and
8 we thought rather than putting it in the flowchart,
9 which would maybe tend to get too complicated, you
10 were going to address that in the text of the plan
11 itself.
12 MEMBER APOSTOLAKIS: Well, it's attracting
13 so much discussion, maybe it belongs --
14 MR. PARRY: Well, I think that -- well, if
15 we make the viewgraph any more busy, though, I think
16 we'll -- we'll make things even more complicated. I
17 think this is really just a -- ultimately, we'll have
18 to read the --
19 MEMBER APOSTOLAKIS: Put one or two words
20 there to direct people somewhere else to --
21 MR. PARRY: Okay. All right.
22 MEMBER APOSTOLAKIS: Because right now it
23 doesn't say that.
24 MR. PARRY: That's fine. We'll do that.
25 And what box -- let me go back up to Box

1 1.1, then. If the applicable portions of the PRA do
2 not conform to existing standards, which means, for
3 example, if a licensee comes in with an application
4 that he has not done a -- he has not used Reg.
5 Guide 1.200 to demonstrate quality of his PRA, then he
6 would basically get a low priority review ultimately.
7 And this is a picture of when -- you had
8 asked, George, I think through Mike, that we talk a
9 little bit about the schedule. This is not going to
10 take place immediately the guidance documents are
11 established. Okay? There's a phase-in period for
12 this.
13 For example, we've built in currently into
14 the schedule a year after the guidance has been
15 developed to allow licensees to meet that guidance.
16 Now, the year is perhaps negotiable. I don't know.
17 We haven't decided that that's definitely the date,
18 but there has to be like a grace period to allow
19 everybody to catch up to the guidance.
20 So moving on from this one, we have the
21 second --
22 VICE CHAIRMAN WALLIS: How do you deal
23 with these statements about risk-significant
24 contributors are meeting current guidance? If you
25 haven't put them in, how do you know if they are risk-

1 significant or not?

2 MR. PARRY: I think it's a -- well, I

3 think you can make a -- you can make a judgment as to

4 whether the change you are trying to make with the

5 application is going to affect the risk from fires or

6 seismic.

7 MEMBER ROSEN: You say -- "could" is the

8 word you used.

9 MR. PARRY: I said "could," yes.

10 MEMBER ROSEN: You say "could affect."

11 MR. PARRY: But I think --

12 MEMBER ROSEN: And I think that's flexible

13 enough.

14 MR. PARRY: Yes. And I think we have to

15 -- I think the general guidance will have to come out

16 and make those statements. It will say, "To do this

17 application, you need a fire PRA, you need a seismic

18 PRA." That doesn't prevent a licensee from -- for his

19 plant to come in and say, "Well, because I'm in this

20 seismic region, I don't have to do a seismic PRA

21 because my plant is not vulnerable at all."

22 VICE CHAIRMAN WALLIS: So these are

23 plausible qualitative arguments that we got into

24 before.

25 MR. PARRY: Well, they may be -- yes.

1 Well, they may be more than plausible and qualitative,
2 but --
3 MEMBER POWERS: What I'm struggling with
4 a little bit here is I sit here and say I'm interested
5 in some component, and I have done a prior PRA. And
6 so I come along and I make a plausibility argument
7 that says, "Gee, the thing I worry about most in the
8 case of fire is spurious operation of this --
9 operation badly."
10 If I can come up with some scenario with
11 this component I'm interested in spuriously operating
12 in some -- in an unusual fashion causes a problem, do
13 I always end up in low priority review, then?
14 MR. PARRY: No. Well, it depends where we
15 are with the standards. I mean, the low priority is
16 -- first of all, the guidance for the application has
17 to specify which -- what the scope of the PRA is you
18 need.
19 Okay. If you -- currently, if it's a fire
20 PRA you need, we don't have fire standards. That
21 doesn't relegate you to low priority review. If after
22 the fire PRA standards are in place you still come in
23 without a fire PRA, that would.
24 MEMBER POWERS: I guess what I'm worried
25 about is your significant contributors not being

1 included.

2 MR. PARRY: Right.

3 MEMBER POWERS: And --

4 MR. PARRY: Well, let me, before you

5 complete your question -- in this context, significant

6 contributor, what I'm really talking about is the big

7 contributor, like the type of initiating event and the

8 type of operating mode.

9 The level of the -- the contributor at the

10 level of the specific basic event is a function of the

11 PRA, and that gets addressed when you do an

12 application. You have to go through and find out

13 which elements of the PRA are relevant to the answer.

14 So I think you are talking at a somewhat deeper level

15 than I was talking about here.

16 MEMBER POWERS: Okay.

17 MR. PARRY: And that won't be forgotten,

18 but it will be addressed in the application-specific

19 guidance.

20 MEMBER APOSTOLAKIS: You have five

21 minutes.

22 MR. PARRY: Okay. Well --

23 MEMBER APOSTOLAKIS: Tony, how much time

24 do you need?

25 MR. PIETRANGELO: I want my time allotted

1 on the schedule.

2 MEMBER APOSTOLAKIS: You will have it.

3 MR. PARRY: I'm going to skip over this,

4 because this is when the Phase 3 --

5 MEMBER APOSTOLAKIS: Yes.

6 MR. PARRY: -- this is sort of futuristic.

7 The only -- okay. The policy issues that we've

8 identified -- and I will focus I think primarily on

9 the statement of the issue. We're still -- we had a

10 meeting with our risk-informed licensing panel the

11 other day, and they gave us some advice on how to

12 perhaps restate some of the pros and cons in here.

13 But I'll at least give you our rationale for why we're

14 making the decision.

15 So the first issue was the one we

16 discussed about in relation to that box. It's the use

17 of the PRA scope greater than that for which standards

18 exist, simply to increase the scope of relaxation

19 requirements.

20 And we asked: should this submittal be

21 given low priority? And our recommendation is yes,

22 primarily on the basis that this is a very resource-

23 intensive thing, and we really would -- and the reason

24 it's resource-intensive is that we wouldn't have the

25 standards to judge it.

1 The second policy issue is once a -- and
2 this is related to the words that were in the SRM. If
3 the licensee submits an application for which all of
4 the applicable guidance documents are in place, which
5 is Phase 2, but they don't conform to that guidance,
6 should we give that application low priority? Or
7 should it be rejected outright?
8 Our argument is that we should err towards
9 the low priority, primarily because rejection would
10 send a message that we haven't been doing the job
11 properly up to date.
12 The issue 3 is when all of the guidance
13 for all current and anticipated applications is in
14 place -- Phase 3 -- should every licensee be required
15 to conform to that guidance before submitting any
16 risk-informed submittals?
17 Okay. Our recommendation here is no,
18 because if the licensee is really only interested in
19 one application, to develop a PRA that would cover all
20 of them would be really, in a sense, an unnecessary
21 burden.
22 The arguments against our proposed
23 recommendation, really, is that without this there
24 really is no forcing function to go to Phase 3.
25 MEMBER APOSTOLAKIS: You are going back to

1 Phase 1.

2 MR. PARRY: Well, no, there's another one.

3 When all the guidance for Phase 3 is in place, if you

4 followed our recommendation, then they would still be

5 able to come in with Phase 2 applications. Okay? For

6 specific application types.

7 And this policy issue says, okay, if they

8 don't follow all the guidance for Phase 2 at this

9 point, which means they're really coming in with a

10 Phase 1, should we reject it outright? And our

11 recommendation here is yes, because this would

12 reinforce the Commission's view that we need to

13 develop more complete PRAs.

14 There is maybe a -- this is also perhaps

15 a little contradictory to what we said in policy

16 issue 2. But we feel that when -- and this is why I

17 think it has to be a policy decision, because the

18 Commission has to weigh in on this -- because reg.

19 guides typically tell you one way of doing things and

20 not -- and we were allowing these applications in the

21 past.

22 So the next policy issue, and the last one

23 we've identified, is effective -- and that was brought

24 up by Mr. Rosen last time. Actually, I think that he

25 suggested this. If the SDOs decline to produce a

1 standard considered necessary for an application,
2 should the NRC develop its own guidance? And our
3 recommendation here is yes.
4 And don't worry about the pros and cons.
5 As I say, we're still working on those.
6 Okay. The activities that we need to do
7 to implement this phased approach, we need to -- I
8 haven't described the tasks here. And, in fact,
9 they've changed a little bit from the version of the
10 plan you have.
11 We need to continue supporting the
12 development and the endorsement of PRA standards. We
13 need to update regulatory guides, and that includes
14 Regulatory Guide 1.200. We probably need to develop
15 regulatory guides for new applications. These are
16 anyway -- in any case being done.
17 We need to develop methods and supporting
18 documents for the technical issues. As you mentioned
19 earlier, George, there are three of the technical
20 issues that were identified in the SRM that we need to
21 address. And we also need to develop staff
22 implementation guidelines, which include things like
23 the standard review plan and office instructions.
24 That's -- the office instructions is where we'll find
25 the discussion of the priorities of review.

1 And the industry also has to do some
2 things. Okay?
3 MEMBER APOSTOLAKIS: Let's look at the
4 schedule itself.
5 MR. PARRY: Okay. We have I think a
6 viewgraph that talks about the schedule. Again, this
7 is not final. The reason I bring it up here is to
8 show you that if you look at, for example -- look at
9 the second group of two -- PRA quality, Reg. Guide
10 1.200 pilots. We are planning to finish those by
11 December 30th, and then modify the reg. guide.
12 The implementation, which is when we would
13 expect this guide to be used for all applications in
14 the future that use internal events PRA, would be --
15 currently it's September 30, 2005. And these are
16 tentative dates, but you will see that -- all
17 throughout here that the implementation follows a year
18 after the completion of the documents. And this is to
19 build in that grace period.
20 MEMBER APOSTOLAKIS: Now, there is nothing
21 on Level 2 on --
22 MR. PARRY: No. Because currently none of
23 our applications really requires a Level 2 and a
24 Level 3 PRA.
25 MEMBER APOSTOLAKIS: Doesn't the guide

1 talk about LERF -- I mean, 1.174?

2 MR. PARRY: It only talks about LERF. And

3 the --

4 MEMBER APOSTOLAKIS: And we have guidance

5 with LERF?

6 MR. PARRY: Yes. The ASME standard

7 addresses LERF.

8 MEMBER APOSTOLAKIS: Which one?

9 MR. PARRY: The current one.

10 MEMBER APOSTOLAKIS: The existing one.

11 MR. PARRY: The existing one covers LERF,

12 yes.

13 MEMBER APOSTOLAKIS: No, you're right.

14 CHAIRMAN BONACA: I had a question on the

15 decisionmaking process that we discussed before -- at

16 the beginning. You know, the presumption is that the

17 delta CDF is independent of the baseline model. I

18 mean, if you do have -- and I agree with that for the

19 foreseeable changes.

20 I'm concerned about a major change like

21 50.46 with tentacles all over the place where you have

22 -- you may have missed certain pieces -- power

23 shutdown, other pieces there which are still affected

24 by that. And, therefore, you're assuming some

25 bounding examples based on similar plants, and so on

1 and so forth.

2 My concern is that plant specificity is so

3 critical in some of these evaluations -- I mean, in

4 the model -- that, you know, the assumption of delta

5 CDF independence may not be true. How do you get

6 comfortable about reviewing it?

7 MR. PARRY: I don't think we can answer

8 that question in this -- in this --

9 CHAIRMAN BONACA: I understand that. But

10 we were discussing before the issue of, you know, Reg.

11 Guide 1.174, and I understand that -- but that's an

12 assumption that is always being made, and even is made

13 in the SRM.

14 MR. PARRY: I think that sort of decision,

15 though, will have to be made in any regulatory guide

16 that's associated with 50.46 and the implementation of

17 it. That will have to address what those issues are,

18 and it will define --

19 CHAIRMAN BONACA: Okay.

20 MR. PARRY: -- what's needed for the

21 application. And that will decide whether it's

22 Phase 1, 2, or 3. Well, it won't be 3, that's for

23 sure, and it may not be 2 --

24 CHAIRMAN BONACA: Yes.

25 MR. PARRY: -- for a while.

1 CHAIRMAN BONACA: Because, I mean, there
2 is a widespread belief that that's always true. But
3 in practical terms, when you do the modeling, and then
4 you do certain assumptions, and then you call, you
5 know, a comparable plant and you say, well, you know,
6 this is -- well, you know, you discover you have a lot
7 of differences in fact that you don't understand until
8 you do the PRA.
9 MR. PARRY: Yes, I think you're right.
10 But in a way this -- this draft plan is irrelevant if
11 we don't have applications that are moving forward
12 that require these different scopes I think.
13 MEMBER APOSTOLAKIS: The item there called
14 alternate methods and treatment of uncertainties,
15 that's the model uncertainty issue?
16 MR. PARRY: Yes.
17 MEMBER APOSTOLAKIS: And the human
18 performance is somewhere else?
19 MR. PARRY: Yes. It's -- well, it's
20 probably not on this. It's not on here, I don't
21 believe.
22 MEMBER APOSTOLAKIS: But in the -- I don't
23 know to what extent you have changed the plan itself.
24 But the discussion of human performance there was not
25 very convincing, and it was --

1 MR. PARRY: We have --

2 MEMBER APOSTOLAKIS: -- completely

3 separated from the issue of model uncertainty. I

4 mean, that issue in human performance is model

5 uncertainty.

6 MR. PARRY: Right.

7 MEMBER APOSTOLAKIS: So it should be

8 handled in some way. Developing guidance regarding

9 accepted practices, or whatever way they put it,

10 doesn't help.

11 MR. PARRY: Well, it helps I think that

12 our review is to understand what's needed to meet the

13 standard. But I agree with you. Those --

14 MEMBER APOSTOLAKIS: It doesn't appear --

15 you have it somewhere else, but not here.

16 MR. PARRY: Right. No.

17 MEMBER APOSTOLAKIS: Here the issue is if

18 there are different views out there, different models,

19 what should I do?

20 MR. PARRY: What should you do, yes. Yes.

21 And, actually, to some extent that's already covered

22 in some of the current reg. guides. To some extent.

23 Okay. But, yes, we need to -- we haven't

24 really focused on that. We've been focusing more on

25 the implementation, but we will revise that. We know

1 that we have to do that.

2 MEMBER APOSTOLAKIS: Well, do you agree

3 that the technical issues are important to all phases?

4 MR. PARRY: They're all important, yes.

5 And I think what you -- but what it -- but, again, I

6 think what that comes down to is that -- is that when

7 you define your decisionmaking process, it has to be

8 robust enough to recognize that these issues have not

9 yet been resolved.

10 And, therefore, I think it has to be done

11 in tandem with the decisionmaking process. It's not

12 really -- this plan really is only to help develop the

13 base PRAs. The model uncertainties will still be

14 there.

15 MEMBER APOSTOLAKIS: Yes.

16 MR. PARRY: But they have to be addressed

17 I think through the vehicle of the decisionmaking

18 process, not through this guide, or through this plan

19 I should say. And so --

20 MEMBER APOSTOLAKIS: So the only

21 benefit -- the only benefit, then, that a licensee

22 would have from the -- this whole process is the level

23 of priority that they would get when they submit an

24 application, in reviewing it.

25 MR. PARRY: But there may be other --

1 MEMBER APOSTOLAKIS: What else?

2 MR. PARRY: There may be other benefits,

3 though.

4 MEMBER APOSTOLAKIS: Like?

5 MR. PARRY: Well, like, for example, if

6 you have a Phase 3 PRA, then its use in resolving

7 another phase -- Phase 3 SDP issues would be -- I

8 think it would be of great benefit.

9 I also think that the development of the

10 PRAs does allow the scope of things like 50.69 to be

11 expanded.

12 MEMBER APOSTOLAKIS: But we could bring it

13 up -- maybe it's most the obvious example, but --

14 MR. PARRY: It is an obvious example.

15 MEMBER APOSTOLAKIS: Anyway, you've

16 handled your time very well.

17 MR. PARRY: Thank you.

18 MEMBER APOSTOLAKIS: Are there any

19 comments or questions from the committee?

20 Well, thank you very much.

21 MR. PARRY: Thank you.

22 MEMBER APOSTOLAKIS: It was very

23 enlightening.

24 So one last question. The plan that I

25 have is not the plan that you have? Mine is dated?

1 MR. PARRY: Yes. I mean, it's in the
2 process of flux.
3 MEMBER APOSTOLAKIS: So your view about
4 the committee writing a letter is what?
5 MR. PARRY: Well, I think the --
6 MEMBER APOSTOLAKIS: Not what the letter
7 should say.
8 MR. PARRY: No.
9 MEMBER APOSTOLAKIS: Should the committee
10 write a letter now or wait until June or something,
11 you know, when we review the final thing?
12 MR. PARRY: I think --
13 MEMBER APOSTOLAKIS: If we review it.
14 MR. PARRY: Yes. I think that probably my
15 guess is that what you're more interested in is the
16 overall philosophy rather than the detailed tasks --
17 task descriptions. And the -- I would suspect also
18 the policy issues, doing a weigh-in on those.
19 I don't think those are going to change
20 dramatically. I don't anticipate they will change
21 dramatically. So if you feel you have enough to go on
22 on those issues, then I think you could write the
23 letter now.
24 MEMBER APOSTOLAKIS: Okay.
25 MR. PARRY: But if you wanted to see the

1 detailed task plans, which I'm not sure you -- I mean,
2 well, I think we've identified the issues that we're
3 going to address.
4 MEMBER APOSTOLAKIS: Very good. Thank
5 you. That was very --
6 MR. PARRY: Thank you.
7 MEMBER APOSTOLAKIS: -- useful.
8 Okay. Mr. Pietrangelo.
9 MR. PIETRANGELO: Good morning. What I
10 want to start with is where we were with the SRM
11 March 31st of last year versus where we are now after
12 the December 18th SRM.
13 From our perspective, what the Commission
14 paid for and SRM put out in December was a vast
15 improvement over the guidance and direction that was
16 provided last March. And I think Gareth touched on
17 this a little bit, but I wanted to underscore it.
18 The position put forward in that SRM --
19 the previous SRM was what we referred to as the all
20 singing and dancing PRA to do any further
21 applications, which was really a significant change
22 from the way we were proceeding and the direction we
23 were heading. It was a -- not only a step change, I
24 call it a cliff change in approach. Okay?
25 Therefore, we view what the Commission put

1 out in December, and the associated paper, as a
2 significant improvement for the following reasons.
3 The direction is to continue to evolve PRA technology,
4 both the scope and technical adequacy and level of
5 detail, while at the same time allowing practical uses
6 of that technology in the regulatory process and to
7 get more efficient as we go. I think we shouldn't
8 forget that.
9 That's a key part of that SRM, and I think
10 that's a lot of what's behind the staff's paper is to
11 try to gain efficiency as we go forward. We want
12 those efficiencies, too. A licensee pays the NRC for
13 the review. If the review takes longer, you're
14 already penalizing the NRC -- or the licensee, because
15 he's paying for it. So we want efficiency in the
16 regulatory process, both for the staff and for the
17 licensee. So I think that there's a good balance
18 there.
19 So we wholeheartedly agree with the
20 overall thrust of the Commission's direction to allow
21 progress as we move forward with evolving the scope
22 and technical adequacy of PRAs.
23 You know, put all the rest of the
24 mechanistic waste and the phases and how to proceed,
25 that's the key part of this decision. And I think

1 it's the right one from our perspective.

2 The other part I wanted to mention also is

3 that we believe applications drive the evolution of

4 PRA. If there's no good use for it, or cost benefit

5 for it, it's going to be highly unlikely that a

6 licensee is going to invest resources in it.

7 A lot of what's in the paper we sent to

8 the staff last week talks about our current efforts,

9 what we're doing this year, and it wasn't mentioned

10 very much in the previous talk about the pilot plan we

11 have on Reg. Guide 1.200 to use the ASME standard.

12 That's a significant effort.

13 That standard alone took over four years

14 to develop. The peer reviews for the Level 1 PRAs

15 that are now a requirement in the standard, the

16 industry started that before the standard was even

17 developed. That took five years, and that's on the

18 areas of PRA we know them most about.

19 The standard came out last year. It took

20 another year to get a reg. guide that endorses it for

21 trial use. It'll take another year at least for us to

22 pilot that and specific applications. And I think per

23 the staff's schedule, it will take about nine months

24 to put out the revision of the reg. guide. So, and

25 that's the thing we know the most about and have the

1 most experience with.

2 When you get into these other areas with

3 you know, fire and seismic and shutdown, there haven't

4 -- there hasn't been one peer review, I don't think,

5 in any of those areas yet. It took the industry five

6 years to do the Level 1 peer reviews. So I think the

7 paper -- this isn't the last time I think the

8 Commission is going to weigh in on the direction for

9 the evolution of PRA and scope of technology.

10 This is going to take a long time. I

11 think what you heard in the ASME/ANS letter was that

12 the schedule might be ambitious. We didn't even talk

13 about schedule in our letter. Okay? We just want to

14 make sure the arrow is pointing in the right

15 direction. However long it takes it takes, and things

16 always take longer than we think they're going to take

17 up front.

18 VICE CHAIRMAN WALLIS: Now, this

19 reluctance to proceed, is it due solely to economic

20 forces? Or is it because you don't know how to do

21 better? It seems to me you do know how to make better

22 PRAs, but you just don't think it's worth it.

23 MR. PIETRANGELO: No, that's not it at

24 all. In fact, you know, I'm going to disagree with

25 the staff on the first policy issue. There are people

1 that are making investments in scope enhancements to
2 their PRA. Fire I think is the best example.
3 And also, I'm going to penalize somebody
4 because there isn't a standard there? We disagree
5 with the staff on that, as did the subcommittee. We
6 think that sends the wrong message.
7 So it's not a reluctance. It's a tool.
8 VICE CHAIRMAN WALLIS: But it is an
9 economic thing. You're reluctant to invest when you
10 don't see a payoff.
11 MR. PIETRANGELO: Well, anyone would have
12 that --
13 VICE CHAIRMAN WALLIS: Right. That is the
14 reason -- that is what motivates your --
15 MEMBER APOSTOLAKIS: I believe, though,
16 Graham, that comes back to a point I tried to make in
17 my introduction.
18 Maybe you missed it, Tony. You'll have
19 your time, Tony. Don't worry about that.
20 MR. PIETRANGELO: Okay.
21 MEMBER APOSTOLAKIS: Namely, the
22 integrated decisionmaking process. The way it's done
23 now, I'm not sure it encourages better PRAs, because
24 you can get by with, you know, a PRA that's not as
25 good as somebody else's. And that is not addressed in

1 all of this, which is part of the philosophical
2 approach that Gareth I think mentioned that a
3 committee might want to look at.
4 That was a timeout. We'll start again
5 with you.
6 MR. PIETRANGELO: Okay.
7 MEMBER APOSTOLAKIS: I don't want you to
8 be anxious, Tony.
9 MR. PIETRANGELO: Okay. But I'll disagree
10 to some extent with the point you just made.
11 MEMBER APOSTOLAKIS: Okay.
12 MR. PIETRANGELO: It's not the
13 decisionmaking process that's not sending the right
14 message to licensees. It's the applications. 50.69
15 is the best example. We mentioned that a lot in our
16 paper.
17 MEMBER APOSTOLAKIS: I agree.
18 MR. PIETRANGELO: Okay. I can't -- as a
19 licensee, I can't opt to do 50.69, unless I have a PRA
20 that meets that ASME Level 1 standard. That's the
21 incentive to get them to go further, and I can't
22 expand the scope of that application to include more
23 SSCs without expanding the scope of my PRA.
24 MEMBER APOSTOLAKIS: That's a very
25 clear --

1 MR. PIETRANGELO: I'd be penalized for
2 using that now. I think that's, again, the wrong
3 message.
4 MEMBER APOSTOLAKIS: You're right. For
5 50.69, you are right.
6 MR. PIETRANGELO: Later on, the staff in
7 the -- I think the Phase 3 part penalizes you for --
8 if you don't meet the standard and don't have a PRA.
9 MEMBER APOSTOLAKIS: Right.
10 MR. PIETRANGELO: Okay? So you're
11 penalized if you have it in Phase 1, and then you're
12 penalized again in Phase 3 if you don't have it.
13 Okay? I just think that's wrong.
14 Phase 1 is Phase 1. It is where we are
15 today. If they have the resources, they review it.
16 I mean, we have a -- and I'm going to ping Mike
17 Tschiltz a little bit on this. We've had an
18 application in on containment ILRT on an industry
19 perspective to go from 10 to 20 years that isn't being
20 reviewed right now. It's been in there since
21 December. It's a big industry activity.
22 The staff asked us to do it, but they
23 don't have enough resources to do it right now.
24 That's just a practical reality. I'd like to get them
25 to get some resources on that, but I would assume

1 that's got a low priority because nobody is reviewing
2 it, and it's an industry initiative.
3 MEMBER POWERS: Tony, I guess I'm just a
4 little puzzled. If a licensee comes in and he has
5 been aggressive in developing PRA, and he has things
6 for which -- in his PRA for which he -- there are no
7 standards to review against, doesn't that ipso facto
8 mean that it's going to take more review on the part
9 of the NRC and, consequently, he is going to be
10 penalized in dollar cost if nothing else?
11 MR. PIETRANGELO: Yes. But evidently,
12 though, he wouldn't submit that application unless he
13 thought that the benefit on the other end of that
14 process was worth it.
15 All right. So it's already tough to do
16 it, and I'm not disagreeing with the staff that that
17 would be a more resource-intensive review. It would.
18 But if somebody is willing to pay for it, it shouldn't
19 automatically get a low priority. It's just going to
20 be the reality that it takes more staff review, and
21 that's the boat we're in now. And I think assigning
22 priorities high and low based on that now --
23 MEMBER POWERS: So it's only --
24 MR. PIETRANGELO: -- inadvertently sends
25 the wrong message I think.

1 MEMBER POWERS: So it's really the
2 labeling that you're objecting to --
3 MR. PIETRANGELO: Yes.
4 MEMBER POWERS: -- not the conscientious
5 attempt to reflect reality.
6 MR. PIETRANGELO: Yes, and inadvertently
7 conveying the wrong message.
8 MEMBER POWERS: I agree with you that the
9 -- it's an unfortunate choice of words. And I think
10 the staff does, too. I mean, they kind of apologized
11 when they presented it.
12 MR. PIETRANGELO: Let me move on here.
13 Overall, we think the staff implementation plan is a
14 reasonable response to what the Commission direction
15 was. I mean, we agree with probably 98 percent of
16 what's in there.
17 I've just shared with you the one where we
18 do disagree on this kind of what we call penalizing
19 the licensee for using a broader scope PRA than the
20 standards available.
21 The other thing we mention in there is the
22 terminology. If you're following this on a day-to-day
23 basis like we do, you know, we understand the nuances
24 in it. But it's not immediately apparent to people
25 outside the process. We thought we were on a path

1 where we weren't talking so much about PRA quality as
2 much as -- more about PRA technical adequacy. I mean,
3 that's the title of Reg. Guide 1.200 is the technical
4 adequacy of PRAs to support applications.
5 Scope means, you know, Level 1, fire,
6 shutdown, other external events, Level 2, Level 3.
7 That's what we mean by scope. We reserve the term
8 quality for a higher level, and that is the ultimate
9 decision out of that risk-informed decisionmaking
10 process. That, to me, is where we really want quality
11 to be achieved.
12 All right. We want good, robust
13 decisions. And you need technically adequate PRAs and
14 -- with an appropriate scope to support that decision.
15 So that's kind of our triangle -- quality, technical
16 adequacy, and scope.
17 When you say PRA quality, and you use,
18 let's say, a bounding method -- all right, it would --
19 things start getting mixed up while you're not using
20 a quality PRA, and it just gets more confusing to
21 communicate to people. So we think we ought to stick
22 with a set and be consistent, and we've already got
23 reg. guides out there that say that, so --
24 MEMBER APOSTOLAKIS: So what you're saying
25 is that the PRA itself may not be of the highest

1 quality, but the decision, though --

2 MR. PIETRANGELO: The decision has to be

3 quality.

4 MEMBER APOSTOLAKIS: -- was -- yes.

5 MR. PIETRANGELO: The PRA has to be

6 technically adequate.

7 MEMBER APOSTOLAKIS: That's an interesting

8 distinction. Interesting distinction.

9 MR. PIETRANGELO: Okay. You were talking

10 about the different phases. I think we're in a lot of

11 -- in some respects, we're in Phase 1.5. Okay? We

12 have been using the peer review results. It's

13 somewhat analogous to -- you'll use the results of

14 your assessment against the ASME standard. So it's

15 not totally Phase 1, and it's not totally Phase 2.

16 But we're about Phase 1-1/2. That's okay.

17 The other thing -- you know, standards are

18 supposed to capture good practices. And this goes

19 back to this other issue about penalizing somebody for

20 having -- you know, how do you get the good practices

21 if you're not incentivizing people to use the methods

22 and improve them? Okay. Again, I think it's

23 unfortunate.

24 The technical issue on uncertainty -- as

25 an industry, we're trying to gather our forces into a

1 single entity to develop some guidance on treatment of
2 uncertainty. We've had some initial discussions with
3 Mary and the staff on this, and I hope we'll get to a
4 point later this year where we can share what that
5 work is about, both with the staff and with the ACRS,
6 because I know it's an important --
7 MEMBER APOSTOLAKIS: I understand EPRI is
8 doing something for the industry, too.
9 MR. PIETRANGELO: Yes. But we're trying
10 to make sure what we do -- EPRI and the owners groups
11 -- that we --
12 MEMBER APOSTOLAKIS: Okay.
13 MR. PIETRANGELO: There's probably about
14 four different efforts. We want one --
15 MEMBER APOSTOLAKIS: Okay.
16 MR. PIETRANGELO: -- that's supported by
17 everybody.
18 Okay. I wanted to quickly go through the
19 policy issues. I think we talked about one. The
20 staff's recommendation is, yes, we don't agree. Okay.
21 On the second one --
22 MEMBER APOSTOLAKIS: You don't agree.
23 Okay.
24 MR. PIETRANGELO: Yes, that's the
25 penalizing thing we've talked about.

1 MEMBER APOSTOLAKIS: Yes.

2 MR. PIETRANGELO: And the second one -- if
3 a licensee submits an application for which all of the
4 applicable documents are in place, but does not
5 conform to the guidance, should the application be
6 given low priority?

7 We agree with the staff's recommendation,
8 and it says it in our paper. If there is a standard
9 out there, and you're using a PRA for that element,
10 and you don't conform to it, then you ought to get a
11 low priority. We don't disagree with that at all.

12 Okay. Policy issue 3 -- when all guidance
13 for all current and anticipated applications is in
14 place, should every licensee be required to conform to
15 that guidance before submitting any risk-informed
16 submittals?

17 The recommendation is no. This is -- I
18 think it was explained before, for the licensee who
19 doesn't want to do that whole suite of things, we
20 shouldn't penalize that. So we agree with the staff's
21 recommendation there.

22 Number 4 -- we disagree. This is on the
23 -- if an application does not conform to the Phase 2
24 guidance, you reject it outright. And the staff I
25 think appropriately captured our concern in the con

1 here, and that there will still be -- and the
2 Commission paper acknowledges this -- if you have a
3 bounding analysis that was good enough before, all
4 right, whether it restricts the scope of the decision
5 or the application, appropriately restricts the
6 application, it's not a resource issue anymore,
7 because it's a bounding analysis. So that's not it.
8 This is just the -- we want you to have a
9 greater scope PRA, and if you don't have it, you know,
10 you can't come in. I think that's the wrong message
11 to send. Not every -- it's going to be a cost-benefit
12 decision. If you want to have everybody have the full
13 suite, require it. Okay? If you can't -- I don't
14 think the agency can even just reject things if
15 there's an appropriate bounding analysis in there
16 that's appropriate for the decision.
17 On number 5, I think this issue is moot.
18 The NRC is paying the standards development
19 organizations to develop standards. Okay? I mean,
20 they're falling all over themselves trying to -- to
21 hurry up and get these things done. So I don't even
22 think this is an issue, and -- but I agree with the
23 recommendation. If the staff thinks a standard is
24 necessary and the SDOs don't want to do it, then go
25 ahead, develop your own guidance.

1 MEMBER ROSEN: Isn't that a little bit
2 simple, Tony? I mean, sure the NRC is paying the
3 standards organization, and the standards
4 organizations use participation across the whole
5 industry.
6 MR. PIETRANGELO: That's true.
7 MEMBER ROSEN: And it is sometimes
8 difficult to get the right people involved --
9 MR. PIETRANGELO: It is.
10 MEMBER ROSEN: -- and that -- and that
11 takes a long time and may -- may or may not be
12 available. So I think it's not entirely moot. I
13 think there is a situation where we have -- I think
14 we've used the word "hostage." I'm not sure that's
15 exactly the right word, but I -- but it -- you know,
16 we are going to have cases where we're not going to
17 have the availability of consensus standards for one
18 or more reasons.
19 And the question, really, then comes if we
20 need a standard, well, yes, the NRC should develop its
21 own guidance, and the industry and the standards
22 organizations should just read it and weep, because
23 they had their chance. The preference is for the
24 standards organizations to do the job. If it's not --
25 isn't done and the agency feels it needs it and goes

1 ahead, fine, that's the way it is, and that fully
2 comports to the OMB Circular.
3 The OMB Circular just says use it if it's
4 available. It doesn't say, you know, hold up with any
5 regulatory action if -- until it's available.
6 MR. PIETRANGELO: Right. And the other
7 point -- you mentioned about they're not -- there's
8 nothing on the schedule for Level 2, Level 3, and so
9 forth. And the proper -- I think the right response
10 was given, "Well, there's no applications that use
11 those elements now."
12 Well, the same can be said for shutdown.
13 There's not one application, I don't think, that
14 requires a shutdown PRA.
15 We think the order of the development of
16 these standards is wrong. We think the fire one
17 should be moved up. That's the one I think that has
18 more -- we need to risk-inform the priorities of the
19 standards development.
20 MEMBER ROSEN: That is a good point.
21 MR. PIETRANGELO: Fire is the one we think
22 we're going to need sooner than the other ones.
23 MEMBER ROSEN: Yes. I agree with you on
24 that, but I think that to -- the need for the low
25 power and shutdown standard is incorrect, because it

1 is important -- and it comes up frequently in the IDPs
2 and elsewhere -- to do cycle risk optimization, where
3 you're making a decision about when you should do
4 online maintenance.
5 The question is often, well, it's going to
6 -- we're going to take some risk, even in shutdown, by
7 having this system out. Will we take more or less if
8 we do it online? Well, you really don't know. I
9 mean, you have some bounding analysis, and you have
10 some qualitative arguments. But you really don't know
11 unless you have a shutdown PRA.
12 MEMBER APOSTOLAKIS: Donnie?
13 MR. HARRISON: Tony is going to have to
14 hold on to that thought, right? This is Donnie
15 Harrison from the staff. I just wanted to back up to
16 issue 4 real quick.
17 I think we probably need to clarify what
18 our position is on issue 4. It wasn't to penalize a
19 licensee that's using a bounding analysis. It's
20 really to get out of the -- where we get qualitative
21 arguments, or you don't do any analysis but you put on
22 compensatory measures to try to control -- do fire
23 watches.
24 And that's really the intent of stopping
25 you from doing that. If you can do a bounding

1 analysis to screen out a hazard, that would be
2 acceptable and --
3 MEMBER APOSTOLAKIS: Yes. Because that
4 can be as rigorous as anything.
5 MR. HARRISON: Right. So I think we need
6 to clarify issue 4.
7 MR. PIETRANGELO: And then we agree.
8 MR. HARRISON: Yes. So I think that's --
9 MEMBER APOSTOLAKIS: But if it's a
10 statement that -- to make it clear.
11 MR. SNODDERLY: Chairman Bonaca, I also
12 wanted to make the committee and Tony aware of one
13 other thing. Tony mentioned the importance of the
14 Reg. Guide 1.200 pilot reviews. Next month in May at
15 the full committee meeting Donnie Harrison is going to
16 do an information briefing to the committee on the
17 status of the pilot application, so we invite NEI to
18 be aware of that.
19 MR. PIETRANGELO: Good. Okay. That's a
20 very important effort. I want to leave you with one
21 last thing.
22 MEMBER APOSTOLAKIS: Sure.
23 MR. PIETRANGELO: We are currently
24 considering an effort to develop guidance on an
25 enhanced decisionmaking process. Recall ancient

1 history -- there was the EPRI PSA applications guide,
2 and then the development of Reg. Guide 1.174 that this
3 committee had a lot to do with. Okay?
4 It's been out there for several years. It
5 has served us well. We're kind of entering this next
6 phase now where we're going to have, you know,
7 quantitative results, some qualitative things, some
8 bounding analysis, some uncertainties, this and that.
9 And there's a thought on our side to
10 saying maybe we need to have an enhanced
11 decisionmaking framework to consider these different
12 things. I think Dr. Kress raised the point about
13 adding in, you know, the contributions from the other
14 elements of scope. And, you know, obviously there's
15 different levels of uncertainties with some of those
16 other things, but is it appropriate to add it in? Or
17 if it is appropriate, how do you do it? That kind of
18 thing.
19 So we're seriously considering an effort
20 on kind of an enhanced decisionmaking framework,
21 probably akin to what we did on the applications
22 guide, but more perhaps for the staff to endorse in a
23 subsequent review relative to 1.174, or just as input
24 to a revision to 1.174. That's still the motherhood
25 document in Reg. Guide 1.200.

1 MEMBER ROSEN: Who has used that?

2 MR. PIETRANGELO: We developed it for

3 ourselves I think first of all. I mean, the

4 applications guide was for ourselves. I mean, there's

5 a lot of risk-informed decisionmaking that doesn't --

6 is not submitted to the NRC. Okay?

7 So I think we have to be certain about how

8 we're doing that and doing it appropriately. And if

9 it works in the regulatory process, then that's even

10 better.

11 MEMBER KRESS: Would that include a more

12 substantive quantifiable definition of defense-in-

13 depth, do you think?

14 MR. PIETRANGELO: Perhaps.

15 (Laughter.)

16 MEMBER KRESS: And safety margins.

17 MR. PIETRANGELO: I think we're kind of in

18 the embryonic stage, but I think given that that's one

19 of the elements in the decisionmaking framework and

20 1.174, I think yes.

21 MEMBER KRESS: Yes. Well, it would be

22 quite interesting to see --

23 MEMBER APOSTOLAKIS: Well, the

24 quantitative measure of defense-in-depth in fact is

25 known as PRA I think.

1 MEMBER KRESS: Yes, but it's -- you can
2 mess around with --
3 MEMBER POWERS: Only to a misguided
4 rationalist.
5 (Laughter.)
6 MEMBER APOSTOLAKIS: Mr. Pietrangelo, do
7 you have anything else that is much more --
8 MR. PIETRANGELO: No. Thank you for the
9 time.
10 MEMBER APOSTOLAKIS: Okay. Thank you very
11 much.
12 I hear no other comments. Back to you,
13 Mr. Chairman.
14 CHAIRMAN BONACA: Okay.
15 MEMBER APOSTOLAKIS: Because I didn't ask
16 for any, right?
17 CHAIRMAN BONACA: Let's take a break and
18 get back at 10:30.
19 (Whereupon, the proceedings in the
20 foregoing matter went off the record at
21 10:11 a.m. and went back on the record at
22 10:27 a.m.)
23 CHAIRMAN BONACA: Okay. Let's get back
24 into session.
25 The next item on the agenda is SECY-04-

1 0037, issues related to proposed rulemaking to risk-
2 inform requirements related to large break LOCA break
3 size and plans for rulemaking on LOCA with coincident
4 loss of off-site power.
5 And Dr. Shack is going to lead us through.
6 MEMBER SHACK: Okay. We had a
7 subcommittee meeting on this in which we discussed
8 essentially the status of the rulemaking in terms of
9 some policy and technical issues that the staff had
10 identified, and the status of the expert elicitation
11 to define the frequency of large break LOCAs.
12 And we'll be reviewing those two items
13 here today, and Eileen and Glenn are going to start
14 off by going over the policy and technical issues that
15 the staff has identified. And then we'll follow with
16 a discussion of the frequency of the large break LOCA.
17 MS. McKENNA: Good morning. My name is
18 Eileen McKenna. I'm currently a Section Chief in the
19 Policy and Rulemaking Program in NRR, but I had been
20 the Lead Project Manager on this effort during the
21 development of the paper that we had sent up to the
22 Commission.
23 With me is Glenn Kelly, Senior Reliability
24 Risk Analyst in the Probabilistic Safety Assessment
25 Branch in NRR. In the room we have other members of

1 our working group who, you know, may be called upon if
2 necessary for various topics.
3 We want to try to get to the technical
4 issues for discussion as quickly as possible, so I'm
5 going to kind of cover this one part fairly quickly --
6 typical agenda, the purpose, background, into the
7 discussion of the issues, and then a wrap-up.
8 Our purpose at this point is -- was to
9 inform the committee about what we've been doing since
10 we got the SRM and to certainly obtain any feedback
11 from the committee that they would like us to consider
12 as we move forward in resolution of the technical
13 issues and development of the rulemaking.
14 Briefly, in background, option 3, there
15 had been previous discussions with the committee about
16 risk-informing technical requirements in Part 50, and
17 50.46 was one of the candidate rules that was
18 suggested as opportunity to consider the risk
19 importance of various break sizes and how that relates
20 to the requirements and make appropriate changes.
21 There was papers that went up to the
22 Commission in '01 and '02, and that resulted in an
23 SRM on March 31, 2003, that, among other things,
24 tasked the staff to conduct two rulemakings -- one to
25 prepare a proposed rule that allows for a risk-

1 informed alternative to the present maximum LOCA break
2 size, and, second, to prepare a proposed rule that
3 would risk-inform the functional reliability
4 requirements and thus relax the current requirement
5 that for -- assuming large break LOCA with a
6 coincident loss off off-site power.
7 The SRM had a number of specific
8 statements about what they wanted the rulemaking to
9 consider, and I just want to cover a few of those
10 because they led to, in some respects, some of the
11 issues that we're dealing with.
12 As I mentioned, the first one was to
13 develop the risk-informed alternative maximum LOCA
14 break size. The Commission suggested a change to the
15 definition of LOCA to exclude some low-risk
16 contribution. But, you know, they kind of left it
17 open as to exactly how that might be accomplished.
18 It did state that the staff must establish
19 the risk cutoff for defining the new maximum LOCA
20 break size. And, again, they gave some examples of
21 how that might be undertaken.
22 There was a statement in there that the
23 Commission would not support changes to functional
24 requirements unless they were fully risk-informed, and
25 the Commission gave as an example that they did --

1 that they did not support changes to ECCS coolant flow
2 rates or containment capabilities.
3 VICE CHAIRMAN WALLIS: Unless they are
4 fully risk-informed.
5 MS. McKENNA: Well, the first sentence was
6 -- the functional requirements, unless fully risk-
7 informed. This was a separate sentence.
8 VICE CHAIRMAN WALLIS: Yes. So it wasn't
9 clear to me whether it was dependent on the -- this
10 being risk-informed or not. This is part of our
11 discussion in the subcommittee.
12 MS. McKENNA: Well, yes. Exactly, right.
13 VICE CHAIRMAN WALLIS: It seems to be a
14 bit up in the air.
15 MEMBER APOSTOLAKIS: And fully risk-
16 informed means what?
17 MS. McKENNA: Well, this is one of the
18 things that we spent a lot of time discussing in our
19 working group as to -- we'll get into that in I think
20 some of the issues that we are presenting.
21 MEMBER APOSTOLAKIS: Phase 3 or 4.
22 MS. McKENNA: There were three other
23 statements I'll just touch on from the SRM. One about
24 -- it's kind of using best estimate ECCS evaluation
25 models. I won't spend a lot of time dwelling on it,

1 just that that was part of it.

2 The next one I think leads directly to the

3 point that was just made. The SRM had a statement

4 that once the standards are in place, the PRA should

5 be Level 2 internal and external initiating all modes.

6 PRA subjected to peer review and submitted to and

7 endorsed by the NRC.

8 Now, obviously, this SRM predated the

9 December SRM on the action plan, but this was, you

10 know, a statement in the SRM that we were responding

11 to. And, finally, there was a statement that

12 operational changes should be reversible if local

13 frequency estimates, which are -- you know, as Rob

14 will probably tell you, you know, there is a tasking

15 to revisit the estimates every 10 years. And if we

16 find that the frequency change is unacceptable in some

17 sense that we might need to reverse what was

18 implemented under this undertaking.

19 MEMBER FORD: Could you say something

20 about the origin of the 10 years, and whether that's

21 immutable? Given the fact that many of the

22 degradation modes that become unfortunately

23 unexpected.

24 MS. McKENNA: I think it came out of the

25 Commission vote sheets in the SRM. There was a

1 separate provision for a five-year look for new
2 failure mechanisms. And I think, as Rob had mentioned
3 at the subcommittee, this doesn't mean that we're
4 going to be ignoring operating experience and
5 information as time goes on. But it was more that the
6 Commission wanted this periodic, you know, more in-
7 depth perhaps consideration of the information and
8 reassessment.
9 So that's how it kind of -- I don't know
10 if there's any more magic to the 10, beyond just --
11 MEMBER FORD: So it's not immutable.
12 MS. McKENNA: I don't think -- I mean,
13 just other than, you know, as I said, the Commission
14 proposed it. But, you know, if there was some basis
15 for us to say, you know, we really think we need to do
16 it more often, or whatever, I'm sure, you know, the
17 Commission would not, you know, say no on that -- in
18 that sense if we had, you know, reason for that.
19 MEMBER KRESS: And PRA referred to in your
20 second bullet --
21 MS. McKENNA: Yes.
22 MEMBER KRESS: -- that's -- if you change
23 the rule, then the licensee comes in and wants to make
24 changes to his plat based on risk information, that's
25 the PRA you're talking about.

1 MS. McKENNA: That's correct. Because
2 this is meant to be a voluntary alternative that a
3 licensee could take and use, not that they'd be
4 required to do that. And this would be, again, part
5 of -- if you were making these changes, then we need
6 to consider the impact on risk. And the Commission
7 was looking for this level of PRA.
8 MEMBER KRESS: That looks like a Phase 3
9 PRA. What would you call it?
10 MS. McKENNA: I'm not an expert, but I
11 think -- Glenn, maybe -- would you call it a Phase 3?
12 Or Mark?
13 MR. KELLY: No. It's actually a Phase 4,
14 because it has been reviewed by the NRC, and that
15 doesn't happen until Phase 4.
16 MEMBER APOSTOLAKIS: But weren't we told
17 earlier that there has been no application of Level 2
18 PRA to this day? And the letter from the -- from ANS
19 and ASME says that there are no plans to issue a
20 Level 2 standard. So when you say once standards are
21 in place, that means now you are talking about several
22 years in the future.
23 MS. McKENNA: Well, that was one of our
24 considerations as we were working on this effort. And
25 as I mentioned, I think the December SRM kind of gave

1 another opportunity to revisit this point as to
2 whether this level of PRA is necessary for the
3 applications that might come out of this redefinition,
4 which kind of leads into the paper and what the scope
5 of the rulemaking might be.
6 MR. MARK RUBIN: Yes. This is Mark Rubin
7 from the staff. The original SRM said reviewed and
8 endorsed by the staff, and this is something, as
9 Eileen said, that's being sort of revisited by the
10 further work being done by the rulemaking. It will
11 probably be subsumed by the phase quality initiative
12 and be developed in more detail by the rulemaking and
13 fleshed out by the detailed rulemaking.
14 MS. McKENNA: So, as I said, that was kind
15 of the backdrop of where we were in the basically
16 March/April timeframe last year, and just -- I'm going
17 to go through a couple of bullets on what we -- you
18 know, we did. As I mentioned, we had a working group
19 that we brought together people from various groups
20 that would be impacted and would need to contribute to
21 this effort.
22 And we went through the SRM and some of
23 the things like, what does fully risk-informed mean to
24 us, and how would we carry that out, and we tried to
25 understand, you know, that if we really did this in

1 particular ways what would it mean and how would we do
2 it.
3 We got some initial stakeholder input
4 about, you know, what kind of applicants -- this was
5 supposed to be voluntary alternative -- you know,
6 candidate offered as a -- for potential burden
7 reduction as -- that's suitably risk-informed. And
8 so, you know, we get some -- so I had some discussion
9 about what could be the scope and what should be
10 required for implementation, and some idea of possible
11 applications that industry might be interested in as
12 a result of the redefinition.
13 We started looking at, okay, how might we
14 write a rule? How would we do this? You know, should
15 we redefine LOCA, and what's the implication if we did
16 that? Or should we write it in a different way that
17 was more focused on, you know, an application that
18 you'd -- you know, you'd list particular applications
19 or, you know, as a process like, you know, instead of
20 saying here's the requirements that no longer apply,
21 and here's the new requirements.
22 And we tried to look at various ways you
23 might go about that, so that we did do it in a risk-
24 informed way and made sure that we had the right
25 requirements, that the changes that might occur to the

1 plant would be appropriately looked at, that PRA scope
2 would be suitable to what we're doing. And as we said
3 in the last bullet, the lifetime aspects, you know,
4 which gets you to the reversibility things of, you
5 know, over time are we -- you know, are the changes
6 going to continue to be acceptable?
7 As a result of those deliberations and
8 discussions, we identified a number of issues that we
9 thought needed development and resolution in order to
10 move forward with the rulemaking. And we'll talk
11 about these a little bit more shortly.
12 And we also did some -- initiated some
13 research activities to look at some implications of
14 some of these things -- that if you were to do, for
15 example, uprates, what might be the kind of change in
16 the thermal hydraulic response. You know, how might
17 that affect risk on some candidate sample basis to,
18 you know, give us an idea of what ballpark we might be
19 in on some of these things?
20 We had a briefing for the Commission
21 assistants in January, and kind of as a result of some
22 of that discussion and our efforts to try to present
23 these issues and how they were challenging us to
24 complete the rulemaking, we ended up sending up the
25 SECY-04-0037 paper. And what we tried to do is frame

1 the issue.

2 The major issue we saw is that we needed

3 to have a better understanding from the Commission of,

4 really, how far they meant us to go. Were they really

5 looking for a very specific set of a few small things

6 that could be done that are support arising from the

7 large break LOCA redefinition?

8 Or were they really looking for a broader,

9 it's redefined, and take it where it leads you with

10 some suitable set of acceptance criteria that, you

11 know, are risk-informed, but these were very different

12 kinds of rulemakings and approaches. And the

13 complexity of solving the issues and the success of

14 those would certainly vary.

15 So that's the major issue we framed to the

16 Commission as policy of how -- do we go in a specific,

17 narrow, or do we go more broad, comprehensive? And we

18 also had some others in there, but this was the major

19 topic.

20 And then, as I'll turn it over to Glenn in

21 a moment, there were also a number of technical --

22 technical/regulatory we called them -- issues that we

23 felt needed to be considered.

24 Let me turn to Glenn.

25 MR. KELLY: Hi. I'm Glenn Kelly with PRA

1 Branch in NRR. This morning I'd like to talk to you
2 about some of the technical and regulatory issues that
3 arose as we attempted to meet the guidance that was
4 laid out in the SRM that the Commission gave us in
5 March of 2003.
6 We found that there were -- some of these
7 technical issues were potentially very challenging.
8 The first one that I'd like to talk about is
9 determining -- one of the things we felt we had to do
10 was to determine what are the appropriate criteria
11 that we needed to use to decide what would be the new
12 maximum design basis LOCA.
13 And then, once we decided what that
14 criteria was, how much confidence would we need to
15 have in that particular criteria, or in the
16 information that was going to be used to determine
17 whether or not that criteria was met. And Rob
18 Tregoning is going to be talking later to you about
19 the elicitation -- expert elicitation that developed
20 frequencies for these small and large break sizes.
21 VICE CHAIRMAN WALLIS: I don't know how
22 you assess confidence when you ask experts.
23 MR. KELLY: Well, I think that that's one
24 of the things that Rob is going to be talking about,
25 and about the process that they use. And they have

1 attempted to include the uncertainty among the
2 experts, as well as just the inherent uncertainty in
3 the results themselves. But they'll talk in more
4 detail about that.
5 MEMBER KRESS: Will you talk about the --
6 what is the -- what you think is the appropriate
7 criteria?
8 MR. KELLY: I'm sorry?
9 MEMBER KRESS: Well, you know, you talked
10 about the issue is what is the appropriate criteria to
11 use, redefining the LOCA. Are you going to talk about
12 what you've decided at --
13 MR. KELLY: In our paper that we sent to
14 the Commission on March 3rd, we identified a number of
15 technical issues. And one of the ones that we said
16 that we wanted to --
17 MEMBER KRESS: Well, you want feedback
18 from the Commission on that. That's what you --
19 MR. KELLY: We were not seeking Commission
20 feedback on that. We were indicating to the
21 Commission that this was a technical issue that we
22 were going to be working on.
23 MEMBER KRESS: I see.
24 MS. McKENNA: The paper we did kind of
25 talk -- suggest that we thought a frequency of break

1 size was part of this criteria for selection, rather
2 than a risk number, for example. I think that -- but
3 it's not something that we've picked a number and
4 we're going with it, but it's kind of an approach that
5 we had suggested in the paper.
6 MR. MARK RUBIN: This is Mark Rubin again
7 from the staff. A frequency-based approach and an
8 appropriate confidence about that are two I think of
9 the challenges that, you know, we are faced with, that
10 we have to develop. We are early in the process. We
11 are certainly seeking guidance and consult in doing
12 that, and I think Rob may have some --
13 MR. TREGONING: Yes, just a clarification.
14 This is Rob Tregoning from the staff. We looked at
15 uncertainties due to two -- two areas. One, we looked
16 at the uncertainty within the responses for each panel
17 member in the elicitation, but then -- so we captured
18 that. We also captured the variability among the
19 panel members, so we had two different measures that
20 we used to capture each of those areas of uncertainty.
21 And we would propose that -- and one of
22 the things we've talked about and we're still kicking
23 around on the staff level -- and it goes to the heart
24 of this issue -- how do you use both of these measures
25 of uncertainty in a rigorous way when you go set the

1 regulatory -- when you revise the regulatory
2 framework.
3 So that's -- that's certainly a
4 substantial technical issue that we're, as Mark said,
5 still struggling with.
6 MR. KELLY: And one of the aspects that I
7 think you'll find as I think we go through these
8 technical issues is that potential resolution of one
9 issue many times depends on how you're resolving
10 something else, because, for example, one of the
11 things that we'll talk about later here is about the
12 retention and mitigation capability.
13 Having -- if you had no retention and
14 mitigation capability, you might choose a different
15 criteria than if you had very high confidence in
16 having retained mitigation capability. So these are
17 all things that have to be considered when we come up
18 with our final recommendations.
19 MEMBER SHACK: Now, the elicitation scope,
20 too, is only the degradation of piping systems, which
21 is certainly not the only way that you can get LOCAs.
22 And it wasn't clear how you were going to address
23 essentially the other LOCA frequencies.
24 MR. KELLY: There are -- the elicitation
25 has attempted to address other non-piping breaks, such

1 as manway covers, things like that. It -- they have
2 not, at this point, completed work on things such as
3 the effect of seismic events on the piping, or water
4 hammer, what -- and I don't believe that they're going
5 to be dealing with heavy load drops. But they have
6 covered things up through vessel rupture.
7 MR. TREGONING: Yes. Glenn, let me try to
8 be clear. What we did in the elicitation -- and we're
9 having a lot of the discussion that may best be
10 postponed for when I'm up there. I don't want to take
11 too much of your time here this morning. But the SRM
12 was very clear in the direction that was really
13 specifically to look at that -- those portions of
14 LOCAs that were due to primarily normal operating
15 loading due to passive system degradation.
16 As you've mentioned, you certainly get
17 LOCAs from a variety of additional sources. One of
18 the things that we've mentioned is an issue is when we
19 do this rule revision we have to consider all of the
20 sources of LOCA to make sure that we're fully risk-
21 informed.
22 So in areas -- and, you know, so areas of
23 crane drops, areas of seismic, areas of -- we
24 considered water hammer, just not the rare water
25 hammer -- the water hammer that would only occur -- we

1 defined "normal loads" as loads that you'd expect over
2 a 60-year plant life. So if it's the rare -- you
3 know, the one in a 100-year water hammer, we didn't
4 explicitly consider that.
5 So all of these things need to be also
6 rolled in and considered as well. And we've looked at
7 one piece. We obviously still need to go back -- and
8 there's been a lot of work done over the years in
9 these other pieces, and our plan is to go back and
10 look at this work, dust it off, and see which of this
11 -- which of this -- given what we want to do with the
12 information, does this work still hold? You know, is
13 it still valid, or do we need to update it in some
14 sense?
15 There's been a lot of work done on seismic
16 piping failure frequencies, and we don't want to
17 reinvent the wheel so to speak. We just want to take
18 what we've done, update it as we need to to try to
19 make sure it's consistent with the intent of, again --
20 MEMBER SHACK: Well, I was more interested
21 in Glenn's example for -- of the manway failures. Is
22 that included, or isn't it included --
23 MR. TREGONING: Yes.
24 MEMBER SHACK: -- in your scope?
25 MR. TREGONING: Yes, that's included in

1 the scope.

2 MEMBER ROSEN: How about reactor coolant

3 pump seal?

4 MR. TREGONING: Not pump seals. We

5 defined -- we were very clear dealing with passive

6 system metallic components. And we didn't deal with

7 things like stuck open valves, pump seals. We defined

8 those as active system LOCAs.

9 Now, we are -- we do have a corollary

10 effort that's looking at updating those frequencies.

11 Those frequencies have been studied pretty extensively

12 throughout the years, and we've got a pretty good

13 operating experience for those types of frequencies.

14 So we are updating those numbers just to ensure that

15 they are consistent with the latest numbers that we

16 have for the passive system failures.

17 MEMBER KRESS: Do you envision this rule

18 when it's written to be -- have a different form for

19 application to new plants as opposed to an operating

20 plant?

21 MR. KELLY: As we had talked about for the

22 subcommittee, we've proposed that for future plants

23 that the -- that we postpone the effort to define how

24 LOCAs would work for them. And one of the reasons was

25 that it's not clear what would constitute a design

1 basis event for future plants.

2 And because what we're talking about here

3 is modifying the design basis to exclude certain

4 breaks above a certain size. It's just not -- I'm not

5 sure how that would fit in with -- because it may be

6 that a future application might be entirely risk-

7 informed.

8 I'd like to move on to technical issue

9 number 2, and that issue had to do with a better

10 understanding of what is the practical effect if I

11 actually take an event, such as breaks above a certain

12 size, out of the design basis? What does that mean

13 technically? What does that mean legally, for QA

14 maintenance, reliability, all of these other things?

15 How far do the tendrils of this go throughout the

16 design? That's a very challenging question.

17 What can be changed under the rule if you

18 change the design basis, if you take these events out

19 of the design basis? Will I be able to have much

20 larger power uprates than I was able to do before? I

21 think that would be an expected consequence.

22 Would I be able to change my ECCS

23 capabilities? Will I be optimizing my flow rates to

24 handle small break LOCAs rather than large break

25 LOCAs? Ultimate heat sink capacity might change. I

1 could change boron concentration in the refueling
2 water storage tank or in other places. EQ profile is
3 going to change in containment, things like that.
4 So where if we go to a broader rule, where
5 it's a process-oriented rule rather than a very
6 defined list of changes to equipment, under a broad
7 rule, where, if anywhere, do we want to say, okay,
8 here is where you stop.
9 VICE CHAIRMAN WALLIS: But if the large
10 break LOCA had never been there, all of these things
11 would have been different.
12 MR. KELLY: That's correct.
13 MEMBER ROSEN: We have the great fortune
14 in this industry of having a bunch of innovative and
15 intelligent people running these plants. And you can
16 be sure that if this rule goes into place they will
17 scurry around and find all of the opportunities, even
18 the ones you missed.
19 MR. KELLY: Right.
20 MEMBER ROSEN: Now, that leads me to my
21 question, which is, are you using the industry's
22 resources or asking the industry to help participate
23 in these discussions? Because they will likely have
24 ideas about ways this could be used that will go
25 beyond what you might expect.

1 MR. KELLY: I'm sure that they have
2 already been thinking about many ways that they can
3 make use of this potential rule change. We have asked
4 a number of times. We've gotten some responses back
5 from the industry. I think one of the most complete
6 responses was a white paper that they put together,
7 gave us a draft in July of 2003 that describes some of
8 what they wanted to do.
9 There was also some discussions that were
10 held at an overseas conference where they talked in
11 more detail about some of the potential changes that
12 they might like to make. So we've had some
13 discussions.
14 For various reasons, we've not had --
15 since -- when was the last time we had a public
16 meeting?
17 MS. McKENNA: July, I think.
18 MR. KELLY: July of last year -- we've not
19 had a public meeting, and it's in part because we were
20 preparing to go forward to the Commission and explain
21 where we were.
22 MS. McKENNA: We weren't sure of the
23 Commission's receptiveness to some of the areas one
24 way or the other. So, you know, it's kind of -- we
25 could have discussion with the stakeholders externally

1 and say, "Okay. Yes, it sounds like these are good
2 candidates," and then but -- but, you know, the
3 Commission said, "But we didn't want you to change
4 ECCS flow rates." So, you know, is that one off the
5 table?
6 So that was part of our difficulty with
7 having too much discussion on possible -- I think we
8 have an idea from the things that Glenn mentioned of
9 some of the things that are in people's minds, and I
10 -- you know, I think they are looking for, okay, well,
11 what would be involved?
12 You know, what's the -- again, some of
13 those -- am I going to have to do a full scope PRA in
14 order to get these? You know, what else -- you know,
15 are there some other tradeoffs? Things like that.
16 And, you know, should we continue on these, or are
17 they just going to be rejected?
18 MR. MARK RUBIN: But in direct answer, we
19 will be actively soliciting industry participation.
20 As part of the rulemaking we will be having numerous
21 public meetings asking just those questions and
22 incorporating in our rulemaking activities all
23 stakeholder participation.
24 MEMBER ROSEN: Very good. Because as this
25 comes into focus more and more in the industry, they

1 will get -- more and more ideas will come forward that
2 -- some of which will be challenging, and some of
3 which will be no-brainers. But whatever, it takes --
4 what I want to do is encourage you to continue to do
5 that, to continue to pulse it as you go forward,
6 because it's not a one-shot kind of thing. People
7 will think of new things as the process moves forward.
8 CHAIRMAN BONACA: The question I have
9 regarding some of the examples here -- I mean, some of
10 them would prevent the reversibility that the SRM is
11 specific on. And why would you use them as examples?
12 For example, I see using the excess capability of ECCS
13 for doing many things. A reduction in ECCS capability
14 -- are you speaking of qualification?
15 MS. McKENNA: Well, certainly some are
16 more difficult to reverse than others. Absolutely.
17 CHAIRMAN BONACA: Or flow rates?
18 MS. McKENNA: Yes.
19 MR. KELLY: Part of the -- one of the
20 things that we've talked about in reversibility is
21 that there are two ways to do reversibility. One way
22 would be to actually physically reverse the
23 modification, whatever was made, in a sense of if I
24 took out a pump, put the pump back in.
25 Another way of reversing it might be to --

1 changing how I operate the plant in some way to give
2 me the same effect, in the sense of I might be saying
3 what I'm really reversing is the increase in core
4 damage frequency. And, therefore, if I can do other
5 things that are going to change that increase in core
6 damage frequency, that would be equivalent to making
7 -- reversing that change. And that would be, you
8 know, the way we're postulating it, where we would say
9 that that's acceptable.
10 CHAIRMAN BONACA: Because, I mean, maybe
11 I misunderstood it, but I read the SRM always as, in
12 fact, not proposing to reduce the functional
13 capability of the system, but to use it for other
14 purposes. I mean, that to me is -- defines
15 reversibility.
16 You know, if you talk about beginning to
17 remove pumps and pipes, yes, I mean, to reverse it
18 means pretty massive changes to the plant. I mean --
19 MS. McKENNA: Well, this was one of the
20 issues we did pose back to the Commission to say, you
21 know, could they give us any more insight of what they
22 had in mind by reversibility, and were they open to
23 the kind of reversibility that we were talking about
24 of, you know, kind of an overall risk thing rather
25 than saying, you know, this -- on a change-by-change

1 basis, you have to undo it versus what Glenn was
2 talking about of considering that it's a risk
3 contribution, is there something else that offsets it.
4 MR. KELLY: In looking at the SRM, their
5 SRM was put together from a number of vote sheets.
6 And there are some places where we had some difficulty
7 in interpreting exactly what was meant, and there are
8 some places we felt it was requiring a very narrow
9 rule. In other cases, it appeared to be applying in
10 a much broader sense.
11 And so, again, that's one of the things
12 that we've gone back to the Commission and said if you
13 want a very specific, potentially a rule where we
14 basically list, you know, the only changes that you
15 can make, are you going to do it on a basis of broad
16 changes?
17 CHAIRMAN BONACA: Yes, okay. That's
18 great. Appreciate your bringing it up, because, I
19 mean, I always presumed in my mind that reversibility
20 meant something. And that combined with the
21 reevaluation of the frequency of breaks every 10
22 years, so it seems to me that if you have that process
23 -- but you are right, I mean, you could interpret it
24 differently. And so --
25 MS. McKENNA: And it is a bit of a new

1 concept in regulation to say that, you know, you do
2 something and then you reverse it later, you know, if
3 particular -- on a case by case -- you know, there is
4 always kind of the you revisit it if you get new
5 information. But to specifically build into your
6 process reversibility I think is a little unusual.
7 MEMBER ROSEN: Well, it's not entirely
8 new, Eileen. I think in the exemption request, the
9 graded QA thing for South Texas, there was a
10 requirement to relook -- to look at whether the
11 changes that had been made were, in fact, affecting
12 the failure rates, and, if so, to consider whether the
13 new failure rates that were being observed were large
14 enough that you'd want to reverse the changes. So I
15 would say there is some precedent.
16 MS. McKENNA: Okay. That's fair. I mean,
17 again, we're getting more into the risk-informed
18 applications, where I think it becomes more of a
19 consideration.
20 CHAIRMAN BONACA: But to me, the SRM
21 really meant controlling the interface between within
22 design basis and beyond design basis, and be flexible
23 about that -- flexible based on the information you do
24 have regarding frequency of breaks. And so that, to
25 me -- well, that's the way I interpret it.

1 MEMBER SIEBER: I think you have the other
2 issue, too, of if you change the plant's design basis,
3 and then you modify the plant -- for example, the sump
4 screens -- if you say risk-informing that issue means
5 leak before break or limiting the break size, that
6 limits the debris accumulation which is what really
7 sets the size of that screen. So that's not a
8 reversible process. That's a tear out and replace
9 process.
10 CHAIRMAN BONACA: See, that's what I mean.
11 I think that, you know, I see a more narrow definition
12 of reversibility -- I mean, something you can effect.
13 MEMBER SIEBER: Well, that goes a step
14 further, too. You know, you really don't need to
15 change 50.46 in order to apply that principle to that
16 particular question. And I think that application,
17 though, would have to be consistent with whatever it
18 is you do in 50.46, you know, because you're relying
19 on the same philosophical and theoretical --
20 MS. McKENNA: Absolutely.
21 MEMBER SIEBER: -- basis to make that
22 change to the plant.
23 MS. McKENNA: I mean, this goes back to
24 the comment I think that -- about what areas there is
25 interest in the industry, and this one has come up as

1 a potential candidate of, you know, is there room
2 here?
3 I mean, I think there's recognition that
4 some of these other issues that we talked about, like
5 mitigation capability, would have to be dealt with in
6 a manner consistent with what we're talking about
7 here.
8 But this is one where there is, you know,
9 a real application potentially, and people seeing --
10 you know, they're going to have to make a decision
11 about what kind of upgrades to make on their screen
12 potentially, and, you know, could that be done in the
13 -- something other than consider the double-ended and
14 treat it like, you know, we would normally do and, you
15 know, take -- see where that takes you.
16 MEMBER SIEBER: Well, I think that without
17 some kind of guidance, when licensees propose a
18 modification to the plant to deal with that, you are
19 going to get all -- a wide variety of approaches and
20 a wide variety of assumptions. And it would be good
21 if you are prepared for that when the time comes.
22 MS. McKENNA: Well, I think that's why,
23 you know, we want to try to work through these issues,
24 and those activities, you'll see in a later slide, you
25 know, to try to get us to that point of having some

1 consistent basis to make those kind of decisions from.

2 MEMBER SIEBER: Well, that will be your

3 first challenge -- to come --

4 MS. McKENNA: No question.

5 MEMBER SIEBER: -- to come in the door

6 before you even get to 50.46.

7 VICE CHAIRMAN WALLIS: It is very

8 thoughtful on that, but it seems to me that you really

9 ought to consider a broad -- what would you do if

10 there were a broad interpretation of this? And then

11 back off from that.

12 So, I mean, that's the biggest thing you'd

13 have to face when you have very broad interpretation,

14 and then you'd face all of these issues in spades. If

15 you faced that and thought about that, then you might

16 be able to argue about how you should back off from

17 some of the implications of that.

18 MR. KELLY: Well, I think that's one of

19 the things --

20 VICE CHAIRMAN WALLIS: You can't just

21 whittle away at a problem by asking all of these

22 questions. You may well have to interpret a broad

23 change in the rule.

24 MR. KELLY: Well, I think most of these

25 questions -- these issues came up with the thought

1 that a broad rule might be the approach the Commission
2 chose.
3 MS. McKENNA: Again, there were
4 indications about, okay, if you really define the
5 definitions -- the LOCA in the regulations and said --
6 you know, and carry it forward, you would do that
7 broad thing.
8 And so then we started asking ourselves,
9 well, you know, did the Commission really mean, would
10 the -- did we think it would be appropriate to really
11 use it in this way? Or, you know, does that mean that
12 you can change this part of containment? Does that
13 mean you can do this? Can you do that? And on what
14 basis would you decide that?
15 You know, as Glenn said, are there things
16 where we're saying, "No, we don't want to entertain
17 changes in that area, because we think it would not be
18 risk-informed"? And do you do that by writing
19 criteria? Do you do it by fencing things off?
20 There's different ways you could approach
21 it, but those are some of the considerations, because
22 we were looking from the -- you know, if it really was
23 broad, you know, just doing broad by itself, you know,
24 we think is not sufficient. You would have to figure
25 out, what is the box you build around it, so that when

1 -- the changes that actually get implemented are the
2 right ones.
3 MR. KELLY: I think issue number 3 we've
4 already talked about. So I'd like to jump on to issue
5 number 4, and that has to do with mitigation
6 capability. Technically, if one were to merely say,
7 okay, I've taken break sizes, say, above six inches
8 out of the design basis, that if one did that, then
9 there would be no requirement that the design mitigate
10 breaks above six inches.
11 And, therefore, there would be no
12 requirement that a LOCA of six and a half inches would
13 not go to core melt, would not go to early containment
14 failure. There would be no requirement at all for
15 that.
16 CHAIRMAN BONACA: Right.
17 MR. KELLY: Now, we -- and the industry
18 has indicated their agreement, too, in meetings that
19 they think that this -- some mitigation capability
20 should be retained for these break sizes that are
21 greater than up to the double-ended guillotine break.
22 But the question comes: what would this
23 mitigation capability be? We've talked about that we
24 wouldn't need as much assurance. For example, now we
25 basically require for a design basis accident you can

1 handle, you know, loss of off-site power or loss of
2 one of the, you know, greatest single failure, and all
3 of these other things that go along with it.
4 Maybe we would say, you know, you need
5 only one train. We require -- we don't think that --
6 maybe we're going to let you go beyond 2,200 degrees F
7 peak clad temperature. It's still -- we have some
8 research work going looking into that, about what are
9 the potentials for --
10 CHAIRMAN BONACA: Well, most likely they
11 use best estimate.
12 MR. KELLY: That's correct. We would be
13 using codes, especially once you're going beyond, you
14 know, what -- your design basis would be looking for
15 best estimate type -- those are realistic codes in
16 this case.
17 MEMBER POWERS: Professor Bonaca, you
18 raised this interesting issue of best estimate in
19 connection with peak clad temperature. It seems to me
20 that when we go look at what the intentions of peak
21 clad temperatures were when they formulated the
22 original versions of 50.46, you have to be careful we
23 do not forget what the realities are today.
24 The realities today are that we're taking
25 fuel to much higher levels of burnup than were ever

1 envisaged at the time the original regulation was
2 written. Yet we do these peak clad temperatures now
3 both in -- in the DB analysis codes and even in the
4 best estimate codes in this rather peculiar fashion
5 where we're not looking at the peak temperature at any
6 time of a particular location.
7 What you see in these plots is the
8 temperature that's highest wherever it is in the core.
9 And so we're looking at things that temperatures
10 affect to see if that clad will rupture and release
11 its fission product inventory.
12 But, in reality, if you take clads to high
13 levels of burnup, you oxidize them more, you create an
14 oxide layer, and they are susceptible to other things
15 now than were ever envisaged at the time. For
16 instance, thermal shock -- now it's not just the peak
17 temperature, it's what the delta T that the clad
18 experiences and it suddenly cools down, and what not,
19 that becomes important.
20 So when we say we go to best estimates, I
21 think we have to think about not best estimates in a
22 stylized design, but best estimates of what's
23 physically going on in the fuel.
24 CHAIRMAN BONACA: That's right. Because
25 probably in this case, I mean, the concern would be,

1 you know, coolability more, and so you relax the
2 criteria which you are using. But you are still
3 expecting some level of coolability of the fuel, and
4 that would go -- that kind of evaluation.
5 MR. MARK RUBIN: Yes. Mark Rubin again.
6 We certainly agree. We'll be working with our
7 colleagues in the Office of Research to try to develop
8 the appropriate approaches and methods to develop the
9 criteria to arrive at the appropriate criteria as part
10 of the rulemaking development.
11 MEMBER POWERS: I think your colleagues in
12 the Office of Research are going to be very heavily
13 stressed when you come and ask them this question --
14 (Laughter.)
15 -- because you're going to ask them, gee,
16 what really happens in a core when I have a break, and
17 they're going to have to admit that they don't have a
18 whole lot of experimental data for these kinds of
19 scenarios that you're looking at.
20 And they're going to give you plausibility
21 arguments, and I hope you're skeptical enough that you
22 will be able to see through plausibility arguments and
23 say, "Where is your data?"
24 MR. KELLY: One or the other areas about
25 the mitigation is once we decide -- once we decide

1 whatever level of mitigation it is that we want, then
2 we have to decide, is that something that we expect a
3 licensee to justify that they've met that? Is that
4 something that we're going to look at generically and
5 try to do it? How is that actually going to happen?
6 And, again, it will depend on whatever the mitigation
7 was.
8 If it -- certainly, the further we go
9 beyond 2,200 peak clad temperature design basis, and
10 the further out we go, the more uncertainty we have,
11 the more we're stressing the codes themselves, and
12 whatever analytical tests or physical tests will be
13 performed.
14 The fifth issue --
15 MEMBER APOSTOLAKIS: In the fourth, as I
16 remember, in NUREG-1150 the conditional containment
17 failure probability was essentially between zero and
18 one. The uncertainty was huge.
19 (Laughter.)
20 MEMBER POWERS: Well, I don't think
21 Professor Apostolakis is being facetious there. I
22 believe that's what the result was.
23 MEMBER APOSTOLAKIS: Yes. So when you
24 say, how will this be shown, uncertainty in core
25 damage and severe accident would need to be addressed

1 -- are you going to do more than what 1150 did, or --
2 I mean --
3 MR. KELLY: I think -- when I say that, I
4 think one of the things that we have to do is we have
5 to take a very hard look at exactly what Dr. Powers
6 has talked about, is what is the data that we have?
7 You know, if we say that we're going to go beyond
8 2,200 degrees F, we're going out in these other areas,
9 how are we going to -- I think it's important that we
10 very carefully characterize our state of knowledge
11 about how good these new numbers are, and then take
12 that into account in our decisionmaking process.
13 MEMBER APOSTOLAKIS: But my point is, with
14 the current state of the art, this uncertainty is
15 huge.
16 MR. KELLY: Yes.
17 MEMBER APOSTOLAKIS: So now you are moving
18 beyond the current state. The uncertainty is not
19 going to go down, is it?
20 MR. KELLY: No, it's more huge.
21 (Laughter.)
22 MEMBER APOSTOLAKIS: Huger.
23 (Laughter.)
24 MR. MARK RUBIN: This is Mark Rubin again.
25 We may move beyond. We may not. What we need to have

1 is confidence in mitigative capability. And it really
2 will be up to the utilities who want to voluntarily
3 implement this approach what approaches and what
4 criteria they want to use.
5 They may -- we've seen an initiative from
6 the BWR Owners Group on an initiative for a LOCA/LOOP.
7 They're going to use the current peak clad temperature
8 in 50.46, and they have enough margin to do that using
9 some best estimate and hydraulic codes. And they're
10 going to stay with 2,200 degrees peak clad
11 temperature.
12 They don't have to push beyond the current
13 criteria. The PWRs may or may not have the ability to
14 do that.
15 Whether people have to go into areas
16 pushing the technology and having to look into some of
17 the areas of greater uncertainty will be something we
18 may have to look at or we may not have to look at. We
19 don't know yet.
20 MEMBER ROSEN: The only thing I would
21 quarrel with what you said, Mark, is you said you were
22 going to have to have confidence, and I would say you
23 need to have appropriate levels of confidence, given
24 the circumstances beyond the new design basis --
25 MR. MARK RUBIN: Yes.

1 MEMBER ROSEN: -- break. And it would be
2 -- it ought to be variable. Maybe you'll have less
3 confidence if you are thinking about the full 36-inch
4 break, the biggest break, let's say.
5 MS. McKENNA: I think that goes back to
6 something Glenn said earlier about the
7 interrelationship among things. Depending on where
8 you select your break size, what you do, what kind of
9 changes you make, the degree of mitigation and/or the
10 confidence you have in it, they all have to be
11 commensurate with each other, so that, you know, you
12 support whatever you're doing.
13 CHAIRMAN BONACA: And the definition you
14 put in about what happens beyond design basis will
15 affect, for example, how many megawatts I can increase
16 my power level by.
17 MS. McKENNA: Absolutely.
18 CHAIRMAN BONACA: I mean, you are, you
19 know, potentially here considering the large span of
20 breaks beyond six inches or eight inches, or whatever
21 it might be. You know, you could conceivably raise
22 your power level very much.
23 MEMBER POWERS: You were looking
24 apparently at just changing break sizes. Have you
25 looked at all at what the Germans have been doing

1 about the double-ended guillotineness of the break?

2 MS. McKENNA: Do you mean in terms of the

3 rate at which it --

4 MEMBER POWERS: No, just take it -- no,

5 no.

6 MS. McKENNA: I'm not sure I understand

7 what you --

8 MEMBER POWERS: They got rid of the

9 double-ended guillotine, and they said, "Well, the

10 thing will break, and it's an offset, and I have this

11 much" -- and they changed the flow area.

12 MS. McKENNA: Okay.

13 MEMBER POWERS: On the -- for the flow

14 based on a variety of arguments that I never really

15 quite understand, but they have blacksmiths, too, and

16 they make arguments that this is how pipes -- large

17 pipes really break. And I believe their blacksmiths

18 as much as I believe our American versions of that

19 profession, which is totally without question.

20 (Laughter.)

21 MR. KELLY: Well, you'll have an

22 opportunity to ask the blacksmiths a little later as

23 they explain their numbers that they have for the

24 break size frequencies. From our standpoint, we are

25 -- you know, we will work with that information that

1 we get.

2 And I would only assume based on the level

3 of expertise that was amongst the 12 experts that were

4 there that they are aware of -- or at least a number

5 of them were certainly aware of that data, and Rob can

6 talk to you more about some of the input that they

7 gave to the experts to make sure they were all kind of

8 on the same page.

9 MEMBER POWERS: You're asking blacksmiths

10 to all speak from the same page. That's an impossible

11 task.

12 MR. KELLY: To the extent possible.

13 (Laughter.)

14 VICE CHAIRMAN WALLIS: And as I said at

15 the subcommittee, number 4 is very interesting to me,

16 because it looks to me the beginning of a discussion

17 of what one might do about a reactor where you didn't

18 have a design basis accident spectrum, but you had to

19 put far more preventative, mitigative, and all these

20 other features in there as part of the design. But

21 you didn't have the current design basis structure.

22 So this looks like we are beginning to look at a

23 regulation of that sort.

24 MR. KELLY: Right.

25 MEMBER RANSOM: It seems to me in making

1 some of these decisions you also have to decide what
2 risks are acceptable. In other words, are there
3 incredible accidents which provide a risk that you
4 can't do anything about? And while pipe breaks are
5 more probable than some of these more incredible
6 events like vessel failure, vessel rupture, they don't
7 provide -- because of the mitigating systems -- as
8 much risk as those.
9 And so, really, it seems like the tradeoff
10 here is in risk based between what risk -- do these
11 contribute significant risk? And a lot of times the
12 large breaks don't contribute significant risk because
13 of the mitigating systems that you have. And if you
14 take them out, they now become more significant from
15 a consequence point of view.
16 And so that tradeoff, it seems to me, is
17 there. And I wonder in a way if this isn't driven
18 more by the intuitive idea that large breaks are less
19 probable than small breaks, even though the -- and the
20 consequences often times are less, too, because of the
21 mitigating systems, you know, that you have
22 accumulators and you can take care of them.
23 And, in fact, I think that's borne out by
24 the advanced reactors in which they turn small breaks
25 into large breaks, because they are easier to manage.

1 MR. KELLY: Well, I think, as we've talked
2 about before, is that all of the risk assessments that
3 I'm aware of have shown that the design basis
4 accidents are "no, never minds" in risk space. They
5 don't constitute a risk challenge to the plant. It's
6 when you get additional failures that you run into
7 problems. So --
8 MEMBER POWERS: Well, the design basis
9 accidents, by definition, should contribute nothing at
10 all to the risk.
11 MR. KELLY: Well, one would hope that, and
12 it works out that the way that the plants are designed
13 and operated that that is the reality as far as --
14 MEMBER POWERS: Kudos to the designers,
15 because they did their job.
16 MS. McKENNA: But it's also why, you know,
17 we were saying that once you get into consideration of
18 particular changes that there would need to be some
19 kind of risk assessment, because if you -- as a result
20 of redefining your break you decide to change your
21 mitigation, you need to see how that influences
22 whatever events you have.
23 If you change something in your low
24 pressure injection, that may deal with your large
25 break LOCAs, but it may deal with other events where

1 you ultimately have that as part of your success path
2 as well. You need to think -- you know, consider that
3 impact, too.
4 MEMBER ROSEN: You know, I'm troubled by
5 a little bit of this discussion in the area of this
6 constant refrain of when you take out the design --
7 the mitigating systems, when you remove the high
8 pressure safety injection system.
9 Well, the reality of it is that I don't
10 think anybody is going to do that. Now, of course,
11 I'm guessing, too, about the future. But I don't
12 think anybody is going to do that. I think it would
13 be costly to do that and difficult, and would
14 introduce all kinds of problems.
15 But what more likely will happen is
16 someone might say, "Well, there are these requirements
17 for the high pressure injection system -- for testing
18 and maintenance and all of that -- and if one -- and
19 I'll keep on doing those. But if one day I run into
20 trouble and I can't quite do it exactly right, I might
21 once in a while not do that."
22 And it's that kind of thing that's more
23 likely, and I think we ought to be careful about
24 leaving the impression that if this is ever passed
25 that there's going to be a wholesale on 100 plants

1 tearing out of the mitigating systems. I just don't
2 think that's --
3 MR. MARK RUBIN: No, we're not -- of
4 course not, and we're not suggesting that. My
5 microphone just fell apart.
6 (Laughter.)
7 We're not suggesting that, of course, at
8 all. But what we just wanted to point out is the
9 current Part 50 regulatory structure, the way the
10 design basis accidents are formulated, that's not
11 precluded. The way the regulations are formed you do
12 the design basis accidents. Those constrain what
13 systems you need to respond to them.
14 And if you were designing a plant today,
15 if you don't need it for a design basis accident, it
16 doesn't have to be there. But the real issue is if
17 you do change the limiting accident -- and for a
18 number of the plants the large break LOCA is limiting
19 -- you could -- if you had the thermal capability and
20 the generator, and the steam generators in the case of
21 the PWRs -- you could do a substantial power uprate to
22 the degree that you maybe couldn't hack a double-ended
23 guillotine break any more without significant core
24 damage.
25 And so you could, in a sense, back into a

1 scenario where you couldn't survive a large break LOCA
2 anymore without a large amount of core damage. And
3 we're just pointing that out.
4 MEMBER ROSEN: Okay. Well, that's -- I
5 accept that. I agree with that. But let's be careful
6 about the -- even referring to the idea that we're
7 going to be taking out -- these systems out.
8 MR. MARK RUBIN: We didn't mean to suggest
9 that.
10 MEMBER ROSEN: I think that's not likely.
11 MS. McKENNA: No.
12 MR. KELLY: The reality more is -- as
13 you're saying is maybe that somebody is going to say,
14 you know, I don't need these accumulators any longer.
15 I can vote them out. Or I can have -- I have a train
16 that -- where I needed it before, and I -- maybe I can
17 have a six-month outage in this train now, because I
18 really just don't seem to need it that much.
19 So that's the type of thing that would be
20 the potential that's there.
21 The fifth issue is: how should adequate
22 defense-in-depth be assured under this rule? And to
23 what extent do the guidelines laid out in Reg. Guide
24 1.174 need expansion? I think there's two aspects to
25 this.

1 Number one, Reg. Guide 1.174 provides an
2 excellent -- in answers to George's comment, since
3 he's not here -- the -- in risk-informing what we
4 really -- when we talk about doing that and being
5 fully risk-informed, we're really talking about
6 following the process laid out in Reg. Guide 1.174.
7 And in Reg. Guide 1.174 there are a number
8 of areas where it talks about defense-in-depth. And
9 one of them is it gives a listing of seven different
10 aspects that it feels if you meet -- if you follow
11 these things, it's going to help give you adequate
12 defense-in-depth.
13 And we've heard back from industry that
14 even though these define that that maybe that they're
15 not sufficiently well defined that it was too much of,
16 you know, I'll know it when I see it, in a sense of
17 the way the NRC has treated it. And they'd like maybe
18 a little bit better definition.
19 We've said that -- told the Commission we
20 will look at that and we will see whether we can do a
21 better job of defining what -- you know, what those
22 mean, if that's necessary. And the other area is that
23 in Reg. Guide 1.174 it was designed as a way of
24 changing the licensing basis. But it was not meant as
25 a way of changing regulations.

1 One of the inherent assumptions in Reg.
2 Guide 1.174 is that you would continue to meet all of
3 the regulations. Now we're talking about having a
4 process whereby we're going to be modifying the
5 regulations based on a Reg. Guide 1.174 type process.
6 So we're also going to be looking at
7 seeing whether there is any additional aspects to
8 defense-in-depth that need to be added, not -- I'm not
9 saying that we've identified anything at all, but we
10 just want to look and see, is there anything else,
11 since we're going to be changing, you know, the
12 underlying pinnings of -- of how we've basically --
13 what we've used to design our plants, is there
14 anything else that we need to think about to add to
15 Reg. Guide 1.174 as an enhancement?
16 VICE CHAIRMAN WALLIS: Well, as we said at
17 the subcommittee meeting, the large break LOCA is in
18 the rules now because of defense-in-depth. If you're
19 going to take it out, you have to give a proper
20 argument in terms of defense-in-depth for taking it
21 out and somehow negate the arguments which were then
22 used to put it in the regulation.
23 It looks as if risk is going to be used to
24 nibble away at defense-in-depth rather than defense-
25 in-depth being used to trump risk arguments. I'm not

1 quite sure which wins here.

2 MR. KELLY: Well, my understanding -- and

3 I was not around when they originally did this. But

4 my understanding is that the -- part of the concept of

5 defense-in-depth was that it was designed to help

6 protect against the unknown, the uncertainties that we

7 have, the significant uncertainties.

8 And some of the things that would --

9 reasons that have been expressed about why we're even

10 looking at changing these -- considering removing some

11 of these larger breaks from the design basis is that

12 we have more knowledge now about pipe break phenomena,

13 about materials, and that we've had much more

14 experience amongst the nuclear reactors.

15 And it is believed that there may be good

16 reasons, therefore, to, based on that now increased

17 knowledge, and, therefore, lesser uncertainty, that

18 maybe now we can get rid of some of those things from

19 the design basis.

20 VICE CHAIRMAN WALLIS: Okay.

21 MR. KELLY: Issue number 6 deals with a

22 concern that -- and there's two parts to 6, so I just

23 want to make sure I come back to two different parts.

24 But 6 talks about cumulative increases in risk and

25 about the need to limit that. And I think there's two

areas to that.

One of them is as -- what we don't want to have is a plant coming in, let's say -- let's say that we said that, okay, the increase in risk that you could have under -- under the rule, say, was 10^{-5} core damage frequency per year, if we decided that that was the appropriate value.

And so this month I'd come in and I'd get that, and three months from now I come in and I'd say, "Ah, I have this other fix, and I want to increase that 10^{-5}." And six months later I have another 10^{-5}.

There's nothing in Reg. Guide 1.174 to preclude you from doing that. It does ask you to -- but we do say under Reg. Guide 1.174 that somebody is supposed to be tracking cumulative risk, and that cumulative risk is total cumulative risk, total risk on the plant. And they're also supposed to be tracking the total increases.

And I think what we're looking here is that some way we're deciding -- we want to decide how -- what's a good way to actually track the change in risk associated with whatever plant modifications are made under the rule.

CHAIRMAN BONACA: And limit.

MR. KELLY: Excuse me?

1 CHAIRMAN BONACA: And limit at some point.

2 MR. KELLY: Right. And have a limit. And

3 then the question is: if we have a limit, is that

4 limit only for changes made under the rule? Or what

5 if I'm making other changes outside of the rule and

6 they're affecting this, how does that count?

7 If my total core damage frequency is two

8 times 10^{-5} per year, is it okay for me to continue to

9 make changes that are going to be increasing my risk?

10 Or do we decide that maybe we don't want to do that?

11 That's one of the things that we believe needs to be

12 discussed and addressed in the --

13 MEMBER APOSTOLAKIS: So what if I have a

14 record of a bad safety culture, would you do the same?

15 MR. KELLY: If you can tell me how to

16 quantify it, I would --

17 MEMBER APOSTOLAKIS: It's common knowledge

18 that my safety culture has not been good the last 15

19 years. Would that play a role in anything?

20 MR. KELLY: We normally handle changes --

21 problems with safety -- we used to handle it in the --

22 in how we put plants on the watch list.

23 MEMBER APOSTOLAKIS: Yes. But you don't

24 do that anymore.

25 MR. KELLY: We don't do that any longer.

1 I wouldn't know how to do that. Certainly, it's a
2 consideration, but how you would address that in a
3 rule I'm not sure.
4 MEMBER KRESS: It seems to me like Reg.
5 Guide 1.174 already has built into it limits by way of
6 the requirements on the various regions due to the
7 absolute values of CDF and LERF. It seems to me like
8 what you need to do is specify or -- or require some
9 frequency of update of the PRA, so that it
10 incorporates all of the changes that have been made as
11 they are made, and also have some specification on the
12 scope and quality of the PRA itself.
13 So, then, the Reg. Guide 1.174 processes
14 automatically have limits in them and keep track of
15 the cumulative changes in risk, it seems to me.
16 MR. KELLY: Dr. Kress, I -- it looks very
17 simple on the surface, but it's not. And one of the
18 reasons why it's not is historically what happens is
19 when a utility makes an update to its PRA, it will not
20 only update its PRA associated with whatever plant
21 changes have been made in the period since the last
22 time they had an update, but they'll also make
23 modifications to the PRA itself to improve the PRA in
24 some area. And those modifications --
25 MEMBER KRESS: Well, it seems to me that's

1 all right, though.

2 MR. KELLY: Oh, it is. It's wonderful

3 that the PRA is updated. But the -- as I modify my

4 PRA, if I were to go back and look at modifications

5 that I made under my PRA -- under my plant before, the

6 changes to my PRA may, in turn, because I've improved

7 my PRA, may change how much those changes to the plant

8 increased or decreased the plant risk.

9 So over time as -- each time I change my

10 PRA, potentially I have to go back and look at all of

11 the plant changes, and it becomes very messy. We --

12 MEMBER KRESS: Yes. Well, that's what I

13 mean by an update to the PRA. Just make sure it's

14 always current.

15 MR. KELLY: That's fine. But what --

16 MEMBER APOSTOLAKIS: Phase 4.

17 (Laughter.)

18 MR. KELLY: But the problem comes with,

19 then, just saying, "Okay. I'm just going to sum up

20 all of my old changes and say that constitutes or

21 equals the actual change that's been made."

22 CHAIRMAN BONACA: By the way, another

23 point is, I mean, Reg. Guide 1.174 -- it gives you a

24 limit, but that is not an end point.

25 MEMBER KRESS: Yes. I don't want you to

1 sum up all of the old changes. I think you just keep
2 track of the status and condition of your plant, and
3 calculate the new CDF and LERF. And it automatically
4 incorporates all of the changes.
5 CHAIRMAN BONACA: Yes. No, but I'm saying
6 that the -- you know, I mean, by saying that there is
7 a limit there, I could creep to that limit, change --
8 through changes, and to me that is not right.
9 MEMBER KRESS: Well, I don't know why not.
10 CHAIRMAN BONACA: Well, perhaps we should
11 discuss that.
12 MEMBER KRESS: I mean, you -- you creep up
13 to the limit with more --
14 CHAIRMAN BONACA: Well, the fundamental
15 principle in the regulation has always been that
16 whenever the plant is, you stay there. I mean, so far
17 as your licensing basis. And even if you have some
18 margin, even though you can apply for it now that it's
19 under 50.59, but it doesn't mean necessarily that you
20 can push everything to your -- you know what I'm
21 trying to say? Now, this is -- would be a different
22 concept.
23 MEMBER KRESS: Well, as long as you are
24 risk-informed and keeping your defense-in-depth, you
25 should be able to do that.

1 CHAIRMAN BONACA: If you can creep to that
2 limit, why can't you make a big change all the way to
3 that limit?
4 MEMBER KRESS: I don't see why not, as
5 long as you maintain defense-in-depth and keep within
6 the limits.
7 MEMBER APOSTOLAKIS: No. The regulatory
8 guide doesn't allow that.
9 MEMBER KRESS: The guide wouldn't allow
10 you to do that, because it limits -- it limits the
11 delta you can get within a region. But, you know, the
12 cumulative -- it would allow you to creep up to it,
13 and that should be all right.
14 CHAIRMAN BONACA: I mean, that's an issue
15 that -- right now I agree with it.
16 MEMBER APOSTOLAKIS: Are you familiar with
17 the phased approach that the Commission has proposed
18 to reach --
19 MR. KELLY: I'm somewhat familiar, yes.
20 MEMBER APOSTOLAKIS: Could 50.46 be risk-
21 informed with anything that is less than a Phase 4
22 PRA? I'm serious.
23 MR. KELLY: Could it be risk-informed?
24 MEMBER APOSTOLAKIS: Yes. I mean, could
25 any of these issues that you are raising --

1 MR. KELLY: I think clearly it could be
2 risk-informed at a Phase 3.
3 MEMBER APOSTOLAKIS: Why?
4 MR. KELLY: Because you would have
5 addressed all of the -- you would have provided
6 guidance for all of the major risk contributors, and
7 that they would have addressed those, and that they
8 would have followed that guidance.
9 Now, the question comes, would we, you
10 know -- would their peer review be adequate for us?
11 MEMBER APOSTOLAKIS: Sure.
12 MR. KELLY: And if we felt that a peer
13 review was adequate, I think we'd -- then we'd be
14 okay.
15 MR. TSCHILTZ: This is Mike Tschiltz. I'd
16 just like to say that I think we're not there yet. I
17 think we need to define what 50.46 is going to allow
18 before we define what the quality is going to be.
19 So --
20 MEMBER APOSTOLAKIS: I mean, you have
21 issues here like uncertainty, and core damage and
22 severe accident analyses would need to be addressed.
23 Okay? How should adequate defense-in-depth be assured
24 under this rule? And there were all sorts of other
25 statements regarding PRA and quality, and so on.

1 And it seems to me that if you don't have
2 a Phase 4 PRA, you're not going to be able to answer
3 it.
4 MEMBER ROSEN: The Phase 4 PRA is the
5 state of the art.
6 MEMBER APOSTOLAKIS: State of the --
7 MEMBER ROSEN: And so it --
8 MEMBER APOSTOLAKIS: No, no, no. It's
9 also NRC reviewed, right? Phase 3 is not --
10 MEMBER ROSEN: And approved and endorsed.
11 MEMBER APOSTOLAKIS: Endorsed, yes. Yes,
12 this is endorsed. There is much more to it than just
13 state of the art.
14 MS. McKENNA: I think Donnie wanted to --
15 MR. DINSMORE: Yes. Well, just a second.
16 This is Steve Dinsmore from the staff. I think --
17 see, what we've been working with is that when you
18 change the design basis LOCA sites, when you just do
19 that without changing the plant, you're not really
20 changing the risk. It's only when you start changing
21 the plant that you're affecting the risk.
22 And so what we postulated is possible was
23 -- yes, well, that's assuming that the --
24 MEMBER APOSTOLAKIS: How about the way I
25 operate the plant?

1 MEMBER SHACK: It's still a change.

2 MEMBER APOSTOLAKIS: Oh. You consider

3 that --

4 MS. McKENNA: Yes.

5 MR. DINSMORE: Yes. Well, if it's in your

6 design basis, it's embedded in the design basis, so

7 you'd have to change the design basis to credit -- to

8 take credit for the change in the size. And the way

9 we work now is if -- every time somebody comes in with

10 a change we would evaluate the part of the PRA they

11 need for that change.

12 So we could envision that -- if we set the

13 limit on the delta CDF and the delta LERF like we do

14 now, we can do that evaluation. And we can evaluate

15 the part of the PRA which is needed to support that,

16 using the current methodology as being approved by the

17 phased approach.

18 So, in other words, if they -- they want

19 to change something that's not in the PRA, which is a

20 significant contributor, we'd say, "We can't do that."

21 But it is possible to make some changes --

22 MEMBER APOSTOLAKIS: Are you referring to

23 50.46 now?

24 MR. DINSMORE: Yes.

25 MEMBER SHACK: It depends on what change

1 you want to make.

2 MS. McKENNA: Right. It's more narrow or

3 broad, if you have specific changes that --

4 MR. TSCHILTZ: I think what he's saying,

5 in effect, is you could be in Phase 1 for certain

6 changes envisioned under 50.46.

7 MR. DINSMORE: Or at least that's the way

8 we're kind of talking about it right now. It might

9 get modified, but --

10 MR. HARRISON: This is Donnie Harrison.

11 If I can jump in for a second, if I can just talk

12 about the phases just briefly.

13 If you remember Phase 2, if we write the

14 guidance for the application, and in that guidance it

15 tells you what PRA quality you need or what scope of

16 issues need to be addressed within that, so as part of

17 the rulemaking there will be some type of guidance

18 also developed that will need to address that area.

19 So you can enter Phase 2 and the PRA phase

20 of -- quality phases for a 50.46 application when it's

21 done -- once that guidance gets written and it tells

22 you what you need from a PRA quality perspective, and

23 then those standards are in place.

24 MEMBER APOSTOLAKIS: Are these statements

25 consistent with what I keep hearing from our Chairman

1 about the tentacles of 50.46 all over the place? Now
2 you are telling me, oh, they can pick a little thing
3 and do it, and no big deal. I thought 50.46 was
4 everywhere.
5 MR. HARRISON: Well, again, I'm just
6 talking about the phased approach, so that we don't --
7 MEMBER APOSTOLAKIS: But you can do this
8 with Phase 1.
9 MS. McKENNA: I think this goes back to
10 what you're actually -- what's the application, what
11 are you really changing as a result -- you say, "I've
12 redefined my break size," or "I've taken something out
13 of the design basis," and then what do I really do?
14 Am I changing my diesel start time? Am I, you know,
15 doing some -- you know, how I operate one of my --
16 MEMBER APOSTOLAKIS: Well, the two major
17 issues --
18 MEMBER SHACK: A major power uprate is
19 very different from changing the diesel start time.
20 MS. McKENNA: Right. Right. True.
21 MEMBER SHACK: And the PRA level I need to
22 support those two changes may, you know, be
23 substantially different.
24 MR. MARK RUBIN: We'll be developing --
25 MEMBER APOSTOLAKIS: As a general

1 statement, that's correct.

2 (Laughter.)

3 MR. MARK RUBIN: We'll certainly be

4 focusing on the PRA quality attributes explicitly as

5 part of the rulemaking development. But we're going

6 to be leveraging the phased quality initiative as part

7 of it and trying to fit as much as we can directly

8 into that.

9 VICE CHAIRMAN WALLIS: Well, we've had 20

10 percent power uprates without any magical, huge

11 advance in PRA already. And we have had some

12 questions about the PRA quality, but they haven't

13 really led to any holdups in approving those power

14 uprates.

15 MEMBER APOSTOLAKIS: Which comes back to

16 my comment this morning. I mean, the heart of the

17 matter is the decisionmaking process. As long as you

18 can get all this stuff, with the present situation

19 where presumably we are in 1.5 -- Phase 1.5, there is

20 absolutely no incentive to move it. Anyway, okay.

21 MR. DINSMORE: Well, I guess this comes

22 back a little bit to whether it's a broad or a narrow

23 scope. If it's a broad scope, we'd have to be

24 prepared for pretty much any changes, whereas Dr.

25 Rosen said that they will be out there looking to see

1 what they can change.

2 So we'd have to really deal with this

3 directly, and we haven't quite figured out how to do

4 it, which is why it's up there. Whereas, if it's a

5 narrow scope, where it's defined beforehand, we can

6 take a look at that, and then we could actually figure

7 out what exactly the PRA quality requirements would be

8 to support those allowable changes.

9 MR. KELLY: Issue number 7 is, what's the

10 appropriate scope and quality of PRA, which we've

11 already talked about here. And 8 is also the question

12 about future reactors, which we've talked about. So

13 let's move on to the next page.

14 The staff has seven activities outlined in

15 the paper that we're going to -- we're going to talk

16 -- we're going to determine the -- how we're going to

17 choose the maximum break size, identify the level of

18 mitigation required for the LOCAs beyond the new

19 maximum break size.

20 We're going to develop criteria, including

21 the metrics, for determining what would constitute an

22 acceptable plant change. We're going to develop

23 criteria for determining total CDF, maximum CDF, that

24 would be -- we might use as saying, okay, if you're

25 above this, we want to handle you differently than if

1 you're below this.

2 We're going to look at the need for

3 additional defense-in-depth criteria, if any. We're

4 going to, as we mentioned, see if we need to improve

5 on the guidance in Reg. Guide 1.174 on how you attain

6 defense-in-depth.

7 We're going to develop criteria to

8 demonstrate what it means to have adequate mitigation.

9 And we're going to look at over time what kind of

10 information the utility is going to have to retain or

11 develop in order to assure that things are going okay.

12 And, of course, we're going to do this

13 very quickly.

14 (Laughter.)

15 Research has ongoing work in thermal

16 hydraulics and risk assessment, and we may be faced as

17 we go along asking for additional work.

18 MEMBER APOSTOLAKIS: What does it mean?

19 MR. KELLY: Is Hossein here? There he is.

20 Would you like to speak about what --

21 MEMBER APOSTOLAKIS: What does the first

22 bullet mean, Hossein? You have to go to a microphone

23 and speak with sufficient clarity and volume.

24 MR. HAMZAHEE: Yes. This is Hossein

25 Hamzahee, Section Chief, PRA Branch in Research. I

1 think what Glenn is saying under bullet one is that
2 Research has already undertaken a number of activities
3 to support this rulemaking, one of which is the
4 thermal hydraulic calculations.
5 Mainly, we are trying to look at some of
6 the postulated changes and then look at some of the
7 potential changes in -- like peak cladding temperature
8 or oxidation limits, and this is ongoing. And the
9 other thing we are doing is we are trying to look at
10 those and then do some risk assessment, trying to
11 figure out what are the potential changes to some of
12 the assumptions in the PRA models, and then making
13 some of those changes, try to look at some selected
14 plants and see how the risk profile would look like.
15 So these are the ongoing activities that
16 Research has been working on.
17 MEMBER APOSTOLAKIS: So this doesn't mean
18 that thermal hydraulics and risk assessment are trying
19 to put together --
20 MS. McKENNA: No.
21 MEMBER APOSTOLAKIS: It's activities in
22 risk assessment that --
23 MR. HAMZAHEE: That's correct. However,
24 sometimes as -- what we get from the thermal
25 hydraulics may help us in understanding what would be

1 the potential impact on some of the PRA assumptions.

2 MEMBER APOSTOLAKIS: Well, it should.

3 MR. HAMZAHEE: It should.

4 MEMBER APOSTOLAKIS: It should.

5 MR. KELLY: Okay. And the last bullet

6 involves LOCA/LOOP - the March 31st, 2003 SRM asked us

7 to address looking at relaxing the requirements for

8 LOCA/LOOP. We have BWR Owner's Group topical which we

9 believe is going to be coming in shortly, which will

10 be addressing that issue. We've asked the Commission

11 if it's okay if we go ahead and review the topical,

12 deal with that issue, and then go forward once we've

13 gotten some experience and real-life exemption

14 requests in this area.

15 MEMBER ROSEN: Do you think that the BWR's

16 approach will be instructive for the pressurized water

17 reactors, as well, or are they two separate issues on

18 LOCA/LOOP?

19 MR. KELLY: My personal opinion is that

20 it's going to be a little bit different for the

21 boilers because they have significant thermal margin

22 that may not be available for all PWRs. And the

23 boilers are able to make modifications to the plant

24 and still using realistic code runs show peak clad

25 temperature below 2200 degrees F.

1 MEMBER ROSEN: Well, isn't your strategy
2 a little unfair to most of the plants, that two-thirds
3 of the plants are PWRs. And so if you're saying
4 you're going to wait to work on the PWRs until later
5 while you work on the BWRs, and not have any
6 likelihood that what you'll learn from the BWR
7 approach will be helpful to the PWRs, it seems a
8 little unfair. Have you thought about that?
9 MR. KELLY: The boilers have done -- the
10 BWR Owner's Group has done some work on developing
11 rationale why the seven changes can be made, or
12 combinations of these seven changes can be made and it
13 be acceptable to the plant.
14 As far as we know, the pressurized water
15 reactor plants have not gone ahead and done this work.
16 We have already investigated looking at the issues
17 such as developing a methodology to determine plant-
18 specific conditional probability of loss of off-site
19 power given a LOCA, which is very important because
20 it's a very site-specific issue, where a plant even
21 within -- if you have multiple plants on a site, can
22 depend on different plants at the site.
23 This issue can be handled on a plant-
24 specific basis. And what we're trying to do, and that
25 would be available for reactors if they chose to come

in that way. We prefer to be able to do it for a number of reasons, including resources to do it via topical report. I'm not sure if I'm really answering your question in part, but in essence the BWR Owner's Group has done a significant amount of work here. I mean we recognize that.

MEMBER ROSEN: You don't need to be specific to my point. Just be aware, I hope we've exchanged -- my feeling about that is that I'm not sure that's exactly fair to PWR to delay work on the PWR world while you consider the BWR LOOP/LOCA.

MR. RUBIN: This is Mark Rubin again from the staff. I don't think we're actually delaying the work. Any design would have to show thermal hydraulic success for delayed diesel start. And the BWRs happen to be showing that success through a TRACG calculation, still using 2200 peak clad temperature. A PWR may come in using RELAP or some other code. The general approach should be as applicable to a PWR. They don't have the same thermal margin. They may have a little tougher job in the T/H calculation, but the general analytical approach should be applicable, but they much not have as much pad in the delay of the diesel start. Instead of going to 80 seconds, they may only be able to delay to 22, 23, 32 seconds. But

1 I think we're going to learn a lot from the BWR
2 Owner's Group approach, and I think it's going to be
3 very efficient from a staff researcher's perspective,
4 and I think the real expert is now standing at the
5 microphone, and will be able to share his perspective.
6 That's Mr. Lazevnick.
7 MR. LAZEVNICK: Yes. I'm Jim Lazevnick
8 from the Electrical Branch in NRR, and Glen and Mark
9 addressed the thermal hydraulic aspects which are, of
10 course, different between the BWR and PWR. But the
11 electrical aspects between a BWR and PWR are not based
12 on thermal hydraulic issues. They're based on
13 electrical design features, grid features and other
14 things that are not necessarily specific to BWR and
15 PWR. So we do expect to learn a good deal from the
16 BWR approach in terms of the electrical areas that
17 will carry-over directly to the PWR designs, as well.
18 MEMBER ROSEN: Well, I don't want to make
19 too much of this.
20 MS. McKENNA: Well, we want to wrap up
21 because we don't want to take all of Rob's time, so I
22 think just quickly in summary that, as we've said, we
23 want to be careful in doing a redefinition of the
24 large break LOCA so that we don't lose the margins
25 that exist as a result of the current designs as we

1 move forward. I think this question about should it
2 be narrow or broad, and what kind of changes could be
3 forthcoming from the rule, we have to get to some
4 meeting of the minds on that.
5 We sent the paper to the Commission. We
6 asked for policy direction in certain areas. We are
7 continuing to work on some of these technical issues,
8 as was mentioned, while we're awaiting that kind of
9 feedback. And as indicated, certainly any feedback
10 from the Committee that you would like us to consider
11 as we move forward, we get direction from the
12 Commission as we try to shape the rule making. We'd
13 certainly be very interested in that. Thank you.
14 MEMBER SHACK: I think we better move on
15 because I think Rob will have a fair amount of
16 material to cover in his time that he has available.
17 MEMBE POWERS: Well, despite his limited
18 time, I have to say that I continue to be troubled
19 primarily about some identified sites, and the
20 paradoxes that you can get from there. I continue to
21 worry whether PRA is the right technique to both
22 design and assess these design-basis accidents. And
23 I keep coming back to my structuralist biases, George,
24 and say shouldn't -- if we're looking at 50.46, should
25 we really be looking at what it was intended to do;

1 and that was to preserve barriers, that what would be
2 intolerable in any design is a failure of the reactor
3 coolant system that led to a concomitant failure of
4 containment, and to assess that they took the biggest
5 load that they could think of to put on containment.
6 We now know that containments are much stronger than
7 just their design levels, and so one can think about
8 backing off. At the same time, we were worried about
9 preserving the ability to cool the core, and they
10 asked what's the fastest we get the water out of the
11 system, and make it difficult to get the water back
12 in, and so they came up with this doubled-ended
13 guillotine pipe break. And they designed a system
14 that can put water back in very quickly. We now know
15 that that's not the only way to get to an incurable
16 situation.
17 MEMBER ROSEN: It may not be the worst way
18 either.
19 MEMBE POWERS: That's right, it may not be
20 the worst way. And I keep wondering if we shouldn't
21 -- if we are so enamored with this PRA that we're not
22 looking at these barrier-type arguments as a way to
23 approach redesigning 50.46. And that if the
24 preservation of barriers isn't a better objective for
25 50.46, than risk. I mean, this comes inherently

1 because of a disbelief in the omniscience of the PRA
2 analysts. I simply don't believe they can think of
3 everything that a plant can be asked to do.
4 MEMBER KRESS: I think I tend to agree
5 with you, Dana, that we have to think of barrier
6 presentation, so I think in this rule change you have
7 to do something about preserving that type of defense-
8 in-depth. But the fact is that this rule results in
9 other things that have very little to do with
10 barriers. And I think we can deal with these other
11 things in risk-based, but I think -- I'm with you. I
12 think I'm a structuralist defense-in-depth in this
13 thing, and you have to maintain that part of it
14 somehow.
15 MEMBER SIEBER: I'm a rationalist with
16 structuralist tendencies, which I admit to. And so I
17 think Dr. Powers has offered an important caution,
18 that when we go forward we ought to be thinking about
19 defense-in-depth. But I don't think these two
20 approaches are exclusive, mutually exclusive. I think
21 we're thinking about finding a balance.
22 CHAIRMAN BONACA:: Sure. And I think what
23 we're saying is that these plants were built with
24 margin we didn't realize we had when we built them.
25 And now through PRA we measure the margin, it doesn't

1 mean that you have to cash it all in. I mean, you
2 can't.
3 MEMBE POWERS: Where I worry about self-
4 identified sets is identify that margin, and then I
5 use the PRA to take advantage of that margin. I will
6 get into paradoxes. I worry about that a lot. And I
7 think the consequences that Dr. Kress speaks of,
8 people lose quickly, very quickly lost sight of what
9 they were trying to accomplish in 50.46, and said this
10 is the end in itself, and I think that was not the
11 case. And I think the PRA is an excellent vehicle for
12 showing you where those things resulted in unnecessary
13 margin having been created. I mean, PRA clearly is
14 the technique to show you where you have margin. I'm
15 not sure that it's the technique they subsequently use
16 to design something that's better, and I'm not sure
17 it's the right technique to use to design something
18 that's taken knowledge in neutral. I just offer that
19 for my concerns.
20 MR. TREGONING: Okay. We want to follow-
21 up the discussion we had on some of the regulatory
22 concerns and issues that we're struggling with as an
23 agency, and again we had a lot of good discussion and
24 insight on today to talk about one piece of this. But
25 it's sort of the first piece we've tackled of this

1 revision exercise, so I'm going to be giving what
2 hopefully will be very a condensed version of the
3 presentation.
4 MEMBER SHACK: It will be a condensed
5 version.
6 MR. TREGONING: I qualify it. I'm at the
7 discretion of the ACRS here, so I trust in your
8 judgment. I'm Art Tregoning, and Lee Abramson and I
9 will be presenting the development of the passive
10 system LOCA frequency that will be used as part of the
11 technical basis to provide information to do a risk-
12 informed revision of 10 CFR 50.46.
13 The objectives and scope of the
14 elicitation, we touched on this a little bit earlier
15 in regard to the questions that we had during the
16 earlier presentations. I'm just doing these again to
17 make sure that they're clear. I've gone over these a
18 number of times at various ACRS meetings, but really
19 the primary objective that we set out to do with this
20 elicitation was to develop generic BWR and PWR piping
21 and non-piping passive system LOCA frequency
22 distributions as a function of both the break size -
23 so obviously how big the break is, if it's a small,
24 medium and large - and also, the operating time.
25 MEMBER ROSEN: Why do you say non-piping?

1 I thought we heard earlier that you only considered
2 piping.
3 MR. TREGONING: No, only passive system,
4 not active system. We looked at non-piping pressure
5 system components, as well.
6 MEMBER ROSEN: For example?
7 MR. TREGONING: For example, pump bodies,
8 valve bodies, the vessel itself.
9 MEMBER ROSEN: Okay.
10 MR. TREGONING: Manways, all of those -
11 steam generator tubes which aren't historically
12 considered as piping, even though they have many
13 similarities. CRDM nozzles and tubes, things like
14 that. Anything which could break due to degradation
15 that could -- the break itself could lead to a LOCA,
16 so not a consequential LOCA, but a primary LOCA in the
17 primary system. And that's the first point, so we're
18 looking at LOCAs which initiate in an isoluable
19 portion of the RCS. These are primarily LOCAs that
20 are related to passive component aging, but we just
21 don't look at aging without considering mitigation,
22 because we're just not letting the plant sit there,
23 and we're doing something in many cases to try to
24 combat aging, so for specific aging mechanisms, we
25 tried to temper the effects by whatever mitigation

1 measures are currently in place now.

2 I said that we did this as a function of

3 break size. We looked at small, medium, and large

4 break LOCAs. Even though the rule we've talked about

5 -- we've talked about potentially redefining a break

6 size which has more impact on --

7 VICE CHAIRMAN WALLIS: Well, you didn't

8 look at this number 2 about the risk of someone over-

9 tightening the bolts on a manway or something like

10 that.

11 MR. TREGONING: We did consider --

12 VICE CHAIRMAN WALLIS: Is that passive

13 component aging?

14 MR. TREGONING: Even though passive

15 component aging was the primary thing, we did look at

16 common cause failures for things like bolting.

17 VICE CHAIRMAN WALLIS: I thought you did.

18 MR. TREGONING: Yes, so that's true. So

19 again, we looked at small, medium and large breaks,

20 and we also looked at -- we further subdivided the

21 large break category. Historically we looked at three

22 LOCA sizes. We looked at six, so we broke the large

23 break LOCAs into four separate regions. And the idea

24 behind that is we wanted to try to get a more

25 comprehensive look at the frequency spectrum -- at the

1 frequencies over a spectrum of break sizes, and we
2 wanted to go into bigger break sizes that may be of
3 the level that we're looking at doing this
4 redefinition. So we looked at large breaks and we
5 categorized them to a much finer extent than we've
6 ever done previously.
7 We looked at three different time frames.
8 We provided fixed estimates at these different times.
9 We provided estimates for the current day which we
10 defined roughly as 25 years of average fleet
11 operation. We looked at 40 years and 60 years. Why
12 those two times? Well, 40 years and 60 years
13 correspond roughly to the end of the original license
14 period, and then the end of the license extension.
15 The 25 and 40 year estimates also
16 coincided with direction that we got from the SRM that
17 we need to consider LOCA frequencies which look
18 forward 10 years, with the expectation that at a
19 minimum in another 10 years we're going to have to go
20 back and revisit those if -- again, assuming that
21 something doesn't come up in the interim which calls
22 into question the basis of the frequencies that we've
23 developed to date. So that's why we picked these
24 three different time periods, so we can give forward-
25 looking estimates, and again also provide information

1 that we could use to assess when we get to the point
2 of redefinition in 10 years time how much change would
3 be expected over this original set of estimates.
4 Primary focus as I mentioned were
5 frequencies associated with normal operating loads and
6 expected transients, and a major assumption here that
7 I'd like to list to make sure people are clear about -
8 we assume that there were no significant changes
9 would occur in the future in the plant operating
10 profiles, so that essentially -- why do we make that
11 assumption? Well, we have a certain amount of service
12 experience. We're essentially saying that we're not
13 going to have such radical changes that the service
14 experience is going to become moot at that point, so
15 we're not going to do something which dramatically
16 undermines the historical database that we've
17 developed.
18 Of course, the database for big LOCAs are
19 essentially zero LOCAs over thousands of years of
20 reactor operating experience. But we do have an
21 extensive database of precursor LOCA events, which
22 would be things like cracks, leaks, things like that.
23 And that's something that we've developed over the
24 years fairly extensively, especially for piping. And
25 that was really the primary basis that the various

1 experts used to extend that to go from the precursor
2 information to LOCA frequency. So we want to make
3 sure, which is that final bullet or that final caveat,
4 that we don't do anything that undermines that basis.
5 CHAIRMAN BONACA:: But if you use this
6 margin to increase power level, there will be a
7 significant change in the plant operating profiles.
8 MR. TREGONING: If the plant operating
9 profiles would result in additional, I'll say
10 additional precursors occurring, then that's obviously
11 -- that would undermine the basis of the LOCA
12 frequency, yes. It's very simple.
13 MEMBER FORD: But you're making the
14 assumption there that the mitigation actions are going
15 to counter the degradation due to, for instance, power
16 uprates. It relates to Mario's question, that your
17 presumption there is that mitigation actions will
18 offset any increased degradation rate due to power
19 uprates.
20 MR. TREGONING: With any of the aging
21 mechanisms we looked at the effectiveness of
22 mitigation, and tried to assess that. But just -- and
23 this is why that 10 year window is so important. As
24 we do changes, if we find things that change in -- the
25 operating profiles have changed, that's changed the

1 basis for these estimates, we have to very carefully
2 evaluate them, and make sure that we are clear in
3 saying hey, these no longer hold for this reason.
4 MR. RUBIN: This is Mark Rubin from NRR.
5 The preliminary transmittal we got raised questions on
6 whether significant power uprates would be covered by
7 the evaluation that was done by the expert elicitation
8 panel, so if we're going to be allowing significant
9 power uprates based on the preliminary curves we got,
10 it raises some questions on the validity of the
11 application. So that's something that would need to
12 be looked at before that was allowed.
13 MR. TREGONING: That's exactly correct.
14 And that's why specifically I wanted to raise that
15 caveat because that's a very obvious application that
16 we need to be careful as we go forward with.
17 I just have a couple of summary slides
18 here, and I've tried to boil down what I've presented
19 a couple of weeks ago. And I've two slides which show
20 qualitative insights that we got from the experts.
21 This isn't comprehensive by any sense, and it's not
22 even necessarily a consensus among the panel, but it
23 is sort of many of the common themes that came out of
24 this exercise, so I just wanted to summarize these
25 quickly. We've gone over these much more in-depth at

1 the Subcommittee meeting.

2 With BWR and PWR plants, we -- a number of

3 different aging mechanisms were identified, and I've

4 listed here some of the ones that the experts thought

5 were most important. For BWRs, they thought thermal

6 fatigue, ICSCC, mechanical fatigue, FAC were some of

7 the major drivers. With BWRs a lot of the experts

8 indicated that they do see increased operating

9 transients compared to the Ps, i.e., greater

10 likelihood of water hammer, and that's going to effect

11 the frequencies that you would develop for Bs versus

12 Ps.

13 Some interesting comments from the

14 experts. A number of people had this, which I didn't

15 expect going in, but they really look at the BWR

16 community as being further up on the learning curve

17 with dealing with aging mechanisms, and developing

18 mitigative measures to effectively combat them based

19 on the IGSCC experience that the BWRs lived through in

20 the 70s and early 80s.

21 MEMBER SIEBER: That's a nice way to state

22 that.

23 MR. TREGONING: Well, you know, you always

24 evaluate your experiences and try to grow from them,

25 both personally and professionally, so I think you

1 have to look --

2 MEMBER SIEBER: I'm sure they have the

3 greatest amount of growth.

4 MR. TREGONING: They've had growth

5 certainly, because of that. The cautionary note is

6 that when you look at service experience for BWRs, you

7 have to be very careful because it's colored by a

8 large extent to some of this pre-mitigative experience

9 in IGSCC, so that was a challenge with the experts.

10 We provided them operating experience data back to

11 essentially the beginning of reactor time, you know,

12 in the early 70s and 80s. I'll say the beginning of

13 large scale commercial reactor time. So that was one

14 of the things that they really had to do to make sure

15 that they -- as they evaluated that data they

16 accounted for the mitigative measures that have been

17 put in place.

18 For PWR plants they really identified a

19 lot of the same mechanisms, although certainly one was

20 predominant, which is one that we started seeing

21 greater frequency within the operating experience

22 database recently, and that's primary water stress

23 corrosion cracking. So this was one that probably

24 dominated for most experts the answers that they gave

25 us for PWR plants. But thermal fatigue and mechanical

1 fatigue are important, as well.

2 We looked at both piping and non-piping

3 passive system failures, so I just wanted to put a

4 couple of insights that we got for each of those

5 categories. And I don't know that there's -- there's

6 no great revelations here, but I think they're worth

7 stating, nonetheless.

8 With piping, with a bigger LOCA you can

9 get -- or I'll say an intermediate LOCA, so something

10 let's say an effective six inch break. You can get an

11 effective six inch break by a complete break of a six

12 inch pipe, or you can get it due to a partial failure

13 of a much bigger, say a 30 inch pipe. So when you

14 looked at these different LOCA categories, each expert

15 had to make an assumption - well do I think the

16 complete failure of the smaller pipe is more likely,

17 or the partial failure of the bigger pipe?

18 Typically without fail, the experts tended

19 to consider that the complete failures of the smaller

20 piping was generally more likely than the partial

21 failures of the larger piping, so this is a general

22 truism that many of the experts expressed.

23 Interestingly, a lot of the experts felt

24 both qualitatively and quantitatively that aging may

25 have the greatest effect on intermediate size piping,

1 and by intermediate size, I'm talking about breaks in
2 6 to 14 inch pipes, and 14 inch up to maybe the surge
3 line for PWRs.
4 Why is that? That seems kind of odd at
5 first. Well, the rationale is that the smallest
6 piping we have a lot of experience with, not all of it
7 good, but we've had failures in small piping. And we
8 sort of have a good understanding of what the small
9 pipe failure rate. And many experts expected that
10 that would be relatively constant as we move forward
11 into the future.
12 Consequently, larger piping up to the
13 reactor coolant, the primary lube piping, that we have
14 the biggest margin on for two reasons. One, we tend
15 to have higher quality inspections of that piping.
16 And secondly, the bigger the piping is, and the
17 thicker it is, the more leak before break margin we
18 have in that piping. So when you looked at the
19 results, what you saw was if aging had an effect with
20 given experts, it tended to occur in these 6 to 14
21 inch pipe break ranges.
22 MEMBER ROSEN: Before you go on, would you
23 say that there's an operating experience database to
24 support that first bullet, that complete failures of
25 small piping are more likely than partial failures of

1 large piping?

2 MR. TREGONING: If you take it to the

3 extreme, yes. I mean, we have seen complete failures

4 of like one inch, maybe even up to two inch pipes.

5 Certainly if you include steam generators, we've seen

6 a lot of complete failures of steam generator tubes.

7 MEMBER ROSEN: Well, if you left the steam

8 generator tubes out --

9 MR. TREGONING: Even leaving them out of

10 it, we have a lot of small pipes that are socket

11 welded that we've seen complete failures of.

12 MEMBER ROSEN: The ones I think about all

13 the time are things like, well, like the Surry

14 failure, you know, big fish mouth and partial failure

15 of a large pipe. Not a double-ended guillotine, a

16 very astounding failure, but it wasn't --

17 MR. TREGONING: Pretty close, yes.

18 MEMBER ROSEN: It wasn't double-ended but,

19 you know, I'm talking about the Summer case which was

20 more of a leak.

21 MR. TREGONING: Right. And again, with

22 small pipes you tend to have, especially the socket

23 weld pipes you get into issues with small pipe where

24 they mainly have one or two weld passes. And again

25 you have increased -- you have a problem with one of

1 the weld passes, and then all of a sudden you've got
2 a crack in that pipe that may go completely around an
3 essentially 50 percent through-wall, so I think
4 there's a lot of operating experience, when you go to
5 the very small pipe, the one and two inch pipe that
6 does tend to support that assertion.
7 MEMBER FORD: Well, I'm having as I had
8 the other day, great problems with these qualitative
9 statements. They're undoubtedly true, but they are
10 based on a very, very scattered database. There's a
11 great deal of uncertainty, quantitative uncertainty,
12 so how do you come up with quantitative conclusions
13 from these observations? Are they supplemented by
14 some sort of modeling or what? Real modeling, not
15 field modeling.
16 MEMBER ROSEN: Not opinions.
17 MR. TREGONING: Again, as we developed
18 this basis, as we developed what we call the base
19 cases, those were actually physical models.
20 MEMBER FORD: Well, could you give me an
21 example of a physical model?
22 MR. TREGONING: Yes. Probabalistic
23 fracture-base models trying to model the evolution of
24 let's say IGSCC within --
25 MEMBER FORD: Is this the PRAISE code?

1 MR. TREGONING: We used PRAISE, and we
2 also use the PRODIGAL code, yes. So you have --
3 certainly, you have limitations that are inherent in
4 whatever code you're using, and that was certainly
5 something that each expert had to consider. But we
6 didn't model every piping system, but we picked four
7 different piping systems that we tried to model, and
8 four or five different degradation mechanisms that we
9 tried to model, and that we also tried to model in
10 other ways using service history data as the basis.
11 Service history data was the basis for all
12 of these but we tried to predict LOCA size based on
13 essentially statistical methods, as well. Markovian
14 methods and sort of dosimetry analysis, so we had four
15 different experts that looked at that precursor data
16 and tried to, for those specific systems, make
17 assessments as to the LOCA frequency. And as I've
18 shown earlier, we got a quite wide variety of
19 responses.
20 MEMBER FORD: You pointed out the BWRs I
21 think correctly are more experienced at resolving some
22 of these problems, understanding them for various
23 reasons. And yet if you based your modeling solely on
24 historical behavior for BWR pipes for instance, as you
25 mentioned here, I fail to see how you could come to

1 any conclusion based on historical piping failures.

2 MR. TREGONING: It depends on how you

3 define historical. And again, that was the challenge

4 with Bs, because we had to look at both pre and post

5 mitigative service experience. And we really based it

6 on -- redeveloped our idealized model of the IGSCC

7 type of failure. We had -- even though we considered

8 normal water chemistry, we applied a weld overlay. We

9 applied one mitigative measure. We asked the experts,

10 and we said okay, many plants have more than one

11 mitigative measure, so how would that affect the

12 failure rates in those particular plants.

13 MEMBER FORD: And there's a database so

14 that they could say there's a factor of improvement of

15 Yay.

16 MR. TREGONING: Yeah, we gave them data

17 that looked at it. And we parsed it in many ways. We

18 just did it on a calendar year, so that's sort of pre-

19 19 versus post 1983. These were the failure

20 frequencies - I don't want to say failure frequencies,

21 but this was the rate of precursors versus --

22 MEMBER FORD: A group of experts had the

23 same database and they made a conclusion based on that

24 database.

25 MR. TREGONING: Yes. And we actually had

1 several databases. We had two primary databases that
2 we used, and why is that? Well, every database is
3 slightly different. And we wanted to give the experts
4 a sampling of some of the databases that were out
5 there. I will say though that even though we gave
6 them two primary databases, the general conclusions of
7 the databases were similar, even though one was much
8 more comprehensive than the other one.
9 With non-piping, as I'm trying to move
10 along here, the - so I said allegedly it's going to be
11 compressed. Non-piping, again estimation of non-
12 piping failures is more challenging than piping. Why
13 is that? Well, there's a number of very good reasons.
14 One, we had widely varying operating requirements,
15 design margins, materials and inspectability, i.e.,
16 you're looking at component failure and then also bolt
17 failure, as we talked about with Dr. Wallis. So you
18 have widely varying failure modes and scales. And
19 with non-piping, you don't tend to have the same
20 wealth of precursor information that you do with
21 piping, just because it hasn't received historically
22 as much study as the piping arena has.
23 However, the large non-piping components,
24 and for the Ps we're talking the pressurizer valve
25 bodies, pump bodies, they tend to have a bigger design

1 margin compared to piping, but they tend to have
2 decreased inspection quality and quantity. They tend
3 to be large all static cast stainless steel components
4 which as most people know are just generally a bear to
5 inspect, and sometimes they're not even inspected at
6 all, or very infrequently. So you have these sort of
7 competing things. You have a bigger design margin,
8 but then you also have reduced inspection quality.
9 And then with the smaller non-piping
10 components, the steam generator tubes, the CRDM
11 nozzles, things like that, I think in general the
12 experts expected these components to benefit most from
13 improved inspection methods and mitigation programs.
14 So these are the frequencies that we got,
15 and this is sort of a simplified plot of the
16 frequency. It doesn't show any of the panel
17 variability. These only show -- these are essentially
18 a consolidation of the mean predictions from the
19 experts, and what this shows are the mean, and then
20 the 95th percentile.
21 We asked each expert essentially what they
22 thought their best guess was for these LOCA
23 frequencies, and then we asked them to bound it above
24 and below. We essentially said give us a guess that
25 you think there's a 5 percent likelihood that the

1 frequencies will be above the value that you give us,
2 and then a 5 percent likelihood that the frequencies
3 would be below that, so we tried to capture their
4 uncertainty in that way.
5 MEMBER APOSTOLAKIS: Let me understand
6 this. If I take say one of these dots, the first one
7 on the left, the blue one. Okay. The top one says
8 BWR 95th. Right?
9 MR. TREGONING: Yes. That's the 95th
10 percentile.
11 MEMBER APOSTOLAKIS: And the other one is
12 --
13 MR. TREGONING: Is the mean.
14 MEMBER APOSTOLAKIS: Whose percentile?
15 You say the communities of experts that you elicited
16 opinions from, or --
17 MR. TREGONING: This is the community.
18 These are boiled down to community -- we asked each
19 individual expert --
20 MEMBER APOSTOLAKIS: I understand that.
21 MR. TREGONING: -- for their individual
22 estimates, but these are boiled down estimates. These
23 are the mean and the --
24 MEMBER APOSTOLAKIS: And they processed
25 somehow the individual --

1 MR. TREGONING: Yes. Yes.

2 MEMBER APOSTOLAKIS: This is very

3 interesting.

4 MR. TREGONING: This particular -- we did

5 this a number of different ways so I want to be

6 careful. I believe this particular result is the

7 median of all the community means that we got. I

8 believe that to be the case. It may have been we

9 looked at the median, we looked at taking the

10 geometric mean and the trend geometric mean. There's

11 essentially no difference, so I believe this one is

12 the median, but --

13 MEMBER APOSTOLAKIS: But you didn't try to

14 get the experts to reach consensus?

15 MR. TREGONING: No, we did not.

16 MEMBER APOSTOLAKIS: So if I look at the

17 95th now, there were some experts that actually gave

18 you a higher estimate.

19 MR. TREGONING: Of course. What I'm not

20 showing --

21 MEMBER APOSTOLAKIS: And all experts are

22 treated as having equal credibility.

23 MR. TREGONING: All experts are treated as

24 equal credibility, except what we're recommending is

25 that we use -- when we estimate these community

1 distributions that we use the term geometric mean,
2 which would essentially mean we'd be throwing out the
3 highest and the lowest. That would be, I think, Lee's
4 and my recommendation, so that would down weight --
5 MEMBER APOSTOLAKIS: If you use a
6 geometric mean you are throwing away?
7 MR. TREGONING: A trend mean.
8 MR. ABRAMSON: It's Olympic-type scoring
9 where you throw away the high and the low scores.
10 That's the analogy.
11 MR. SNODDERLY: George, here's a plot that
12 we can show you from the Subcommittee meeting that I
13 think really showed the results for each individual
14 expert, and then how they were combined to make this
15 plot.
16 MEMBER APOSTOLAKIS: I'm going to need
17 much more than that, Mike, given what plans Dr. Powers
18 has for me. I'm going to need to understand this much
19 better. Right?
20 MR. TREGONING: Right. But you're
21 correct, there certainly is variability associated
22 with each of these dots. And I haven't shown the
23 confidence bounds associated with these dots. Just
24 really only in the interest of time, and no other --
25 MEMBER APOSTOLAKIS: Isn't it remarkable

1 though that you have experts -- I mean, is this plot
2 sending the message that for this particular break
3 diameter on the left which is, I guess, one-eighth of
4 an inch or something - the community of experts - oh,
5 but this is -- you have lots of data for this problem.
6 Right?
7 MR. TREGONING: Yes.
8 MEMBER APOSTOLAKIS: So as you move to the
9 right, you would expect to see --
10 MEMBER SHACK: Steam generator tubes you
11 have a database.
12 MR. TREGONING: Right.
13 MEMBER APOSTOLAKIS: I mean, look --
14 MR. TREGONING: And with PWRs, that's what
15 dominates there at the smallest break sizes.
16 MEMBER APOSTOLAKIS: Yeah, but even if I
17 go to what, more than 10 inches, the uncertainty is
18 not that great.
19 MR. TREGONING: But again, what this
20 doesn't capture is the panel variability. That's
21 what's not captured here through -- and that's
22 captured through confidence bounds about either of
23 these plots. What you see is the confidence bounds
24 increased associated with any of these one data --
25 MEMBER APOSTOLAKIS: You have a confidence

1 bound on the 95th percentile?

2 MR. TREGONING: Yes, and also the mean.

3 MEMBER APOSTOLAKIS: Okay.

4 MR. ABRAMSON: What we got, as Rob said,

5 is from -- the basic analysis was we took the results

6 from every expert and we just propagated it through

7 and got an answer, actually a median 95th percentile

8 for each expert. And for BWRs, we had eight experts

9 that we had enough information to get a total

10 frequency, for PWRs we had nine. And then we took

11 each of those data sets, and this is supposed data

12 sets.

13 MEMBER APOSTOLAKIS: Right. But these

14 results like this presumably would be used as input to

15 what we heard earlier about PRA, you know, the Phase

16 VI PRA. If you have 5th and 95th, and then a

17 confidence interval of 5th, a mean and 95th, that is

18 not consistent with the inputs of a standard PRA. A

19 standard PRA would require a distribution of the

20 frequency that you have there. So now you are giving

21 me additional stuff which is confidence interval on

22 the 95th percentile, and the PRA analysts will not

23 know what to do with it.

24 MR. ABRAMSON: Well, the reason that this

25 differs from a usual PRA is because we had a panel of

1 experts here. Presumably one panel -- the usual PRA
2 is based on one expert or one expert group. It's one
3 answer that you get, including uncertainty. The point
4 of departure here, of course, is that we use this
5 expert elicitation based on a panel of experts. We
6 did not try to get a consensus. We thought it was
7 very important to let our analysis reflect the
8 diversity of opinion, the variability among the panel
9 members, and that's what we show.
10 How this is going to be used for
11 regulatory purposes is something that we're working
12 on, how you would use this diversity and variability
13 among the panel members.
14 MEMBER KRESS: Would it be appropriate to
15 assume that distribution is normal, and therefore you
16 have all the information you need right there?
17 MR. ABRAMSON: Yes.
18 MEMBER APOSTOLAKIS: No. You see, that's
19 --
20 MEMBER KRESS: If it's all normal, you
21 have it all right there.
22 MEMBER APOSTOLAKIS: No, but that's what
23 he's saying, that take any dot, there is a confidence
24 interval.
25 MR. ABRAMSON: That's right.

1 MEMBER APOSTOLAKIS: That's what I'm
2 saying, that the PRA analysts will not know what to do
3 with it.
4 MEMBER ROSEN: We don't give it to them.
5 MEMBER KRESS: We don't have that level.
6 MEMBER APOSTOLAKIS: What will you give?
7 MR. ABRAMSON: It's not the PRA analyst.
8 It's the decision maker ultimately that's going to
9 have to use this. The Commission, obviously, the
10 Committee is going to have to use this in making the
11 decisions.
12 MEMBER SHACK: We're going to have to wrap
13 up in about five minutes.
14 MEMBER APOSTOLAKIS: Four. All this is
15 documented some place, isn't it?
16 MR. ABRAMSON: Oh, yes.
17 MEMBER APOSTOLAKIS: Good.
18 MR. TREGONING: I'm going to skip the next
19 slide, and just move onto the summary. Again, just to
20 quickly summarize, we used a formal elicitation
21 process to estimate generic P and BWR frequencies,
22 function of flow rate and operating time, considering
23 both piping and non-piping contributions. We
24 developed quantitative estimates for these base cases
25 that Dr. Ford and I discussed a little --

1 MEMBER APOSTOLAKIS: Oh. I'm sorry. I
2 got excited by the summary. That's very nice.
3 MR. TREGONING: Developed quantitative
4 estimates for piping and non-piping, these base cases,
5 which were these idealized set of conditions where we
6 tried to analyze certain systems and certain
7 degradation mechanisms using a variety of approaches.
8 Panelists gave us quantitative estimates supported by
9 qualitative rationale. They first had to determine
10 important contributing factors, i.e., what important
11 piping and non-piping systems were important for
12 failure, what degradation mechanisms were important in
13 terms of governing specific LOCA frequencies for each
14 given break size. And then they provided
15 relationships between these important contributing
16 factors and the base cases.
17 The base cases were the only set of
18 quantitative frequency numbers that we initially
19 derived as part of this exercise, so each expert gave
20 us qualitative or I'll say ratios between those
21 factors and the base case frequencies.
22 On the results we had relatively good
23 agreement among the experts about what factors are
24 important, and which ones contribute to LOCAs in
25 piping and non-piping system. We did have large

1 uncertainty and variability in actually quantifying
2 those frequencies associated with the contributing
3 factors, but we certainly expected this going on.
4 There's a wide variety of approaches and
5 opinions on how you take precursor data and assess the
6 likelihood of LOCAs given that precursor data. So
7 this was not unexpected, and this was one reason why
8 we didn't want to get consensus, because we didn't
9 want to suppress this uncertainty and variability in
10 any way.
11 And the slide I didn't show is that the
12 smaller break sizes were generally within the range of
13 the NUREG/CR-57.50 estimates, and those were the last
14 estimates that we did with LOCA frequencies. This is
15 serendipitous because --
16 MEMBER APOSTOLAKIS: Tell me again what
17 57.50 was.
18 MR. TREGONING: That was a large study
19 that was done in INEL which --
20 MEMBER APOSTOLAKIS: Oh.
21 MR. TREGONING: The initiative event
22 frequency study.
23 MEMBER ROSEN: What year was that?
24 MR. TREGONING: '97 was when they did the
25 pipe aspect of it. That was data up through '97.

1 MEMBER ROSEN: So they're looking at data
2 up to '97.
3 MR. TREGONING: Right. But we used --
4 MEMBER APOSTOLAKIS: That's when we made
5 the news that some of the initiating event frequencies
6 were four times -- because they were using the PRAs,
7 were four times greater than what the data would
8 support. This is an important NUREG.
9 MR. TREGONING: And we used a totally
10 different approach than what they used, the 57.50. So
11 the fact that many of these estimates were somewhat
12 comparable was a bit of a surprise. Again, when we
13 tended to see -- we did see some elevation in the
14 57.50 estimates around the medium break LOCA regime,
15 and that's consistent with the qualitative rationale
16 that the experts felt that aging would affect. Again,
17 the 6 to 14 inch pipes.
18 MEMBER APOSTOLAKIS: The surprise was
19 what, that your estimates were close to 57.50.
20 MR. TREGONING: That was a surprise, yes.
21 MEMBER APOSTOLAKIS: Because you expected
22 your estimates not to be close. 57.50 is databased,
23 isn't it?
24 MR. TREGONING: Well, again, there's no --
25 they had to extrapolate precursor data, as well.

1 MEMBER APOSTOLAKIS: I'm sure.

2 MR. TREGONING: So they used a totally

3 different methodology that was essentially one expert

4 instead of a team of experts.

5 MEMBER APOSTOLAKIS: Did you make sure

6 that your experts were not influenced by 57.50?

7 MR. TREGONING: I don't want to say not

8 influenced. We told them what was done in 57.50

9 because we wanted them to have an understanding of

10 that.

11 MEMBER APOSTOLAKIS: Somebody gave them a

12 copy in the middle of the night.

13 MR. TREGONING: They all had copies of --

14 MEMBER APOSTOLAKIS: But then why are we

15 surprised that the results are not that different?

16 MR. TREGONING: That wasn't the basis --

17 the 57.50 numbers was not the basis of this exercise.

18 It was the data -- and we had a much -- the 57.50

19 looked at a database of leak events, which is

20 incredibly small. We looked at this database of

21 entire precursor events, part through-wall cracks,

22 full leaks, and even pinhole leak sort of things, so

23 57.50 was really looking at data that just looked at

24 bigger leaks, essentially. We did have one of the

25 57.50 authors on the expert panel, so he was likely

1 biased by --

2 MEMBER ROSEN: By his prior work.

3 MR. TREGONING: Right. But that was one

4 --

5 MEMBER APOSTOLAKIS: We have to be very

6 careful with our words here.

7 MR. TREGONING: Right. So that was one of

8 the team of 12 was 57.50 people, but we thought it was

9 important to provide perspective as what was done in

10 the past, because we're just revisiting and trying to

11 update that study.

12 MEMBER APOSTOLAKIS: The reason why I'm

13 saying is because in the early days of PRAs, this

14 doesn't count against the five minutes, in the early

15 days of PRAs, all sorts of people, consultants were

16 coming from different directions. We have our own

17 database. Everybody was copying Wash 1400. You know,

18 instead of 5, 10 to the minus 3, they would make it

19 5 and a half. I have my own --

20 VICE CHAIRMAN WALLIS: George, are we out

21 of the early days of PRA yet?

22 MEMBER SHACK: I think we're going to hear

23 from NEI.

24 MEMBER APOSTOLAKIS: Okay. Great.

25 MEMBER ROSEN: In other words, this is

1 entry.

2 MR. SNODDERLY: While NEI is coming up to

3 the table, right now I think we need to consider how

4 we want to review the final wrapping up of Rob's work,

5 which is going to be in the form of a NUREG. What

6 we've tentatively done is we scheduled a Subcommittee

7 meeting for June 24th. Rob would have a draft of the

8 NUREg ready by the end of May. That would give the

9 Committee about three weeks to look at that, and then

10 we could write a letter on the final NUREG at the July

11 meeting.

12 MEMBER ROSEN: Which subcommittee?

13 MR. SNODDERLY: It's been under Dr.

14 Shack's Regulatory Policies and Practices, and

15 everyone is invited.

16 MEMBER ROSEN: Everybody is invited to

17 submit themselves to Dr. Shack's tender ministrations.

18 MR. SNODDERLY: June 24th. We'll discuss

19 it at the PM -- I just wanted you to consider that's

20 the approach that -- so we've got to think about how

21 we're going to wrap this up.

22 MEMBER APOSTOLAKIS: Are you going to

23 change it?

24 MEMBER SHACK: We may.

25 MEMBER APOSTOLAKIS: In May, or you may?

1 MEMBER SHACK: We may change it.

2 MEMBER APOSTOLAKIS: Okay.

3 MEMBER SHACK: The problem is the Thermal

4 Hydraulics Committee would value the whole week.

5 MEMBER APOSTOLAKIS: Only that week? Is

6 it 15 minutes time, this time?

7 MR. PIETRANGELO: I know I'm between

8 lunch, and I know I'm hungry, so I'm going to make

9 this as brief as possible.

10 Okay. First of all, before I start this

11 I want to say I have tremendous respect for the staff

12 that worked on the SECY, the working group that's been

13 working on this. I even like some of them personally

14 as human beings. Okay? But the staff requirements

15 memorandum from the Commission that they've been

16 working to had a lot in it, and was subject to some

17 interpretation.

18 Nevertheless, I would be less than candid

19 if I said anything that we were extremely disappointed

20 by what was in this SECY, and what went up to the

21 Commission on this. I think it was noted earlier, we

22 had two meetings, one last June, one last July. We

23 sent the staff a white paper in September. There has

24 been no dialogue since that time. I didn't hear

25 anything this morning, and the issues that were teed

1 up that were different from what we heard seven months
2 ago. Okay? And that isn't even in a way just
3 reopening some of the stuff that went into the 1174
4 decision making process.
5 It took them seven months to get another
6 SECY up to the Commission to ask for direction less
7 than one month from when the proposed rule was due, so
8 when you have a lack of engagement like this, and you
9 circle the wagons, and I don't know what the reasons
10 for it internally at the NRC. When you stop dialogue,
11 I think it's very destructive. We have people in the
12 industry who are interested doing things on this, that
13 are funding activities, and for the staff to just
14 close -- you know, we call it the cone of silence in
15 the industry. We never like when it's raised. And in
16 this case, I thought we had productive dialogue early
17 on but it's been stymied.
18 When we read the SECY, I'll be very honest
19 with you. It was, to us, a lot of hand wringing about
20 what licensees might do if we actually had an
21 alternative break size in the regulation, and how do
22 we know what the effects are going to be, and what if
23 they do this, and what if they do that? Like we heard
24 this morning, we're already doing research on what a
25 power uprate might mean if we had an alternative break

1 size.

2 I mean, we know there's going to be a lot

3 -- there's no delusions about the technical work

4 that's going to be necessary to do this. I think

5 research has done an excellent job thus far. It's

6 taken a long time. Okay? But we've got a good

7 foundation to start with, and their efforts should be

8 focused on getting a firm technical basis for an

9 alternate break size for both a B and a P. Doing

10 anything beyond that at this point I think is wasting

11 their resources. Okay.

12 There's been no successful regulatory or

13 form initiative that hasn't been preceded by some form

14 of industry pilot or exemption-type request. And this

15 effort is sorely in need of one. To be honest, I have

16 no interest whatsoever in discussing some of those

17 issues that were raised by the staff this morning in

18 this abstract context.

19 This Committee has been discussing

20 defense-in-depth since it has been formed. Okay. I

21 mean, to what end is that going to take us? So we

22 need specifics, we need a pilot here.

23 We're in total agreement with the staff

24 recommendation on the LOOP/LOCA BWR pilot. You're

25 going to get a submittal on that soon. It will have

1 some good things for Ps in it too that are relevant.
2 But on the P side, what I think we're pushing at this
3 point is to bring a risk-informed approach to GSI 191,
4 the PWR sump issue. That's an issue of the day.
5 We think there's a net safety benefit in
6 using a risk-informed approach on GSI 191. That was
7 the other thing that bothered us about this SECY.
8 There was no mention of any safety benefits or
9 potential safety benefits in that entire SECY. It was
10 all about inadvertent consequences, and all of this
11 other stuff. And that's not what the intent of this
12 effort is. And I think they just made it a lot more
13 complicated than it has to be in terms of what we're
14 trying to do.
15 Most of it's margin. It's operating
16 margin for licensees. The double-ended guillotine
17 break is used for things like valve opening times, and
18 flows, and things like that. That's where most of the
19 changes are going to come in. Do I have to overhaul
20 a pump that's 5 gpm under its flow that was sized for
21 the double-ended guillotine break? I mean, that's
22 what we do now for tech specs. That's the kind of
23 thing we're trying to get rid of.
24 There was a laundry list of --
25 VICE CHAIRMAN WALLIS: All things like that

1 it's not large power uprates?

2 MR. PIETRANGELO: They were given a

3 laundry list of things that might occur, and they took

4 the most extreme ones in this thing. And they're even

5 doing research on those now. I mean, there may be

6 very legitimate reasons to not go forward with a power

7 uprate. I think you already touched on them this

8 morning. We didn't get to the application phase on

9 this. It's too early. Okay.

10 We would have been better off with a very

11 focused pilot, so that's what we're going to propose

12 now. We have proposed it in GSI-191 space. I hope

13 that all the staff that was working on this will help

14 us in that effort, because we're going to need help in

15 that effort, because we're under a very time

16 constrained effort on this.

17 We will not be reducing ECCS capability

18 when we risk-inform G-191. We will be changing it to

19 be more risk-informed and response. It's not reducing

20 ECCS capability. If we can make some changes that

21 stem from an alternative break size, you can have a

22 net safety benefit. You could even get small breaks

23 which are the higher frequency ones that drive the

24 risk of the sump issue out of scope for this issue

25 because you'd never get to recirculation using the

1 sump, so I think there's tremendous potential there.
2 And unless we get something accomplished that shows
3 that there's a net safety benefit, then I don't see
4 any future for this effort.
5 I mean, the Chairman has been pretty clear
6 about that's why he's pushing this effort in all his
7 talks on this, and I think that's what the
8 Commission's expectation is. And to get a SECY back
9 like that that had no mention of it, and that only
10 spoke to the abstract discussion and all these -- how
11 we have to do mitigation capability for beyond design
12 basis events. We raised that issue eight months ago.
13 We know we have to do that.
14 I mean, that's one of the things research
15 could work on now, is what's appropriate acceptance
16 criteria for those beyond design basis things. That
17 would be at least a tangible thing we could use in
18 this. But as was mentioned, for the BWRs they're
19 probably going to use the existing acceptance criteria
20 that's in 50.46.
21 For the GSI-191 we'll probably use net
22 positive suction out at the stream. It's a lot more
23 work to go develop these alternative acceptance
24 criteria, and we understand that. And it probably
25 does warrant a research effort, so it depends on the

1 application and what you want to get out of it at the
2 end as to what acceptance criteria you can settle for.
3 If you need something that's less conservative, then
4 you have to do more work to go get it.
5 Again, using more realistic methodology,
6 we all knew we were going to do that for beyond design
7 basis things. And GSI-191, maybe it's credit for
8 containment back pressure, credit for non-safety
9 related equipment, and less conservative assumptions
10 that are used in our baseline methodology under
11 regeneration and transport, and all that other stuff.
12 So, I mean, this is not brain surgery to figure out
13 more realistic methodology. But just to throw all
14 those issues up, and they go back to the Commission
15 and say - and there's three of them up there, and they
16 have limited staff, all these technical and policy
17 issues. I think the Commission has not been well-
18 served on this issue.
19 I have no idea what they're going to do
20 with that SECY, but again, we're just disappointed
21 that it got to this point, and that the dialogue was
22 stopped on this. So we're going to focus on pilots
23 that can help demonstrate how these things would be
24 done, because to try to discuss these in the abstract,
25 at least from our perspective, leads nowhere.

1 VICE CHAIRMAN WALLIS: Now, Tony, I'm
2 puzzled because I thought when we had a discussion
3 with you folks some time ago that you guys were going
4 to make the case for changes in 50.46 rule. And now
5 it seems to be that you're annoyed because the staff
6 hasn't done it for you.
7 MR. PIETRANGELO: No, that's not it at
8 all. Okay. We knew the research work was ongoing.
9 That is going to be the basis for the alternative
10 breaks. Ultimately, we're going to have to
11 demonstrate the applicability to our plants of that,
12 whatever number is come up with, and how you would
13 control change using that. Okay.
14 Again, as I think was said before, just
15 the placement of an alternative break size in the
16 regulation or in the licensing basis of a plant
17 changes nothing. It's what goes forward from that.
18 You know, trying to discern in advance all the
19 potential effects of all the changes that could stem
20 from an alternative break size is a useless exercise.
21 We don't have enough resources, time or money to do
22 that.
23 MEMBER ROSEN: I think I understand your
24 point, and I think I feel some of your pain. Now tell
25 me what it is you're going to do on this pilot that

1 will help. What is the pilot going to be?

2 MR. PIETRANGELO: I think at least on the

3 BWR pilot, there are some defined changes in that

4 topical report that stem from decoupling LOCA from

5 LOOP. Okay. So that's very well defined. You can

6 draw a nice box around it.

7 The same thing can be said for GSI-191.

8 I'm not going to try to change the universe with an

9 alternative break size. I'm going to use it for

10 debris generation purposes, and I also may use it on

11 containment spray operation set points.

12 MEMBER ROSEN: So you're going to get a

13 plant, a PWR, obviously, for the sump issue.

14 MR. PIETRANGELO: Right.

15 MEMBER ROSEN: To actually do some

16 calculations and vary the break size --

17 CHAIRMAN BONACA:: To show how it would be

18 done.

19 MEMBER ROSEN: To show how it's going to

20 be done, rather than rely on the NEI document?

21 MR. PIETRANGELO: We have to go forward.

22 We had an effort ongoing on GSI-191 for quite some

23 time, a baseline evaluation methodology. What we have

24 right now is a deterministic approach and a risk-

25 informed approach. The deterministic approach is what

1 you think it is. Okay.

2 The risk-informed approach would be an

3 alternative break size along with a beyond design

4 basis, how do you mitigate the double-ended guillotine

5 break, as we've been talking about, and for any kind

6 of Option 3 activities.

7 MEMBER KRESS: Tony, there are a lot of

8 possible changes that could be --

9 MR. PIETRANGELO: There are.

10 MEMBER KRESS: And I agree with you, it's

11 not very progressive to try to figure out what all of

12 those are, and to try to figure out their implications

13 with respect to risk. It seems to me like the way to

14 handle those is change them one at a time on a plant-

15 specific basis, and using something like Reg. Guide

16 1.174, and some defense-in-depth considerations. And

17 that would automatically allow the thing to be

18 controlled and looked at.

19 MR. PIETRANGELO: That's precisely what we

20 proposed last September, was an approach based on Reg.

21 Guide 1.174.

22 MEMBER KRESS: Do you think the existing

23 plant-specific PRAs are doing that for that type of --

24 MR. PIETRANGELO: It depends on the

25 application.

1 MEMBER KRESS: But it seems to me like to
2 handle those changes, plant by plant, each plant basis
3 is the way to handle this.
4 MR. PIETRANGELO: The way we envisioned it
5 going forward was that these specific applications
6 would be identified to use the alternative break size.
7 And then we would develop guidance on each of those
8 applications, just like we have the last 10 years.
9 And we get a lot of interaction with the staff, we get
10 a lot of input from the industry that says here's the
11 way to do that application. All right. And then
12 plants would go in -- there's always been the
13 understanding that even with a revised break size, it
14 was an amendment request that was going to be needed
15 to change it, so by getting the alternative break size
16 -- this was kind of the enabling rule we petitioned on
17 before.
18 By getting an alternative break size in
19 the regulation, you enabled people to go out and do
20 some things and then come in with amendment requests.
21 You can't do that unless you're doing exemption
22 requests if you don't have a change to the
23 regulations.
24 I know I vented a little bit here and took
25 more time than I wanted to, but --

1 CHAIRMAN BONACA:: No, that's valuable,
2 first of all, input to us. And second, examples would
3 limit this genuine concern about all that could happen
4 out there in the universe because of this. Okay. And
5 it will make it more tangible and more specific.
6 MEMBER SHACK: Back to you, Mr. Chairman.
7 CHAIRMAN BONACA:: Thank you very much,
8 appreciate it. And we want to get back in, let's see
9 now, at 1:30 or do you want the full hour? Full hour,
10 so quarter of 2.
11 (Whereupon, the proceedings in the above-
12 entitled matter went off the record at 12:44:32 p.m.
13 and went back on the record at 1:43:54 p.m.)
14 CHAIRMAN BONACA:: We're back in session.
15 MEMBER KRESS: You guys recall that with
16 respect to licensing advance reactors or with respect
17 to the technology neutral framework thing, the staff
18 came up with a number of what we thought were
19 excellent issues to the guidance, and they had options
20 for the Commission to consider with preferred options,
21 and we liked their issues, we liked their options, and
22 they set the thing up. As usual, the Commission
23 didn't agree with all of us, so they sent them back an
24 SRM basically asking them to look at two things.
25 One of them was what the heck do we do

1 about multi-module plants on a site with respect to
2 integrating the overall risk.
3 MEMBE POWERS: You told us several times
4 what to do on that. Did they listen to you?
5 MEMBER KRESS: They didn't listen, no.
6 But we've got another chance here. The other thing
7 has to do with non-light water reactor, where you have
8 to deal with the question of maybe you don't want --
9 maybe you don't have to have a real containment like
10 with leak-tight barium. Maybe you can have other
11 types of arrangements, so the question is containment
12 versus confinement is the way it's been capsulized,
13 but it's more detailed.
14 MEMBE POWERS: If you're in that spectrum
15 of containment to confinement, does the European
16 vented filtered containment?
17 MEMBER KRESS: That's a good interesting
18 question. That probably would be called real
19 containment.
20 MEMBE POWERS: That's a containment.
21 MEMBER KRESS: Yes, I would call it that.
22 But anyway, those are two issues that the staff was
23 asked to reconsider or think about, and they've done
24 that now. And they're going to tell us what their
25 early thinking is on these issues, and get our

1 feedback, I suppose. So with that, I'll turn it over
2 to you, John.
3 MR. FLACK: All right. Thank you, Tom.
4 My name is John Flack. I am the Branch Chief of the
5 Advanced Reactors at Regulatory Effectiveness Branch
6 in the Office of Research. To my left is Stu Rubin,
7 who is a senior level advisor in the branch. To my
8 right is Mary Drouin who is, I guess everybody knows,
9 from the probabalistic risk assessment branch.
10 MEMBE POWERS: Is she qualified to --
11 MEMBER ROSEN: Is that Mary Drouin that
12 was here this morning, or you have two of them?
13 MR. FLACK: No, same one.
14 MEMBER ROSEN: Or evil twin.
15 MEMBE POWERS: Hey, evil is not a word we
16 associate with Mary.
17 MR. FLACK: And to her right is Tom King,
18 a former director in Office of Research, who everyone
19 knows.
20 What I'll do is I'll briefly go over
21 what's in the SECY, some of the background that led up
22 to that and the issues, and the messages we're
23 sending.
24 Basically, first viewgraph, the objectives
25 of our meeting here with the ACRS is to discuss the

1 proposed response to the SRM we received from the
2 Commission last year. That SRM was in response to
3 seven policy issues that stemmed from our review of
4 Advanced Reactors, so we're here to discuss them, and
5 then obtain a letter that would approve where we're
6 headed. And in this context, integrate whatever
7 comments you have with respect to the SECY.
8 The next viewgraph briefly goes over
9 background.
10 MEMBER APOSTOLAKIS: When is your response
11 due?
12 MR. FLACK: It is due April 23rd, so we
13 have very little time on that.
14 Briefly going through the seven policy
15 issues that were raised previously that are listed
16 here on this viewgraph, the first two are basically
17 over-arching policy issues, the first being
18 expectations for safety, and generally the Commission
19 agreed with the staff's position on that; with the
20 exception of accounting for integrated risk and you'll
21 hear more about that today.
22 The second was defense-in-depth, and again
23 the Commission approved the Staff's approach.
24 However, they provided additional guidance, and
25 instead of basically coming up with a new policy, was

1 to revisit some of the policies that we already had,
2 specifically PRA policy statement and others, to see
3 if they can be revised to reflect what we mean by
4 defense-in-depth.
5 The third policy issue, use of
6 International Consensus Codes and Standards, was not
7 approved by the Commission. The staff was seeking to
8 be proactive in that area, to get out in front, to
9 seek to look at the international community for their
10 codes and standards and their application to plans
11 under review. However, the Commission guided the
12 staff in its guidance, guided the staff to review only
13 those there were applicable to a design under review,
14 and that we should enhance our own codes, and not seek
15 out International Codes to do that job.
16 On the fourth one, probabalistic licensing
17 basis, this was generally to revisit the Commission on
18 the fact that we're using PRA more today than when we
19 first proposed this as a policy issue back in the
20 early 90s, and they agree with the staff's position on
21 that on the greater use of PRA, and picking events and
22 identifying system structures and components that are
23 important to safety.
24 On the fifth one, scenario specific
25 licensing source term, that basically is consistent to

1 where we were headed from earlier Commission's
2 decisions on that, so we're consistent with using
3 mechanistic source terms in our licensing decisions.
4 Containment versus confinement, number 6,
5 is what you'll hear again today. The Commission did
6 not approve of the staff's position in SECY and wanted
7 to know a little bit more about it, wanted the staff
8 to go off and look at potential options for
9 containment performance requirements and so on, so
10 you'll hear about that today from Stu.
11 And finally the last one was the emergency
12 preparedness policy issue. And at the time, the staff
13 recommended we do not change anything there, and the
14 Commission agreed to that, no changes regarding
15 emergency preparedness, or no reductions in EPZ.
16 Okay. And then the bottom there, I just
17 summarize what has been approved and disapproved. And
18 it's issues 1 and 6, which you'll be hearing about
19 today.
20 On the next viewgraph we're just briefly
21 looking at how the SECY was structured. It's
22 structured around those issues, 1 and 6. And then
23 there are four attachments to the SECY. The first
24 attachment gives a summary and a basic status of the
25 framework. Mary is prepared to address some questions

1 on that, but basically, you'll be hearing a lot more
2 about that throughout the year. It's not to provide
3 anything new at this point, but only to say this is
4 where we are.
5 Attachment 2 discusses and summarizes the
6 basis for the recommendation that you'll hear on the
7 integrated risk issue. Attachment 3 is the
8 containment functional performance requirements and
9 discussions, a discussion of that issue. And
10 Attachment 4 summarizes the workshop we had, where we
11 entertained the public and other stakeholders on that
12 containment versus confinement issue. Again, the SECY
13 is scheduled to be sent up to the EDO next Friday,
14 which is April 23rd.
15 Okay. Specifically, with respect to the
16 two issues, and I'm not going to get too far into this
17 at this point because you'll hear a lot more about it,
18 but basically, on Issue 1, we were to provide options
19 for and impacts of requiring modular reactor designs
20 to consider integrated risk from the use of multiple
21 reactor modules, and that goes to the issue of putting
22 on many smaller reactors that were equivalent to one
23 larger one, and how to treat that probabalistically
24 from a --
25 MEMBER KRESS: Now when they say risk,

1 they mean both CDF and LERF.

2 MR. FLACK: That's right, front-end and

3 back-end, both pieces.

4 MEMBE POWERS: John, two years ago the

5 modular concepts were all the wild rage. I've heard

6 less people being -- not so much enthusiasm about

7 those in the last year and a half or so. Are they

8 still considered a viable concept?

9 MR. FLACK: Well, there are advantages and

10 disadvantages. I guess the plants seem to be getting

11 bigger for some reason that they're building. And the

12 advantage of building --

13 MEMBE POWERS: Yes. I know that the Finns

14 just purchased a new reactor, and it's 1600 megawatt

15 electrical. It doesn't look like it's moving -- it's

16 definitely a module. It's a heck of a module. I

17 believe it is. I think that's one of four they think

18 they're going to buy. I'm just asking you with your

19 pulse to the floor, do you see people pushing these

20 modules the way they were, say two years ago, or have

21 they just kind of fallen aside?

22 MR. KING: I think maybe Jerry Wilson

23 ought to talk about what the early site permit folks

24 are asking for.

25 MEMBE POWERS: Well, I know that the early

1 site permits have these -- I mean up to 21 modules in
2 one case. But there was two written like two years
3 ago and conceived of two years ago. I'm asking what's
4 the current - say the last six months. I just haven't
5 seen people pushing modules so hard.
6 MR. FLACK: Yes. No, I think you're
7 right. I think the only place we're seeing any action
8 at this point is over in South Africa with the pebble-
9 bed that they're proposing, but at this point in time
10 there's uncertainty there as to when, and what, and
11 how long, so I think at this point, you're correct in
12 your observation. We do not have a module in, or
13 someone that's interested in building a plant for that
14 matter in this country that size.
15 MEMBE POWERS: I mean, even in the Gen-
16 Four Program it seems to me that they have put any
17 modular concepts on the back burner in favor of the
18 more --
19 MEMBER KRESS: In any event, I think these
20 conceptual issues apply to just multi-plant size.
21 MEMBE POWERS: Yes, multi-unit sites.
22 It's a position that you've taken for as long as I've
23 been doing this as a matter of fact, which we won't go
24 into.
25 MR. FLACK: Well, the advantage there is,

1 of course, you could build a number of them as you
2 need them, and not just build one, and hold up all
3 your resources in building one plant all at once, so
4 I think that was the advantage that they promoted when
5 the concept came out, that you can add to the site as
6 needed.
7 MR. WILSON: This is Jerry Wilson of NRR,
8 if I could amplify a little bit on that. WE're
9 expecting two design certification applications next
10 year, advanced CANDU reactor and ESBWR. And at the
11 moment, both of them are optimizing their design to
12 come up a little higher power, so you could see that
13 as some indications that they're looking at higher
14 power. But at the same time, we've recently received
15 a letter from the pebble bed folks saying that they'd
16 like to initiate a pre-application review on the
17 pebble bed reactor next year with possible design
18 certification down the road. And as you also
19 observed, all three of the early site permit
20 applications included the option of possibly building
21 pebble bed reactors, so there's kind of votes on both
22 sides of that issue.
23 MEMBE POWERS: Yeah, the siting permits -
24 I mean, that's just prudence to include that in the
25 range of possibilities. I mean, they also leave open

1 the possibility of buying an EPR at 1600 megawatts a
2 pop.
3 MR. FLACK: Okay. So those are the --
4 well, that was the first issue, was again modular
5 issue. The second issue is the containment functional
6 performance requirements and criteria, and the options
7 and recommendations. So at this point, the SECY is
8 basically intended to summarize the efforts developed
9 for the risk-informed framework and defense-in-depth
10 description. And Mary can talk about that, and inform
11 the Commission of the relevance of the integrated risk
12 issue to the early site permits reviews, are also part
13 of the intent of the SECY.
14 Okay. Basically, the SECY recommends to
15 the Commission two things. It seeks approval of the
16 Staff's recommendation on the treatment of the
17 integrated risk for the modular reactors. And
18 secondly, it's seeking approval of the integration of
19 the options on the containment functional performance
20 requirements with policy recommendations on the frame
21 work. So those are the two basically messages that
22 the SECY is sending us at this particular time. Those
23 are sort of the bottom lines on that, and that's where
24 we're headed. So I'll turn it over now, if there's no
25 further questions, first to Mary, and then that will

1 be followed by Stu to address these two issues.

2 MS. DROUIN: I'm going to speak on the

3 first technical issue of integrated risk, which is

4 Attachment 2 of your SECY. And what we were asked to

5 look at is should the risk, and we looked at it from

6 a modular perspective, that when you look at the risk

7 concerning modules, should they be considered on a

8 unit, a per module basis, or should the risk be looked

9 across all the modules? And we're only at this point

10 with this issue is looking at it from the modular.

11 We're not looking at it from the site. It does have

12 implications for that, but the policy issue is very

13 specific to address the modules.

14 In coming up with the options that we have

15 --

16 MEMBER KRESS: When you're talking about

17 risk here now, are you talking about both CDF and

18 LERF?

19 MS. DROUIN: Yes. When we talk about the

20 risk, we're going to be talking -- I would say right

21 now we're going to use CDF and LERF as the examples.

22 MEMBER KRESS: As the examples.

23 MS. DROUIN: Because without knowing the

24 exact design we have, CDF and LERF might not be the

25 correct figures. But for illustrative purposes in the

1 options that we've looked at, we're going to use CDF
2 and LERF as our examples.
3 MEMBER KRESS: The proper definition for
4 those for gas cooled reactors.
5 MS. DROUIN: Correct.
6 MEMBE POWERS: Why is this an issue? If
7 I look at the safety goals, doesn't it answer that
8 question?
9 MS. DROUIN: If you keep the question up
10 at the safety goal level, but if you try to do it at
11 a surrogate level, CDF and LERF are not always the
12 correct surrogates.
13 MEMBE POWERS: I guess I'm puzzled. I
14 mean, don't the safety goals say that the risk in the
15 individual to nuclear activities will be no more, and
16 it specifies the limits? It doesn't say anything
17 about -- it's very clear, anything within the site
18 boundary counts in that risk.
19 MS. DROUIN: At one time, we've got to go
20 back a little bit historically. The safety goals were
21 applied across the industry as an average. When we
22 went into Reg. Guide 1.74, there was a
23 reinterpretation of the safety goal, and then it was
24 applied on a plant-specific basis.
25 MEMBE POWERS: I see now. It's because of

1 that -- George let you get away with things in 1.174.

2 MS. DROUIN: But you are correct. I mean,

3 if you go back 15 years ago --

4 MEMBER APOSTOLAKIS: I'm trying to be

5 quiet here.

6 MEMBER KRESS: And I've complained about

7 that interpretation in 1.74.

8 MEMBE POWERS: I know you did.

9 MEMBER KRESS: Umpteen dozen times.

10 MEMBE POWERS: And you got just as far as

11 George did on his defense-in-depth philosophy

12 statement. They didn't pay any more attention to you

13 than they did to him.

14 MS. DROUIN: Anyway, the options that we

15 have examined or evaluated and the one we finally

16 ultimately recommended are based on three factors;

17 based on risk guidelines looking at accident

18 prevention mitigation, using CDF and LERF as our

19 examples.

20 It's also looking at the number of

21 potential modules you have at the site, and then the

22 megawatt thermal size of each reactor. And we have

23 identified three specific options.

24 Okay. The first option, where there's

25 really not very much consideration of the integrated

1 or the cumulative risk. And what we're saying on this
2 one is that when you look at each module, we're
3 evaluating each module separately and independently
4 from each other. So, therefore, if you're using CDF
5 and LERF, for example, as your risk matrix -- you're
6 using CDF and LERF and you're using the 1E-4, and the
7 1E-5 respectively, then what we're saying is that each
8 one of these modules has to meet each of those
9 guidelines. So we're not looking at, for example, it
10 doesn't matter whether you have one module or ten
11 modules. It's not looking at the size of the reactor,
12 so whether you have one module that's 100 megawatts
13 thermal, and they're all 100 megawatts thermal, or you
14 have five that's 100 megawatts thermal and another 20
15 that's 600 megawatts thermal, it's not making any
16 difference.
17 MEMBER APOSTOLAKIS: Why would the power
18 level matter? I can see the issue of modules --
19 MEMBER KRESS: It's because the LERF is
20 defined in terms of the fixed fission product
21 inventory.
22 MEMBE POWERS: Source term.
23 MEMBER APOSTOLAKIS: Because what?
24 MEMBER KRESS: LERF is defined and back-
25 calculated based on a fixed fission product release

1 inventory.

2 MEMBER APOSTOLAKIS: And the frequency we

3 have as a goal for LERF is based on that.

4 MEMBER KRESS: Based on that, yeah.

5 MEMBER APOSTOLAKIS: So it's the

6 definition that changes.

7 MEMBER KRESS: It's the actual LERF

8 surrogate for a safety goal that changes.

9 MEMBE POWERS: But it could be

10 recalculated because LERF is consistent with the

11 safety goals.

12 MEMBER KRESS: Yes, it's consistent with

13 it. It can be considerably higher for a smaller power

14 reactor.

15 MEMBE POWERS: But you could back-

16 calculate it and get the appropriate number for the

17 surrogate straightforwardly. Whereas, the CDF would

18 be not necessarily consistent.

19 MEMBER ROSEN: Now, George, you said

20 something that a little puzzled me. You said for

21 light water reactors, but I thought the QHOs were

22 broader on that.

23 MEMBE POWERS: The light water reactors

24 have different weight function than those from

25 advanced --

1 MEMBER APOSTOLAKIS: No, the frequency
2 that we use now as a goal is for the current
3 generation, because they're working backwards, they're
4 evaluating backwards.
5 MEMBER KRESS: LERF is very specific for
6 the current change in light water reactors.
7 MEMBER APOSTOLAKIS: But the change -- if
8 you have a smaller reactor, what we call now a large
9 early release may not be appropriate.
10 MEMBER ROSEN: But the quantitative health
11 objective --
12 MEMBER APOSTOLAKIS: Same for everybody.
13 MEMBER KRESS: Yeah, they're technology
14 neutral.
15 MEMBER APOSTOLAKIS: It's the surrogate
16 that you have to be careful about.
17 MS. DROUIN: Even if your surrogate have
18 changed, I mean, the size reactor could potentially
19 make a difference.
20 MEMBER KRESS: But you still have a
21 question there, even if the surrogate changes.
22 MS. DROUIN: Correct. And we're just
23 saying at this option, all we're doing is staying with
24 the current practice.
25 MEMBER KRESS: The operative words I think

1 on this slide is that bottom bullet.

2 MS. DROUIN: Oh, yes. Sorry.

3 MEMBE POWERS: What, pre-decisional?

4 MEMBER KRESS: Yeah, that's the --

5 MS. DROUIN: No, is that we could be

6 under-estimating the risk to the public, very much so.

7 MEMBER APOSTOLAKIS: By the way, is this

8 by design to look that way, or it just xeroxed on the

9 notebook on the left there.

10 MS. DROUIN: It's supposed to look like a

11 notebook.

12 MEMBER APOSTOLAKIS: The spiral is what?

13 MEMBER KRESS: It's a notebook.

14 MS. DROUIN: It's pre-decisional so you're

15 still in your notebook phase.

16 MEMBER KRESS: She just tore these out of

17 her notebook and xeroxed them.

18 MS. DROUIN: Okay. On the second option,

19 we are started to be a little bit integrated here, but

20 we're only considering the frequency. And what we

21 mean by that is that the risk from all the modules

22 combined has to meet the guidelines. In addition,

23 each module has to meet the guidelines equally.

24 MEMBER KRESS: Now let me ask you about

25 this. Does that mean that you have 10 modules and

1 your CDF goal were 1 times 2 to the minus 4, each
2 module has to be one-tenth times 2 to the minus 4?
3 MS. DROUIN: That's correct. It's
4 whatever your guideline is over N.
5 MEMBE POWERS: But why is that the case?
6 I mean, does that mean that there is no common mode
7 failure here?
8 MS. DROUIN: No, you could have common
9 mode failures. It's just the option we've come up
10 with that we're just going to split it equally. We're
11 just going to look at the number, and not consider
12 still at this time power, the megawatt thermal size of
13 the reactor. We're just going to say you have to meet
14 these guidelines, and the more you have, it's going to
15 be tougher to meet them because we're going to split
16 them up equally.
17 MEMBER KRESS: Does it also say each
18 module must meet the LERF goal?
19 MS. DROUIN: Yes.
20 MEMBER KRESS: So one-tenth of the LERF
21 goal for each module. Now that presupposes each
22 module has some sort of separate containment.
23 MS. DROUIN: No.
24 MEMBER KRESS: Confinement, or that the
25 LERF could all be taken out by the CDF.

1 MS. DROUIN: We're still treating these
2 each independently. You're looking at each module as
3 its own little unit.
4 MEMBER KRESS: Just like it's a reactor
5 sitting over by itself.
6 MS. DROUIN: Right.
7 MEMBER KRESS: And another reactor here,
8 another reactor here.
9 MEMBER ROSEN: This would say that if the
10 licensee thought he might build ten of these
11 ultimately, but it was only going to build one to
12 begin with, you need to be careful and make sure that
13 first one was one-tenth of the LERF and the CDF if he
14 wanted to preserve the option.
15 MS. DROUIN: That's right.
16 MEMBER ROSEN: To design one that ate up
17 too much of the --
18 MEMBER KRESS: They're not going to
19 recommend this option.
20 MEMBER ROSEN: Well, I don't know what
21 they're going to recommend because I haven't heard
22 anything.
23 MEMBER KRESS: Oh, okay.
24 MEMBER ROSEN: But I'm just saying, he'd
25 have to be thinking ahead. He couldn't just plunge

1 right on it and put anything he wants on the site
2 first. He might chew up all his CDF and LERF.
3 MS. DROUIN: That's correct.
4 MEMBE POWERS: That would be good, Steve,
5 because then when he built the next one it's going to
6 be really incredibly safe, and we could shut down the
7 first one, and --
8 MEMBER ROSEN: You might have to build the
9 next one out of impervium, which is any way to build
10 it.
11 MEMBE POWERS: Well, technological
12 advances there.
13 MEMBER APOSTOLAKIS: The penultimate
14 bullet confuses me a little bit. Recognize this
15 accident provision is important regardless of megawatt
16 power. You mean, so if I have 10 modules for CDF, I
17 will have 10 to the minus 5, because --
18 MS. DROUIN: That's right, for each one.
19 MR. KING: The logic, George, is that
20 preventing a core melt accident is important,
21 regardless whether it's a small reactor or a big
22 reactor.
23 MEMBER APOSTOLAKIS: But I would say that
24 this would be true if you kept the 10 to the minus 4
25 forever. But to divide by 10, then that means that if

1 you have a single unit which is 1000 plus megawatt,
2 you're willing to tolerate a higher core damage
3 frequency because it's only one unit. In which case,
4 I don't know that you recognize that accident
5 prevention is important.
6 MEMBER KRESS: Well, I think, George, you
7 are exactly right. I think that 10 to the minus 4 is
8 predicated on the fact that there's something like 100
9 reactors out there of a given size, and that that's an
10 acceptable preventative role with the reactors. If
11 you had 1000 reactors the same size, you might want to
12 think about making that goal something smaller.
13 I think we've already said that for
14 advance reactors, we would probably want to have a 10
15 to the minus 5 anyway.
16 MEMBER SHACK: Yes, but this would just
17 make it 10 to the minus 6.
18 MEMBER KRESS: Yeah, but I can't see the
19 logic to that. I think you want 10 to the minus 5 for
20 each reactor, because that still gives you the same
21 concept that you're using now for the 10 to the minus
22 4.
23 MEMBER APOSTOLAKIS: If you build tomorrow
24 900 reactors, and you have a total of 1,000 - you
25 can't really apply these only to the 900. You have to

1 go back and apply it to all 1,000.

2 MEMBER KRESS: That's right. That's

3 exactly right.

4 MEMBE POWERS: I have never understood

5 this argument. And if I am in Connecticut, I am not

6 threatened at all by the San Onofre reactor.

7 MEMBER APOSTOLAKIS: The Commission was

8 thinking, at least in my interpretation, in terms of

9 the risks nuclear power imposing on the nation.

10 MEMBE POWERS: They may well have thought

11 about that, but they didn't write that.

12 MEMBER KRESS: They never used a CDF,

13 actually used it in the safety goals.

14 MEMBER SHACK: And expectations.

15 MEMBE POWERS: I remain confused by this

16 sentiment, because I read the explicit words, and they

17 talk about an individual. And an individual in

18 Connecticut is never going to be affected by the San

19 Onofre reactors.

20 MEMBER KRESS: I think they will be, and

21 I'll tell you why. You have one more reactor

22 accident, you're going to shut down all --

23 MEMBE POWERS: He may have a code, but

24 he's not going to be affected by the radioactivity --

25 MEMBER KRESS: But I think the idea is you

1 just don't want to have a core melt. And the
2 probability of having one has to do with the frequency
3 times the time, times the number of --
4 MEMBE POWERS: This may be a belief on
5 your part, because there is nothing in policy that
6 says that we don't want to have a core melt.
7 MEMBER APOSTOLAKIS: The policy says
8 nuclear power should not contribute more than one-
9 tenth of one percent to the accident rate. It didn't
10 say in Connecticut or in Oklahoma.
11 MEMBE POWERS: Yes, in individual.
12 MEMBER APOSTOLAKIS: How do you interpret
13 that?
14 MEMBER KRESS: I don't think you would
15 interpret that part of the safety goal in terms of
16 this.
17 MEMBER APOSTOLAKIS: Living in the
18 country. It didn't consider spatial distribution of
19 individuals.
20 MR. KING: It talks about individuals
21 around a reactor site.
22 MEMBE POWERS: Yes, it talks about
23 individuals around the reactor. I don't think any --
24 MEMBER KRESS: I don't think you can use
25 the QHOs to arrive at this 10 to the minus 4, or 10 to

1 the minus 5 at all. I think it's a good issue. It
2 has to do with we don't want to have a reactor
3 accident.
4 MEMBER APOSTOLAKIS: Yeah, I think that's
5 --
6 MEMBE POWERS: I know they don't want to
7 have a reactor accident, but that's not what their
8 explicit QHO says.
9 MEMBER KRESS: I don't think this has
10 anything to do with the QHOs. It's an input into the
11 final thing. I think the reason for having 10 to the
12 minus 4 is another reason in the QHOs. You could have
13 the QHOs with lots of CDFs.
14 MEMBE POWERS: I think the answer to that
15 in debating this issue is to quite referencing
16 yourself to this surrogate, go back to explicitly what
17 you're trying to achieve.
18 MEMBER KRESS: Oh, I wouldn't be against
19 that, but LERFs have been very useful things, I think.
20 MEMBE POWERS: Well, LERF I will agree
21 with you is a useful thing, because it's indifferent
22 to the QHOs. It is CDF that causes the problem, and
23 that's because we don't know exactly how they got CDF.
24 MEMBER KRESS: But I still say the QHOs
25 cannot be used to back derive this CDF, unless you

1 somehow think you can use the CDF as a surrogate --

2 MEMBE POWERS: What I'm telling you is

3 quit using CDF to adjudicate this decision, and go to

4 the QHOs.

5 MEMBER KRESS: Yeah, but what I'm saying

6 there is the QHOs are incomplete in terms of the

7 expectations. The expectations are also that you

8 won't have a core melt accident. You don't get that

9 out of the QHOs.

10 MEMBE POWERS: That may well be your

11 belief.

12 MEMBER KRESS: Oh, okay.

13 MEMBE POWERS: And we all know that the

14 beliefs in Tennessee are unusual. The explicit words

15 don't say that.

16 MEMBER APOSTOLAKIS: Wasn't there a

17 commissioner who --

18 MEMBE POWERS: Yes, Balinski did all the

19 back calculations --

20 MEMBER APOSTOLAKIS: And he considered 100

21 reactor --

22 MEMBE POWERS: He came up with a different

23 number, yes. But that's not what got written down.

24 The fact that somebody did an analysis at one time

25 doesn't carry any weight. What counts is what's

1 written down.

2 MEMBER APOSTOLAKIS: The fundamental

3 problem is, and you touched upon it, is that we have

4 goals that are in terms of per unit something, per

5 reactor here, per reactor here basically; whereas, it

6 should have been the total risk. Then you are

7 covered. If you have total risk, then everything

8 flows naturally. The moment you say the individual

9 around the reactor, the reactor here should be the

10 thing, then you run into problems like this. You

11 can't do it on a per unit basis theoretically. In

12 practice, it works if you have a stable fleet of 100

13 and some reactors more or less of the same power level

14 and so on.

15 MEMBER KRESS: Very much what we've got.

16 MEMBER APOSTOLAKIS: That's why it's

17 important. I'm not saying this to you, but it's

18 important to understand why certain mathematical

19 theories are formulated the way they are. If you go

20 to decision analysis you'll never see anything on a

21 per unit thing, unless there is convincing evidence of

22 doing it on a per unit time, or per unit something

23 doesn't affect anything, that it's constant no matter

24 what you do. It should be the total impact. And I

25 think the total impact is on the nation, not the --

1 maybe the goals are not stated well. You're right,
2 stated for individual basis, but I think what they had
3 in mind was the nation.
4 MEMBER KRESS: But still, with respect to
5 CDF --
6 MEMBER APOSTOLAKIS: That's why --
7 MEMBE POWERS: George, your outrageous
8 beliefs are on better in Boston than they are in
9 Tennessee. It's what is explicitly written down that
10 --
11 MEMBER APOSTOLAKIS: No, but the staff
12 though -- if you work backwards like you did with LERF
13 for CDF, you remember you come up with something like
14 10 to the minus 3. The staff says no, we don't want
15 any accidents, 10 to the minus 4. Okay. And
16 everybody said fine.
17 Now when they said we don't want any
18 accidents, it seems to me they meant anywhere in the
19 country.
20 MEMBER KRESS: That's what I --
21 MEMBER APOSTOLAKIS: They didn't mean no
22 accidents in San Onofre, but it's okay to have in
23 northern --
24 MEMBE POWERS: George, again your beliefs
25 are fine.

1 MEMBER APOSTOLAKIS: It's not a matter of
2 belief.
3 MEMBE POWERS: It's the explicit words
4 that count here.
5 MEMBER APOSTOLAKIS: And, Dana, you cannot
6 be as literal as you usually are when --
7 MEMBE POWERS: I am perfectly capable of
8 being as literal as --
9 MEMBER APOSTOLAKIS: Your level of comment
10 is the same level as your earlier comment, the last
11 word, predecision. You're going literally.
12 MR. KING: But remember, the Commission
13 did write down the 10 to the minus 4 CDF. They wrote
14 it down in a June 15th, 1990 SRM that told us how to
15 implement the safety goal policy, so they sort of
16 supplemented the safety goal policy with that SRM. It
17 was like a six or eight page SRM. It didn't get into
18 the modular plant issue, it did say core damage
19 prevention is important, and use a 10 to the minus 4
20 CDF as a guideline for assessing --
21 MEMBER KRESS: I remember that, and in
22 their expectations for an increased level of safety
23 for advanced reactors they said drop that down to 10
24 minus 5.
25 MR. KING: Well, they said don't do that.

1 The staff recommended drop it down to 10 minus 5, but
2 the Commission said no, keep it the same, today's
3 plants, future plants the same.
4 MEMBER APOSTOLAKIS: Yes, that was a
5 different issue.
6 MEMBER KRESS: Right. That's right.
7 MEMBER APOSTOLAKIS: And with the
8 expectation --
9 MR. KING: That's an issue we're wrestling
10 with on the framework --
11 MEMBE POWERS: Well, then you say with the
12 expectation. How does that figure? That the future
13 plants will be safer, right?
14 MR. KING: They've come out qualitatively
15 and said in a policy statement we expect future plants
16 to be safer, but they never put a number on that.
17 MEMBER KRESS: That true, but they said
18 use the same procedure and thinking you did with the
19 evolutionary plants, and those were 10 to the minus 5.
20 Now I guess that's where I assume that 10 to the minus
21 5 was the operative number. I could be wrong.
22 MEMBER APOSTOLAKIS: It's the intent that
23 matters.
24 MEMBER KRESS: Yes.
25 MEMBER APOSTOLAKIS: Right?

1 MR. KING: Expectation.

2 MEMBER KRESS: But still, if you have

3 three units on a multi-unit site, you wouldn't ask

4 each one of them to have -- going forward of the CDF

5 goal, and in the modular place just the same thing.

6 You ask each reactor to meet the goal on CDF, not a

7 one --

8 MS. DROUIN: That was option one.

9 MR. KING: I mean, that's the fundamental

10 question of how to interpret the safety goal policy,

11 on a per reactor or per site basis. If it's a per

12 reactor basis, you're exactly right.

13 MEMBER KRESS: Well, I'm ambidextrous on

14 that. If it's CDF, it's per reactor. If it's LERF,

15 it's per site.

16 MEMBER APOSTOLAKIS: Yeah. I thought that

17 was what you were proposing.

18 MEMBER KRESS: That's not what you're

19 proposing.

20 MEMBER APOSTOLAKIS: Oh.

21 MR. KING: Well we'll go through, and

22 we'll come back --

23 MS. DROUIN: Why don't we get to Option 3.

24 MEMBER APOSTOLAKIS: Yes, just get to

25 Option 3.

1 MS. DROUIN: In Option 3, what we're
2 saying is that when you look at the risk guidelines,
3 when you look at CDF, that all the modules have to
4 individually meet the CDF.
5 MEMBER APOSTOLAKIS: And what will that be
6 now? Can you give me the numbers because I don't want
7 to have to divide.
8 MS. DROUIN: 1E minus 4.
9 MEMBER APOSTOLAKIS: Each module meets the
10 10 to the minus 4.
11 MS. DROUIN: If it turns out that the risk
12 guidelines for the advanced reactors is a CDF of 1E
13 minus 4, that's what we're saying. And each module
14 would have to meet the 1E minus 4.
15 MEMBER APOSTOLAKIS: Okay. All right.
16 Good. Next.
17 MS. DROUIN: Now for LERF, if it turns out
18 the risk guideline is the 1E minus 5, what we're
19 saying is that each module has to meet it, and the
20 combined has to meet it.
21 MEMBER APOSTOLAKIS: But isn't that what
22 Tom and I just said, and you guys said no?
23 MS. DROUIN: No.
24 MEMBER APOSTOLAKIS: That's what we just
25 said.

1 MEMBER KRESS: No, no. I'm saying --

2 MR. KING: If Option 3 is -- if the

3 overall goal is 10 to the minus 4 for CDF for a plant,

4 for a modular plant, if it's 10 modules it would be

5 one-tenth of that, because when you add up --

6 MEMBER APOSTOLAKIS: That's not what Mary

7 said.

8 MR. KING: I know that's not what Mary

9 said.

10 MEMBER SHACK: That's what the paper says

11 though.

12 MR. KING: That's what the paper says.

13 MS. DROUIN: I don't think they said on

14 the accident prevention they had to each meet it

15 equally.

16 MEMBE POWERS: No, not equally.

17 MR. KING: The paper says --

18 MEMBER ROSEN: Do you guys want to have a

19 caucus?

20 MR. KING: Yes, we may want a caucus here.

21 But the intent of the paper is that each one has to

22 meet one-tenth of the CDF goal, the overall CDF goal.

23 MEMBER ROSEN: We can always take a break.

24 MR. FLACK: I think that's right. The

25 idea is not to allow modules to float up to what a CDF

1 would be for a large plant, recognizing that you have
2 10 modules equivalent to one plant. So you would want
3 any one of those modules to have a lower frequency of
4 core damage, so that when the 10 of them are running,
5 the integrative risk of all 10 running would be no
6 more or less than one large unit running. I mean, I
7 think that's the intent of it at the front-end.
8 MEMBER APOSTOLAKIS: Yes, but again, John,
9 if I think in terms of accident prevention period, the
10 accident prevention is important, I just don't want
11 any accident.
12 MR. FLACK: Right. That's the intent.
13 It's front-end loaded.
14 MEMBER APOSTOLAKIS: Because you have a
15 larger number now.
16 MR. FLACK: That's right. It's front-end
17 loaded. It's leaning towards the preventive side.
18 Now in the mitigation side --
19 MEMBER APOSTOLAKIS: But it's not power.
20 It's because -- it's the number. I don't care. No,
21 it's important. Because you have many more now, you
22 want a lower CDF.
23 MR. FLACK: Right. A lower likelihood of
24 getting --
25 MEMBER APOSTOLAKIS: Whether it's 100

1 megawatt or 1,000, you really don't care, because what
2 matters is not to have an accident.
3 MS. DROUIN: Right.
4 MR. FLACK: Right.
5 MEMBER SHACK: WE're in perfect agreement,
6 George.
7 MEMBER KRESS: No, we're not.
8 MEMBER SHACK: Well, you and I are.
9 You're not.
10 MEMBER APOSTOLAKIS: You and I what?
11 MEMBER SHACK: We're in agreement.
12 MEMBER KRESS: I'm saying each one of
13 them, each reactor ought to be treated the same.
14 MR. FLACK: Reactor or module? The module
15 --
16 MEMBER KRESS: Module is a reactor in my
17 --
18 MR. FLACK: Okay.
19 MEMBER KRESS: So when you impose the CDF,
20 you don't take the 10 to the minus 4 and divide it by
21 the number of modules.
22 MR. FLACK: Why not?
23 MEMBER KRESS: Because I'm interested in
24 not having an accident happen nationwide, and that's
25 equal to the frequency, the CDF times the number of

1 plants, times the time they're operating. That's the
2 probability of having one, and that's what I'm trying
3 to prevent. But now when I go to protect the people
4 around the site from having a -- I use the QHOs. So
5 then I say well, I've got to add up all of the LERFs
6 on this site, and the summation has to meet the QFOs,
7 so I take care of protecting the site people by my
8 LERF. My CDF is a different animal.
9 MEMBE POWERS: Yes. But, Tom, in this
10 case, it seems to me when you go to add up those
11 LERFs, you're really adding up a tenth of the
12 inventories. In other words, you're going to add them
13 all up, but you're going to have divided the numbers
14 by 10 automatically, because --
15 MEMBER KRESS: I eventually am, yes.
16 MEMBE POWERS: So the number is going to
17 come out the same. It's still going to be 10 to the
18 minus 5th for the site as a whole, because the
19 inventories are divided.
20 MEMBER KRESS: But now that imposes CDF on
21 each one of them though, that I should not have
22 imposed.
23 MEMBE POWERS: I mean, that's George's
24 hangup, George and Shack are the ones that are going
25 to be shaft them on the CDF.

1 MEMBER KRESS: No, but I don't want to do
2 that. I don't want to shaft them on the CDF, but I
3 want to make sure they meet the LERF.
4 MEMBE POWERS: The LERF is okay because
5 the inventory is --
6 MEMBER SHACK: This is what you're trying
7 to do. You're trying to prevent a reactor accident.
8 If you've got ten of them, you divide by ten to avoid
9 the accident. Your goal of avoiding a small core
10 melt, you know, you have a strong desire to avoid
11 that. And it's --
12 MEMBER ROSEN: We can argue, and we will,
13 each of the members' opinion, but I'd like to know
14 what the staff thinks. And so, John, will you --
15 MS. DROUIN: I don't have a problem with
16 that.
17 MR. FLACK: All right. She has the option
18 on the next slide. The recommendation for --
19 MS. DROUIN: Our recommendation is Option
20 3.
21 VICE CHAIRMAN WALLIS: And is it your
22 version or Tom King's version?
23 MS. DROUIN: No, it's both our versions.
24 VICE CHAIRMAN WALLIS: Which is?
25 MEMBER ROSEN: CDF divided by ten because

1 you have ten modules.

2 MS. DROUIN: Right.

3 MEMBER ROSEN: And LERF --

4 MS. DROUIN: And LERF, they each have to

5 meet it, and the combined has to meet it.

6 MEMBER KRESS: Doesn't the combined

7 suppose that each would meet it? I mean, they have to

8 be lower. I mean, you don't have to have both

9 statements, just the combined --

10 MS. DROUIN: But it is more, but if you

11 have a combination of modules - and what I mean by

12 that, say you have a mixture where they're not all the

13 same size.

14 MR. KING: Or they're not all the same

15 condition. One can be in refueling, and one can be

16 operating.

17 MEMBER KRESS: Yes, but --

18 MR. KING: The idea was to allow some

19 variation among the modules.

20 MEMBER KRESS: Yes, but that's all taken

21 care of by saying the combined LERF has to meet it.

22 LERF should have taken into consideration that --

23 VICE CHAIRMAN WALLIS: But doesn't this

24 depend on the megawatts per module?

25 MEMBER KRESS: It should.

1 MS. DROUIN: Yes.

2 MEMBER KRESS: It should, and instead of

3 saying LERF, maybe we ought to say QHOs.

4 MR. KING: Yes. Perhaps we could just

5 talk about the combined effect, and that would take

6 care of everything. But the idea is --

7 MEMBER KRESS: I think you don't have to

8 say each one of them.

9 MR. KING: Yes. The real key point is

10 that it is the combined effect that we're interested

11 in. But our view is it's the same thing for CDF.

12 MEMBER KRESS: Yes, but I think we're

13 wrong on that.

14 MEMBER APOSTOLAKIS: I think there is a

15 problem with it, because again, you have to have a

16 point of view. Okay. The point of view you have now

17 is that a 10 to the minus 4 CDF refers to a site. So

18 if I have 10 modules there, I have to divide by 10.

19 That's a point of view. It's not in the goals.

20 My point of view, and I think that's what

21 Tom was arguing also here, is that I don't care how

22 many you have on the site. It's the total in the

23 nation. So if I have -- if you take each site and put

24 10 reactors there, then I go on the order of 1,000

25 reactors, then I should divide --

1 MEMBER KRESS: But shouldn't the --

2 MEMBER APOSTOLAKIS: But just because I

3 did the grand site, it's a perturbation.

4 VICE CHAIRMAN WALLIS: George, I disagree.

5 It's all risk benefit. If you get more megawatts,

6 then you can tolerate more risk. It must be. It's

7 balancing risk versus --

8 MEMBER APOSTOLAKIS: Not when it comes to

9 prevention. Preventing nuclear accidents is a

10 fundamental objective by itself, regardless of the

11 power you get out of it.

12 VICE CHAIRMAN WALLIS: If you have a

13 reactor that produces no power --

14 MEMBER APOSTOLAKIS: It's the LERF that

15 depends on that.

16 MEMBER KRESS: Yes.

17 MEMBE POWERS: Well, let's just pursue

18 something a little further. Suppose I have ten

19 reactors on this site, each reactor is so small that

20 it can never violate the 10 CFR Part 100 siting

21 criteria. Okay. Then I should be willing to tolerate

22 all kinds of accidents there.

23 MEMBER APOSTOLAKIS: And I'm saying no,

24 because even a small accident, people don't care.

25 It's the same thing with security, for heaven sake.

1 If you hit the fence, all you're going to see on CCN
2 is nuclear plant was attacked.
3 VICE CHAIRMAN WALLIS: How do you know?
4 MEMBER APOSTOLAKIS: The fact that --
5 well, how do I know, because I live here. Don't you
6 know that anything that starts with N has a problem,
7 so I think the prevention policy is not to find
8 yourself in that situation. It has nothing to do with
9 whether you produce 1,000 megawatt or 100. You just
10 don't want anything that is called nuclear accident,
11 and that's why we even tolerate the 10 to the minus 4
12 instead of 10 to the minus 3, which would be
13 consistent with the goal.
14 MEMBER KRESS: That's exactly right.
15 MEMBER APOSTOLAKIS: Yes. It's a
16 different objective, it's a fundamental objective
17 independently of the risk.
18 MEMBER KRESS: Absolutely. That's why you
19 can't get it out of the QHOs.
20 VICE CHAIRMAN WALLIS: George, you're
21 going against all the principles of PRA, were you look
22 at consequences, say no accident whatsoever. If the
23 accident has more consequences, you're more careful
24 about preventing it. Right?
25 MR. KING: Having an accident to begin

1 with is a consequence, forget the amount of radiation.
2 MEMBER KRESS: That's part of defense-in-
3 depth and --
4 MEMBE POWERS: Psychological, financial.
5 MEMBER APOSTOLAKIS: The goals of Mary's
6 -- the project that Mary is -- K minus 1 project, on
7 the goals it says -- defense-in-depth says that for
8 core damage frequency you have 10 to the minus 4, and
9 therefore, use 10 to the minus 5. And there is a not
10 so subtle assumption there that prevention is a
11 thousand times more important than mitigation, 10 to
12 the minus 4, 10 to the minus 5, something like that.
13 So I think it's a fundamental objective not to have an
14 accident, period. I don't care how much power you've
15 got --
16 VICE CHAIRMAN WALLIS: Then you should
17 make it 10 to the minus 10 or something.
18 MEMBER APOSTOLAKIS: You could, if you
19 could.
20 MEMBER KRESS: It's a policy statement,
21 and there's no technical reason for it. It's what
22 people think is realistically achievable, and
23 acceptable to the general public.
24 VICE CHAIRMAN WALLIS: Then you better ask
25 the public and not this group of people here.

1 MEMBER APOSTOLAKIS: The public is the
2 five commissioners. That's what the public is.
3 MR. KING: It's clearly a policy decision,
4 and that's why it's gone to the Commission.
5 MEMBER APOSTOLAKIS: Good.
6 MEMBER KRESS: It's policy.
7 MEMBER APOSTOLAKIS: So do I understand
8 where you stand, and the gentleman stands.
9 VICE CHAIRMAN WALLIS: Yes. I'd like the
10 rationale from the staff. I haven't heard much
11 rationale yet that I believe, so is there some
12 believable rationale that you have that you can
13 persuade us with?
14 CHAIRMAN BONACA:: Yes, we heard the other
15 rationales.
16 VICE CHAIRMAN WALLIS: The staff's thought
17 about it much more than we have perhaps, so maybe you
18 could give us a convincing argument.
19 MR. KING: Well, the rationale is that
20 prevention of an accident is important regardless of
21 the reactor size. And when you're adding a group of
22 modules all at one time to a site or over some period
23 of time to a site, you don't want the likelihood of a
24 core melt accident on that site to all of a sudden
25 jump up.

1 VICE CHAIRMAN WALLIS: It says megawatt
2 thermal of modules considered in one line. In the
3 next line it says it's regardless of power, so I don't
4 understand this slide.
5 MEMBER APOSTOLAKIS: Eleven?
6 VICE CHAIRMAN WALLIS: You weren't
7 considering megawatts at all.
8 MEMBER APOSTOLAKIS: Eleven.
9 VICE CHAIRMAN WALLIS: If you're not
10 considering megawatts, that's a false statement.
11 MEMBER APOSTOLAKIS: That's exactly what
12 it said.
13 MR. KING: One is talking about accident
14 prevention.
15 VICE CHAIRMAN WALLIS: It says megawatts
16 considered, and then two lines down it says regardless
17 of megawatts.
18 MEMBER APOSTOLAKIS: This is mitigation,
19 the other is LERF.
20 MS. DROUIN: Action is important.
21 MR. KING: Yes, regardless of plant size.
22 MEMBER KRESS: Megawatts will be
23 considered because when you calculate CDF, it enters
24 into the calculation. But you're not explicitly
25 putting it in the acceptance criteria.

1 MR. KING: Right. But accident mitigation
2 does have dependence upon source term, which is
3 dependent upon plant size, so we're allowing the
4 analysis to give credit for that.
5 CHAIRMAN BONACA:: Yes, and this slide is
6 confusing because it doesn't specify that the
7 statements relate to LERF.
8 MR. KING: Yes, that last one doesn't.
9 You're right. Well, it says accident mitigation the
10 last two words.
11 MEMBER APOSTOLAKIS: Yes, you have to know
12 that.
13 VICE CHAIRMAN WALLIS: I don't understand
14 this at all. You've got three conflicting statements
15 about megawatt thermal. Are you considering megawatt
16 thermal or not? Are you giving credit for --
17 MR. KING: For accident prevention, no.
18 For accident mitigation, yes.
19 VICE CHAIRMAN WALLIS: Well, that's not
20 stated. I mean, it's just three -- it's not spelled
21 out in this slide anyway.
22 MEMBER KRESS: That's what they mean.
23 MEMBER APOSTOLAKIS: I guess the only
24 minor disagreement in I think Tom's and my point of
25 view and your's, is that you take the number of

1 reactors or modules at the site, and you divide the
2 goal by that. I would take a broader view and say the
3 total number in the country should be the number you
4 divide the 10 to the minus 4 by. Now you might say
5 well, I don't know what it is, and so on. But if you
6 -- yes. Yes, the total number in the country, not on
7 that site.
8 MEMBER KRESS: Absolutely, George. You're
9 absolutely right.
10 MEMBER APOSTOLAKIS: You could disagree,
11 maybe, but don't --
12 MEMBER KRESS: Well, from what I hear, I
13 may be adding comments to --
14 MEMBER APOSTOLAKIS: I'm not sure that's
15 a critical point though. Do you think it's a critical
16 point? Well, it is --
17 MEMBER KRESS: I think it is because --
18 MEMBER APOSTOLAKIS: Because they assumed
19 there would be 1,000 reactors.
20 MEMBER KRESS: But I think the industry
21 would be up in arms over that.
22 MEMBER APOSTOLAKIS: I think everybody
23 meets that, 10 to the minus 5. Now one of them, who
24 was it, IG or First Energy -- these guys are going to
25 have a problem.

1 CHAIRMAN BONACA:: I understand where
2 you're coming from, but you can go to the limit,
3 assuming you have your module on that site. Okay.
4 And then you say each one of them is 10 to the minus
5 4 because -- well, you know, we're making the
6 likelihood of core damage on that site very high.
7 MEMBER APOSTOLAKIS: No, no, no. That's
8 not what we're saying. We're not saying you keep the
9 10 to the minus 4. We're saying you take the 10 to
10 the minus 4 and divide by the total number of modules
11 in the country.
12 MEMBER KRESS: That's exactly what I --
13 MEMBER APOSTOLAKIS: Not on one site.
14 MEMBER KRESS: If 10 to the minus 4 is
15 acceptable for 100 reactors, you've got the right
16 show, what you need right there.
17 MEMBER SHACK: Back to the reactors, every
18 time you add a new --
19 MEMBER APOSTOLAKIS: It's a problem.
20 MEMBER KRESS: Well, no, that's a problem.
21 So what you do is you make for advance reactors, you
22 make it 10 to the minus 5 and say now when you step up
23 to 1,000 reactors, which we're never going to get, so
24 we're taking care of the problem. That's the way you
25 deal with the fact that you change it every time.

1 MEMBER APOSTOLAKIS: And then you can say
2 the existing reactors are grandfathered.
3 MEMBER KRESS: Yes. Exactly right. You
4 don't have to backfit.
5 MEMBER APOSTOLAKIS: Look, I don't think
6 this is more stranger than what they're proposing.
7 VICE CHAIRMAN WALLIS: Well, could you
8 explain to me --
9 MEMBER KRESS: I think it's the right
10 thing. It makes a lot of logic and technical sense,
11 and properly I think interprets the --
12 MEMBER APOSTOLAKIS: It could be an Option
13 4.
14 VICE CHAIRMAN WALLIS: So if I put 100
15 modules on a site --
16 MEMBER KRESS: Each one of them has a 10
17 to the minus 5.
18 VICE CHAIRMAN WALLIS: Each one produces
19 --
20 MEMBER APOSTOLAKIS: Ten to the minus 6
21 now.
22 VICE CHAIRMAN WALLIS: -- ten megawatts.
23 Each of them has to have a 10 to the minus 6 CDF?
24 MEMBER KRESS: Sure.
25 VICE CHAIRMAN WALLIS: So the group of

1 them is equivalent to one.

2 MEMBER KRESS: Yeah.

3 MEMBER ROSEN: Right.

4 VICE CHAIRMAN WALLIS: And then how about

5 LERF, same thing?

6 MEMBER KRESS: No, no, no. That's what

7 they're saying, not George and I. I said each one of

8 them has to have 10 to the minus 5. That's what

9 George and I are saying.

10 MEMBER APOSTOLAKIS: They're saying that

11 rather than dividing by the group, you divide by the

12 number in the country.

13 MS. DROUIN: We're looking at in a site,

14 not across the country.

15 MEMBER APOSTOLAKIS: They're looking at it

16 on a site basis, we're looking at it on a nation

17 basis.

18 VICE CHAIRMAN WALLIS: But if you put 100

19 modules on a site, does the public believe you are now

20 doubling the risk of reactor accidents?

21 MEMBER KRESS: You take care of that with

22 your LERF. You protect them with your LERF. You have

23 to add up all of the LERFs.

24 MEMBER APOSTOLAKIS: Yeah, the LERFs will

25 --

1 MEMBER KRESS: That takes care of
2 protecting the people around the site. The CDF --
3 VICE CHAIRMAN WALLIS: So safety has to do
4 with LERF, and sometimes psychological --
5 MEMBER KRESS: Except there is this
6 question with balance in your LERF calculation. You
7 still have to balance CDF properly, but we've already
8 decided what that's going to be.
9 MEMBER APOSTOLAKIS: I mean, they're not
10 independent. It could be another interpretation.
11 MEMBER KRESS: I mean, when we calculate
12 this --
13 CHAIRMAN BONACA:: That's more a practical
14 approach, however.
15 MEMBER KRESS: When you take 10 modules,
16 each one of them with the same CDF and calculate the
17 LERF, you don't just take that one CDF. You use the
18 10 times that CDF, times some sort of way you can fail
19 their containments, whatever it says, so you do add up
20 the CDFs when you calculate the LERF.
21 MEMBER SHACK: But you're going to have a
22 hard time explaining to the guy that he's 10 times
23 more likely to have a nuclear accident in his
24 neighborhood than the guy over there is, even though
25 you tell him the LERF is going to be the same.

1 MEMBER KRESS: Well, we do what's right,
2 not what has appearances of --
3 MEMBER SHACK: The people have certain
4 expectations.
5 MR. KING: Accident prevention is right.
6 I don't see how you can say that's not right.
7 MEMBER KRESS: Well, we're preventing it
8 by --
9 VICE CHAIRMAN WALLIS: What's right is
10 what he thinks is right, not what you think is right
11 for him.
12 MEMBER ROSEN: And that's democracy.
13 MEMBER APOSTOLAKIS: How do you know what
14 he thinks?
15 CHAIRMAN BONACA:: Well, I think
16 instinctively he believes more in prevention than --
17 MEMBER APOSTOLAKIS: I don't think you
18 guys should -- I mean, I don't understand this
19 argument he thinks this individual. These people are
20 represented by the five commissioners, period. All
21 you have to do is convince the commissioners.
22 MEMBER KRESS: That's right.
23 MEMBER APOSTOLAKIS: We don't have to go
24 out on the street and start asking people what do you
25 think. That's the way the system works. The people

1 are the commissioners, so if the commissioners approve
2 this, then it's fine. I mean, let's not talk about --
3 there is no end to this.
4 VICE CHAIRMAN WALLIS: And you've got to
5 give them a good rationale.
6 MEMBER APOSTOLAKIS: And that's what this
7 meeting is all about.
8 CHAIRMAN BONACA:: All right. I think --
9 MEMBER SHACK: This inspires confidence,
10 I'll tell you.
11 MEMBER APOSTOLAKIS: What the staff is
12 proposing is similar to what Tom and I think is right,
13 if you assume that you will have 1,000 of those.
14 Right? Because they divide by 10. And in that sense,
15 they are saying the 100 --
16 MEMBER SHACK: You're sharing the risk out
17 over all the reactors.
18 MEMBER APOSTOLAKIS: Yes.
19 MEMBER SHACK: These guys are really
20 keeping the site --
21 MEMBER APOSTOLAKIS: It's the same thing.
22 It's exactly the same thing.
23 MEMBER SHACK: No, it's not the same
24 thing.
25 MEMBER APOSTOLAKIS: Because then the next

1 step would be okay, I have 100 units and now they're
2 a little higher, I can give an argument that I don't
3 have to worry about them. I don't want to backfit.
4 Okay. Of course, some of them are above 10 to the
5 minus 4, but we don't --
6 CHAIRMAN BONACA:: But the other plants
7 all exist already, but this guy here wants to put 20
8 modules on his location. I can do something about it.
9 Okay.
10 MEMBER APOSTOLAKIS: Yeah, but that
11 something has to have some basis.
12 MS. DROUIN: George, I mean if you've got
13 two different sites and each site has 10 modules, we
14 are saying that they have to meet it -- each module at
15 each site has to meet it at 1E minus 5.
16 MEMBER APOSTOLAKIS: Yes.
17 MS. DROUIN: Because we're looking at it
18 on a site basis. If I understand what you're saying,
19 then they'd have to meet at 5E minus 6, because you're
20 saying you want to take it across everything, which
21 would be a total of 20 --
22 MEMBER APOSTOLAKIS: No.
23 MS. DROUIN: Well, that's what it sounded
24 like you were saying.
25 MEMBER APOSTOLAKIS: Now you will be

1 higher than the minus 5, because in my case I'll
2 divide by the total.
3 MEMBER RANSOM: All sites.
4 MEMBER APOSTOLAKIS: All sites, 140. You
5 divide by 10, but I would divide by 100 and whatever.
6 MS. DROUIN: Okay. But we are not looking
7 at the current set. We are just answering -- the
8 question posed to us by the Commission was what do we
9 do with the modules. It does have implications.
10 That's a separate policy issue if you want to now
11 bring in the current set of plants. But we were just
12 asked to look at the integrated risk across the set of
13 modules, and we answered it in that very narrow
14 context.
15 Now if you want to extend that to the site
16 where you have current plants, that's a separate
17 issue, and we don't have a recommendation for that.
18 MEMBER APOSTOLAKIS: Let me give you my
19 thinking on --
20 MEMBER KRESS: When you do this, and you
21 have say 10 modules on one site, and you take one-
22 tenth CDF for each one of them, and somebody at
23 another site builds three identical sets of these
24 modules, now you're going to have one-third of the CDF
25 for each.

1 MS. DROUIN: Correct.

2 MEMBER KRESS: It doesn't make sense.

3 VICE CHAIRMAN WALLIS: It does to the guy

4 who's living there.

5 MEMBER KRESS: No, it doesn't. He's

6 smarter than that.

7 VICE CHAIRMAN WALLIS: No. If you're

8 going to put 100 modules, he's going to see 100

9 reactors in my backyard, and --

10 MEMBER KRESS: Well, he's going to ask

11 what risk am I being put to, and you're going to tell

12 him the LERF value.

13 MEMBER APOSTOLAKIS: He's never heard of

14 LERF.

15 MEMBER KRESS: LERF in terms of .1 percent

16 of his chances of dying some other way.

17 MEMBE POWERS: Tom, you're absolutely

18 correct. It's not going to take long for that guy to

19 realize that he's getting three times the core banding

20 frequency that his neighbor down the road is being

21 subjected to per module.

22 MEMBER KRESS: That's right. He's the guy

23 that's going to complain.

24 MEMBE POWERS: He's going to complain like

25 crazy.

1 MEMBER KRESS: Yes.

2 MEMBE POWERS: And if George --

3 MEMBER KRESS: It works both ways.

4 MEMBE POWERS: And since George is worried

5 about the headlines in the "Boston Globe", this guy is

6 going to get headlines in the "Boston Globe" as big as

7 the --

8 MEMBER KRESS: Absolutely. And so you

9 pick out a number and you apply it to all of it, and

10 it would be justified on the basis of total number and

11 expectations for increased safety. My guess would be

12 that would be 10 to the minus 5 for every CDF for

13 every module, because I've not used 10 to the minus 4

14 because there is an expectation of increased safety

15 for new plants. And you're planning on increasing

16 these, so I would choose 10 to the minus 5, and say

17 that's what our recommendation is.

18 MEMBER APOSTOLAKIS: Or even higher. It

19 could be higher because --

20 MEMBER KRESS: It could be higher, you

21 know. It could still be 10 to the minus 4.

22 MEMBER APOSTOLAKIS: Let me give you this

23 line of thinking. We want to prevent accident

24 anywhere. Right now it's 10 to the minus 4 per

25 reactor. We have 100 units. That implies that per

1 year we want the probability of 1 percent or less of
2 an accident anywhere.
3 MEMBER KRESS: That's right.
4 MEMBER APOSTOLAKIS: And that's
5 independent of the number of units. So if now my
6 number of units become 1,000, then on a per unit
7 basis, it should be 10 to the minus 5, to preserve the
8 1 percent. If I have 500, it would be whatever it is,
9 to 10 to the minus 5.
10 MEMBER KRESS: Yes. And my point was that
11 the 1 percent, I think rethinking that and having
12 second thoughts about it, it ought to be better than
13 that for new reactors, so let's make it 10 to the
14 minus 5.
15 MEMBER APOSTOLAKIS: No, I preserve the 1
16 percent.
17 MEMBER KRESS: No, what I'm saying is you
18 really shouldn't because the Commission is having
19 second thoughts about that being appropriate.
20 MEMBER APOSTOLAKIS: The 1 percent is
21 anywhere, from any reactor.
22 MEMBER KRESS: I know, but they're having
23 second thoughts about that, so let's make the new
24 reactors 10 to the minus 5.
25 MEMBER APOSTOLAKIS: Oh. And that's a

1 factor of 2.

2 MEMBER KRESS: Yes.

3 MEMBE POWERS: Let just inject a comment

4 that Mr. Wallis would likely make. You guys can't

5 pull these numbers out of the air. They have economic

6 consequences. I mean, you can't just grab at some

7 number and say let's make it this.

8 MEMBER APOSTOLAKIS: No, I'm just

9 inferring from what the policy of the agency is right

10 now. I'm not grabbing anything. I'm saying you have

11 a 10 to the minus 4 goal, 100 reactors. That tells me

12 that on a per year basis, it's 1 in 100. You are

13 working with that. That has been the policy for 40

14 years. Now if you want to go to 500 reactors, or

15 1,000 reactors, I want to preserve it 10 to the minus

16 2 per year, so I have divide by --

17 MEMBE POWERS: Who said that you wanted to

18 preserve the 1 percent? I mean, where is that

19 written?

20 MEMBER APOSTOLAKIS: Make some assumption,

21 okay. I don't want to increase it.

22 VICE CHAIRMAN WALLIS: But, George, here's

23 one of the most important decisions you can make for

24 people living near a plant. You're making it just by

25 pulling 1 percent, or a factor of 10 here.

1 MEMBER APOSTOLAKIS: I'm amazed that you
2 say that, because I'm not making any decision. I'm
3 just trying to analyze the implications of the
4 recommendations, and the five Americans who represent
5 the public will make the decision.
6 MR. FLACK: But getting back to the
7 option, there's a global issue and there's a local
8 issue, you might say. We're looking at the local
9 issue in this paper; the integrated risk when you
10 build a number of modules at a site. And how do you
11 address that risk as coming forward with a licensing
12 application for that site, for that plant that now
13 consists of X number of modules? How do you integrate
14 that risk to come up with criteria, and that's the
15 option that's being chosen.
16 MEMBER APOSTOLAKIS: I think there is a
17 misunderstanding around the table, at least on my
18 part. I know Tom has his own views. I'm not saying
19 this is wrong. All I'm saying is there is an equally
20 plausible, or perhaps a little more plausible
21 interpretation of the goals and the policies, the
22 existing policies, that could lead to an Option 4
23 according to what we've been arguing. I'm not
24 criticizing this. There is a big difference.
25 MR. FLACK: I understand, but --

1 MEMBER APOSTOLAKIS: I mean, you gave
2 Option 1. Now come on, what was Option 1? Option 1,
3 as I recall is --
4 MR. FLACK: Let's treat them all like we
5 do today with regular plants, and --
6 MEMBER RANSOM: Well, what do you today if
7 you have like four plants on --
8 MEMBER APOSTOLAKIS: Nothing.
9 MR. FLACK: Well, we have three plants at
10 a site, Paolo Verde -- and I think it was an option to
11 build two more, correct me if I'm wrong, so we would
12 just look at each plant.
13 MEMBER RANSOM: It's per plant, not per
14 site.
15 MR. FLACK: And we'd consider that in the
16 context of the safety goals, and recognizing that if
17 the plant is meeting the safety goals in every one of
18 those plants, it's safe enough, basically is the way
19 we do business. That's in the context of a policy.
20 It's not a requirement now, it's a policy. We look
21 for the --
22 MEMBER RANSOM: Well, it's a little hard
23 to see the difference between that and say multiple
24 modules.
25 MR. FLACK: Well, the only thing with

1 multiple modules is that you could have many more of
2 those that generate the same quantity of electricity.
3 So the question is okay, now instead of coming forward
4 with one large plant, you come forward with 10 smaller
5 ones. What is the integration of that risk of 10
6 smaller ones, and how should we perceive that risk if
7 we're going to take that and break it down to each
8 module? And I think that was the question at hand,
9 how are we going to deal with that issue.
10 MEMBER RANSOM: I understand that, but --
11 MR. FLACK: And that's what this is about.
12 Now if we talk about other plants across the nation,
13 that's a bigger issue.
14 MEMBER APOSTOLAKIS: Okay. Let me ask
15 another question. I said that this is not wrong,
16 nothing is wrong in this case. This is a different
17 kind of argument. Are you saying that what Tom and I
18 are proposing is wrong?
19 MR. FLACK: Oh, no. I'm just trying to say
20 there's a difference between what we're moving forward
21 with here.
22 MEMBER APOSTOLAKIS: Right, there is a
23 difference.
24 MR. FLACK: And this option that you
25 propose.

1 MEMBER APOSTOLAKIS: So what would be the
2 impediment to putting it as an Option 4, the fact that
3 we don't have time.
4 MR. FLACK: Well, it expands the scope to
5 something more than just modules.
6 MEMBER APOSTOLAKIS: It's that you don't
7 have time, John.
8 MR. FLACK: Well, that's what I mean,
9 expanding the scope --
10 MEMBER APOSTOLAKIS: Because you don't
11 just sit down and write an extra section. I mean, it
12 has to be reviewed by N plus 1 people.
13 MR. FLACK: Yes. Of course.
14 MEMBE POWERS: John, let me ask you this
15 question. You're dealing with a local question. Why
16 are you dealing with it in terms of CDF? Why don't
17 you just go to BRISK?
18 MR. FLACK: I would say in the -- although
19 it's a sort of -- I mean, you might call it a cop-out.
20 It's a lot easier to deal with it as an engineering,
21 the engineering aspect is easy to deal with at that
22 type of consideration, and provided it's consistent
23 with that goal. I'm not trying to say that we're
24 moving away from that goal. We understand that goal
25 is there, but it's a much more difficult goal to work

1 with when you're doing a review of a plant.

2 MEMBE POWERS: But what I'm thinking is --

3 my thinking would go this way. With the risk, looking

4 at the QHO and trying to deal with that, I can get a

5 consistent answer. And then from that, I can figure

6 out a way to calculate the CDF that I want to use. I

7 think CDF is getting you in trouble because this

8 doesn't have any logical connection -- any

9 quantitative, easy to understand connection with QHO.

10 It has a connection with things that George has been

11 talking about, the time, the reactors in the nation

12 times the number of years they operate. And that's

13 fine if you were working on the global issue. But

14 since you're working on the local issue, I think you

15 have to come back to the QHO. Once you get that

16 answer from the QHO, then calculate what the

17 appropriate CDF is.

18 MEMBER APOSTOLAKIS: But I would not --

19 risk is not the only fundamental objection.

20 MEMBE POWERS: I don't argue with that,

21 but his ground rule is he wants to work the local

22 issue.

23 MEMBER APOSTOLAKIS: I understand that.

24 MEMBE POWERS: Okay. And I think where

25 you run into logical traps is working a parameter

1 that's based on the global issue and trying to apply
2 it in the local issue. It gets around that if you
3 would just go and work the QHO approach, and then once
4 he gets that answer, say what does that imply about
5 the CDF, because I know kind of how they got to it.
6 And you could do preservations of some point --
7 MEMBER APOSTOLAKIS: We do this for LWRs,
8 as you remember, Sherrie did that for us, because he
9 went back to 11.50 and other standards, and found that
10 the contribution of the containment, for example, was
11 a certain number. Okay. So you can work backwards
12 now from the QHOs to the large release, and then he
13 looked again and said well, you know, from core damage
14 to release there is a factor of X, and work backwards.
15 With the new designs you don't have --
16 MEMBER KRESS: You don't have that
17 containment.
18 MEMBER APOSTOLAKIS: You haven't done the
19 PRAs, you don't know what the factor will be. It will
20 be difficult to work backwards as we did --
21 MEMBE POWERS: But the QHO, you can come
22 back and you get a LERF. Okay?
23 MEMBER APOSTOLAKIS: If you know how much
24 you buy from the containment.
25 MEMBE POWERS: No, no. I can get a LERF.

1 Okay. So then I can say okay, well the LERF is
2 typically a tenth of the CDF --
3 MEMBER KRESS: That's an assumption.
4 MEMBER APOSTOLAKIS: See, that's an
5 assumption for LWRs.
6 MEMBE POWERS: That is a way of doing it.
7 Okay. And you can make your judgment on what CDF is,
8 but you come up with a LERF. It's quantitatively
9 related to the QHO.
10 MEMBER APOSTOLAKIS: You're right.
11 MS. DROUIN: Okay. If you remember on our
12 slides --
13 MEMBER APOSTOLAKIS: We did that for LWRs.
14 It was 10 to the minus 3, and then they reduced it by
15 10. Sherrie did it for us.
16 VICE CHAIRMAN WALLIS: The LERF is a local
17 thing. It's the guy who's actually living near the
18 plant. And what you're doing here is you're balancing
19 the whole nuclear game, is this is risk/benefit -
20 whose risk, whose benefit? Are you going to look at
21 it as a nationwide thing, or are you going to look at
22 it --
23 MEMBER APOSTOLAKIS: You must because the
24 person, the guy --
25 VICE CHAIRMAN WALLIS: Well, I don't know.

1 You have to enunciate some principles. I'm telling
2 you, the safety of the person living next to the plant
3 is paramount. Therefore, we will decide on LERF. Or
4 it's a risk benefit spread over the whole nation.
5 Therefore, we going to have some other principle --
6 MEMBER KRESS: The risk benefit has
7 already been done.
8 MEMBER APOSTOLAKIS: I'm not introducing
9 any new principles.
10 CHAIRMAN BONACA:: Well, it seems to me
11 that we understand the differences of a plant, and
12 there is another -- I mean, we have little more than
13 half an hour left. I think we should move on, because
14 I see that --
15 MS. DROUIN: The thing I'd like to make
16 clear is that we were using CDF and LERF as examples
17 of our accident prevention in mitigation.
18 MEMBER KRESS: Yes, we understand that.
19 MS. DROUIN: And if you go through the
20 paper, you don't see the words CDF and LERF there, and
21 they weren't on our slides.
22 MEMBER KRESS: That's right.
23 MS. DROUIN: And as we point out on this
24 last slide here, there's guidance that's going to have
25 to be developed. What we're trying to say with Option

1 3 is that in Option 3, that we want to focus in on
2 accident prevention, because we think it's important.
3 We want to prevent accidents. I think that's a goal
4 you can't go away from. And when we look at accident
5 mitigation, we want to take into account on the
6 accident mitigation the size of the reactor. And
7 that's the recommendation we're making conceptually.
8 And there's going to have to be details worked out.
9 MEMBER KRESS: When somebody comes in and
10 says I want to build a modular reactor system on this
11 site, are you going to require him to tell you what
12 the maximum number of modules he's going to have on
13 there?
14 MS. DROUIN: This is a detail that would
15 have to be worked out.
16 MEMBER KRESS: That's one detail because
17 that fixes the number of the CDF and the LERF --
18 MR. KING: I think the way the ESPs are
19 now, they put down the maximum number of megawatts
20 thermal, and then you can divide into that however big
21 your module is. That'll tell you how many modules you
22 can have. I think that's the way they're coming in.
23 Jerry is shaking his head yes over there. So they
24 don't say number of modules, they say total number of
25 megawatts thermal.

1 MEMBER KRESS: Say they're going to build
2 two modules this year, add two more at the end of five
3 years, and add two more five years from now, and we've
4 accounted for the risk of all of those starting today,
5 which doesn't seem like it's developed consistent to
6 me.
7 MEMBER APOSTOLAKIS: So the pebble bed
8 reactor will have a particular design, which may turn
9 out to be okay to be licensed at Site X, but not Site
10 Y. That's what you're saying, because at Site Y they
11 may want to put more. That doesn't make sense to me.
12 MEMBER KRESS: That doesn't make sense.
13 MEMBER APOSTOLAKIS: It doesn't make
14 sense. It has to be nationwide.
15 MEMBER KRESS: Absolutely.
16 MEMBER APOSTOLAKIS: Anyway, I think I've
17 said my peace.
18 MEMBER KRESS: I think it's maybe two
19 against I don't know how many.
20 MEMBER APOSTOLAKIS: Galileo was right.
21 MEMBER SHACK: Burning is fun.
22 MR. KING: Okay. Are we ready to move on
23 to the next one? Okay.
24 MEMBER APOSTOLAKIS: I still want to
25 emphasize that these are matters for interpretation.

1 I'm not saying that what you're doing is wrong. It's
2 just another way of interpreting.
3 MR. FLACK: Okay. We recognize that.
4 MEMBER APOSTOLAKIS: You think what I'm
5 saying is wrong?
6 MR. FLACK: Okay. Are ready to move on?
7 MR. RUBIN: Okay. Fortunately this next
8 topic is a lot less controversial than the one we're
9 leaving. I'm Stuart Rubin. I'm with the Office of
10 Research Advanced Reactors. This next topic is
11 essentially a status report on the work of the staff
12 to develop options, as was mentioned, in the area of
13 non-light water reactor containment and functional
14 performance requirements and criteria. It's been
15 referred to as confinement versus containment but the
16 Commission has kind of broadened that to be a more
17 functional look at containment requirements. This is
18 the third meeting, I believe, with the ACRS on this
19 subject. Next slide.
20 MEMBER APOSTOLAKIS: What am I missing
21 here? The feedback is verbal.
22 MR. RUBIN: Well, because we are --
23 MEMBE POWERS: George, how do you get
24 feedback other than verbally?
25 MR. RUBIN: Well, I mean as opposed to in

1 writing in your letter.

2 MEMBER APOSTOLAKIS: No, no, no. He's

3 right.

4 MEMBE POWERS: You meant oral.

5 MEMBER APOSTOLAKIS: Don't you know you

6 have a Mr. Literal over there.

7 MR. RUBIN: And I thought this would be no

8 controversial. I was wrong.

9 MEMBER ROSEN: Maybe you could get here on

10 Saturday morning when things go smoother.

11 MEMBER APOSTOLAKIS: No, no. John was

12 about to say --

13 MR. RUBIN: The letter is really -- what

14 it's requesting is on the integrated risk part. Okay.

15 Let's go to the next slide. I think we covered that.

16 Again, just by way of background, the

17 staff in the last SECY paper proposed two options.

18 One would have required a conventional type

19 containment for non-light water reactors. The other

20 option was to allow the possibility of other kinds of

21 containments provided that there were performance

22 requirements and criteria that would be established

23 and would be met.

24 VICE CHAIRMAN WALLIS: Why is it retained

25 pressure rather than the content, they're assigned to

1 retain the fission products.

2 MR. RUBIN: Yes.

3 VICE CHAIRMAN WALLIS: There's nothing

4 magical about pressure. Pressure doesn't hurt

5 anybody.

6 MR. RUBIN: Yes. I wouldn't disagree with

7 that, and so --

8 MEMBER KRESS: That's differentiated from

9 containment, as you will maybe filter and vent.

10 MR. RUBIN: Right, to just bottle it up.

11 MEMBER KRESS: But, you know, the idea is

12 --

13 MR. RUBIN: Right. Bottle up everything

14 that might be released from the reactors. The staff

15 recommended the latter option which it had done in

16 previous years, and requested a policy decision, as

17 well as requested permission to proceed to actually

18 develop those requirements and criteria.

19 Basically, this Commission did not agree

20 with either path. They basically felt there wasn't

21 enough information for them to make a decision, and

22 they really weren't sure whether or not if Option 2,

23 if it led to a confinement-type building for an ACGR,

24 whether or not that would be acceptable. So the staff

25 was asked by the SRM to give options, options for

1 functional performance requirements for the
2 containment of non-light water reactors, and certainly
3 ACGRs within that.
4 They specifically asked that we consider
5 the fuel, and core cooling systems in our analysis,
6 and we interact with industry and other stakeholders
7 in developing these options.
8 MEMBE POWERS: Didn't the Commission
9 recognize that the largest reactors this country has
10 ever built had confinements?
11 MEMBER KRESS: That's the N reactor.
12 MEMBE POWERS: N reactor and C reactor.
13 MEMBER KRESS: C reactor.
14 MEMBE POWERS: And that those confinements
15 were in the case of C reactor, were designed to
16 withstand the over-pressure from a nuclear blast.
17 VICE CHAIRMAN WALLIS: From outside.
18 MEMBE POWERS: Yes. And the other thing
19 I wondered, does the Commission understand that a
20 substantial fraction of the plants in Europe are the
21 vented filtered containment design; that is, they're
22 design to act as containments up to a point, and then
23 they vent through a filtration system?
24 MR. RUBIN: I wouldn't want to venture a
25 guess as to this particular Commission. The intent is

1 in the final SECY paper to apprize them of these kinds
2 of facts and information.
3 MR. FLACK: Again, these policy issues are
4 for non-light water reactors, but recognizing that
5 there are also existing situations --
6 MEMBE POWERS: I'm not sure that a
7 containment really cares what's inside of it.
8 MR. FLACK: That's true.
9 MR. RUBIN: And I do have a slide that
10 takes somewhat of a survey, perhaps not including the
11 reactors you mentioned, of plants worldwide, non-light
12 water reactors, either existing or proposed, and the
13 kinds of containments that they have.
14 In terms of where we've gone so far, since
15 the SECY we've tried to collect documents relevant to
16 this, documents of the reactors that you just spoke.
17 We weren't successful, in fact, in retrieving those
18 documents, but we did get many more in other plants.
19 We discussed this with our senior management staff to
20 get their views. We've had a couple of public
21 meetings well attended by the nuclear industry and
22 design folks involved today in designing these plants.
23 And we've prepared a SECY and you have seen a draft of
24 that. And we've also included what stakeholder
25 comments, predominantly from the industry, views on

1 requirements for containments.

2 MEMBE POWERS: You speak of the industry,

3 and I'm sure that what you're speaking of is the U.S.

4 industry, both reactor operators and NPBS suppliers.

5 Do you try to include the views of say the designers

6 of the EPR, which has a double containment, and a core

7 retention device?

8 MR. RUBIN: We haven't specifically

9 targeted them. We've certainly announced our

10 meetings. Perhaps the title of the meetings as being

11 non-light water reactors has caused them not to show

12 an interest, but at this point we have certainly

13 gotten the attention of the HTGR folks, both in South

14 Africa, General Atomics, and DOE, and we've gotten

15 participation from Liquid Metal Mold Salt Reactor

16 Design --

17 MEMBE POWERS: Those are good.

18 Unfortunately, none of those particular vendors have

19 sold a plant; whereas, the designers of the EPR have,

20 and their design is double containment core retention

21 device. It seems to me that that must surely carry

22 some weight. I mean, if this is the kind of plant

23 that the public in the western world is willing to

24 buy, maybe that's one that ought to be put in front of

25 the Commission so that they're aware of it. It may be

1 telling you something.

2 MR. RUBIN: Let me just kind of jump ahead

3 a little bit. In terms of the functional areas that

4 containments serve, there's clearly first and foremost

5 the containment, retention, reduction of fission

6 product release function, the mitigative function.

7 There are other functions, including protective

8 functions in terms of external events, tornado,

9 missiles, aircraft, and the like.

10 The focus of this particular paper at this

11 time is on the function of mitigation of fission

12 product release. Now I'm not familiar with this

13 double containment, but in terms of fission product

14 release, the idea of a conventional leak-type

15 containment is kind of -- probably the extreme case

16 that we're considering.

17 Now when you consider the external events,

18 there may be other kinds of things you want to do to

19 your containment building system, per se - other kinds

20 of shells within a shell, let's say. But the focus

21 right now is on what are the performance requirements

22 for fission product retention, containment,

23 mitigation. That's the focus of this paper at this

24 time, and we will look at the other functions to see

25 what may flesh out when we look at that.

1 Now the industry has said that the way of
2 designing these plants, they start out with a let's
3 say top level objectives of meeting health and safety
4 criteria or expectations, and then from that they
5 develop you might say reactor safety requirements,
6 things like shutting the plant down, containing
7 fission products, removing heat. Some may be
8 technology-specific reactor safety requirements, such
9 as for an ACGR, avoiding chemical attack which doesn't
10 show up as a reactor safety function on light water
11 reactors, per se. So you have some variation right
12 there in one of the top level reactor safety functions
13 from technology. Then from there --
14 MEMBE POWERS: My friends in the
15 metallurgical profession say yes, definitely the light
16 water people have not looked at chemical attack.
17 MR. RUBIN: Okay. From there, they then
18 try to optimize their designs in meeting those reactor
19 safety functions. And the containment may or may not
20 show up in some of those key functions. For example,
21 shutting the plant down, maybe the plant sub-critical,
22 it may not show up there. It could show up in
23 removing accident heated. It certainly will show up
24 in containing fission products and so forth.
25 VICE CHAIRMAN WALLIS: If you could show,

1 really convince me that the fission products could
2 never get out of the fuel which is made so that they
3 can never get out in any conceivable event, then you
4 wouldn't need any containment presumably, because
5 there's no function to be performed.
6 MR. RUBIN: Well, what then comes in is
7 the issue of defense-in-depth.
8 VICE CHAIRMAN WALLIS: Okay. As a
9 performance --
10 MR. RUBIN: There's two major pieces here
11 to the containment functional performance criteria, in
12 terms of mitigating fission products.
13 VICE CHAIRMAN WALLIS: It's other function
14 is a kind of public confidence booster, that you put
15 it there to make people happier.
16 MR. RUBIN: Well, there has to be a
17 balance between prevention and mitigation. If for
18 some reason you fail to prevent that release from the
19 fuel, should there be some sort of a --
20 VICE CHAIRMAN WALLIS: So you're just
21 saying if you're not sure that it's going to be
22 retained.
23 MR. RUBIN: -- defense-in-depth beyond a
24 confinement, which may not have the same functional
25 capability to retain fission products that the fuel

1 was designed to have. It has a role in terms of
2 attenuating the concentrations, but it's not as
3 absolute as the fuel was intended to, so there's an
4 issue of how much defense-in-depth you want in your
5 containment. And that's really, in essence, where the
6 decision lies among the options in terms of fission
7 product release, in terms of picking an option.
8 Do you believe just what you said and say
9 if we rely solely on the fuel, you would in principle
10 say hey, the containment in terms of a confinement-
11 type concept would reduce fission product sufficiently
12 to meet the dose criteria. I'm done. Where's your
13 defense in depth in terms of if fuel were not as
14 effective as you had assumed, that particular concept
15 may not give you additional mitigation capability to
16 compensate for that, so you may want to factor in
17 additional capability beyond what the dose criteria
18 requirements would be.
19 And just to jump ahead, the staff is
20 working on a description of defense-in-depth as it was
21 described earlier, and that description of defense-in-
22 depth is expected this summer, and it will be -- I'm
23 sure it will have as a key feature in there the issue
24 of defense-in-depth of mitigation and fission product
25 retention specifically. We plan to use that

1 particular description when it's developed as a
2 yardstick to look at our options.
3 VICE CHAIRMAN WALLIS: Are you going to
4 have measures of this defense-in-depth so it's not
5 just a philosophical thing, and argue about it.
6 MR. RUBIN: Well, the paper lays out
7 qualitatively the kinds of --
8 VICE CHAIRMAN WALLIS: Well, that's the
9 problem, isn't it?
10 MR. RUBIN: -- defense-in-depth.
11 VICE CHAIRMAN WALLIS: When you get fuel
12 which is better, and better, and better at retaining
13 fission products, you can't just go and say well, it's
14 all irrelevant because we've got to have defense-in-
15 depth.
16 MR. RUBIN: Well, I mean --
17 VICE CHAIRMAN WALLIS: We'll have a
18 measure of these things so you can decide when it's
19 good enough.
20 MS. DROUIN: We have a subcommittee
21 meeting scheduled in July, I think it's all day, where
22 we're going to go through the technology neutral
23 framework, and a large part of that is the defense-in-
24 depth. And it's going to get into a lot of these
25 issues.

1 MEMBER APOSTOLAKIS: We have? July when?

2 MS. DROUIN: I don't remember the exact

3 date in July.

4 MEMBE POWERS: There was a -- following

5 the accident at Chernobyl, Energy Secretary Harrington

6 became very concerned about the energy production

7 reactors, the Department of Energy's production

8 reactors. I mean, they're the biggest reactors that

9 have ever been built in this country, and the public

10 perception that they did not have containments because

11 they deliberately had confinements - when the

12 justification of why the confinement design came up,

13 I think at both of the sites, but especially Savannah

14 River, the design philosophy was well articulated, in

15 which they said they had a peculiar advantage at these

16 sites, that they had control of the population to a

17 much greater extent that you ever do for a commercial

18 reactor. And the advantage of a confinement design is

19 they knew where the fission products would go, and

20 they could just clear that path. And it was just

21 going to contaminate their own site, and it was not

22 going to get beyond it.

23 That always struck me as a peculiarly

24 strong feature of these confinement designs, given

25 that they were strong enough to also serve the other

1 requirement of tanks. Meteorites I think would bounce
2 off some of these confinements. Are you articulating
3 that kind of advantage of the confinement-type
4 concepts that you avoid a pressurized release of
5 fission products when you go to a confinement. And
6 that if you have a confinement with a filtration
7 system, you have even greater control over things?
8 MR. RUBIN: Well, you're jumping ahead to
9 the options. In the options we do go through exactly
10 those points. In the case of if one were to place a
11 traditional containment around a HTGR and one were to
12 have a loss of coolant, you would have some downside
13 to that on safety, in the sense that you might make
14 some of the heat removal systems less reliable. And
15 you also would retain a mode of force for the release
16 of fission products once those fission products were
17 released, a day or two later let's say when the core
18 heated up, whereas a confinement you would release all
19 that energy. You would not pressurize the
20 confinement, and then when fuel were to fail in very
21 some limited manner, let's say, a couple of days
22 later, there would not be mode of force to carry that
23 away, so there is definitely advantage. That is
24 described in the paper, that's described in these
25 charts.

1 I don't know if you want me to keep
2 moving, but that was one of the criteria for
3 evaluating the various options; that being, is the
4 option such that it could have a negative impact on
5 safety in some way? Okay. I won't go through that.
6 We've been talking a lot about what are the
7 considerations. This lists some of what I'll call the
8 generic policy guides that the Commission has set out
9 to -- that has guided our development and assessment
10 of the various options. I won't go into those. We're
11 all familiar with those.
12 And then what I have is another list of
13 what I'll call Commission policy decisions that are
14 more specifically directed at non-light water reactor
15 licensing. And several of these came out in the
16 recent policy decisions on the SECY on light water
17 reactors, that being that risk should be considered to
18 a greater extent, and identifying events to be
19 considered in the design-basis of containment, things
20 like using scenario-specific source terms rather than
21 bounding ones.
22 In the past, prior Commissions have
23 indicated that the containment requirements should not
24 be so stated as to discourage accident prevention and
25 innovation in advanced reactor designs. They should

1 not be so excessive, so to speak. And past Commissions
2 have also indicated, at least for ACGRs, a desire for
3 the staff to take a look specifically at air ingress
4 and core oxidation, and the benefits that might be
5 derived in terms of prevention from the containment
6 itself in preventing that kind of an event. So these
7 are some of the things that we've had as kind of guide
8 posts for assessment.
9 As was pointed out earlier, there is a
10 relationship between what the work here and the work
11 on the framework. The intent is that the requirements
12 at least that we are developing for containment, the
13 options, they be technology-neutral risk-informed and
14 performance-based.
15 Once one gets down to criteria, there's
16 been an argument within the industry, and I think we
17 tend to agree with that. Once you get down to the
18 specific criteria, you need to consider the specific
19 technology and how the criteria for it makes sense.
20 And also, defense-in-depth, as we
21 mentioned earlier, that's going to become a kind of a
22 measure of evaluating each of the options, because
23 this option seemed to optimize the application of
24 defense-in-depth compared to another one. And that
25 will be coming this summer. We'll be able to do that,

1 hopefully.

2 The outcome will have two possibilities.
3 One is, of course, to put into the framework the
4 Commission policy decisions in terms of developing
5 actual regulations, and also will be of use in making
6 decisions on COL and design certification applications
7 on a plant-specific basis.

8 This lists some of the background
9 documentation we looked at. There certainly was a
10 lot. I would point out that we also looked at foreign
11 plants, and operating plants, as well as concepts,
12 things like the HTTR in Japan, the HTR-10 which is a
13 pebble bed reactor in China. We looked at some of the
14 concept plants that are being developed in Japan, and
15 the containments that are applied in each case. And
16 also, the DOE reactors that comprise several different
17 technologies.

18 Let's just go to the next slide. This
19 then again is basically the list of six functional
20 areas that a containment can serve in reactor safety.
21 Again, not all these functions are necessarily
22 required of a containment. Some of these functional
23 areas are let's say a collateral benefit of
24 containment, because it was put there for reasons of
25 let's say mitigation of fission product release. They

1 certainly have come to be very important in terms of
2 prevention of damage of bio-equipment due to external
3 events, external sabotage, security incidents and the
4 like. So this is a list that I think the industry
5 would support.
6 I will say on bullet number 2, bullet
7 number 2, the idea being there that the containment,
8 at least in terms of some HTGRs, in terms of
9 preventing or limiting air ingress has a vital role to
10 limit the amount of air that would be available for
11 air ingress. If you were to read the safety
12 evaluation for the HTTR in their concept plants, the
13 Japanese view the containment's primary purpose for
14 being there is to limit the amount of air, and to a
15 lesser extent to mitigate fission product release.
16 Okay. So on that basis, I wanted to make it more
17 prominent in terms of its importance.
18 And also, in other systems, such as liquid
19 metal reactors, the containment provides kind of a way
20 of containing the loss of coolant in a reactor coolant
21 pressure boundary so that it doesn't go away and it's
22 still there to cover the core, so it prevents core
23 damage in that sense. And certainly, on light water
24 reactors, there are some core damage prevention
25 factors involved.

1 I put the first one in italics because
2 that is the one that we're really focusing on now in
3 this preliminary paper.
4 VICE CHAIRMAN WALLIS: Is all this going
5 to become more specific, such as limit to some value
6 rather than just reduce --
7 MR. RUBIN: Yes. Well, I'm going to get
8 to that. This is kind of a generalized statement.
9 We'll get more specific. Okay.
10 MEMBER APOSTOLAKIS: When you say
11 potential safety function, so that follows a column,
12 says containment building system. So shouldn't these
13 six bullets refer to the containment?
14 MR. RUBIN: That's the intent. In other
15 words, once you --
16 MEMBER APOSTOLAKIS: The second doesn't.
17 MR. RUBIN: The second bullet?
18 MEMBER APOSTOLAKIS: Core damage.
19 MR. RUBIN: Yes, it does. Well, I thought
20 I gave you an example. I talked to you about HTGRs as
21 an example. In fact, I'll just mention it now. Let's
22 go to the next page, and I'll give you an example of
23 that.
24 If you go into the advanced HTGR group,
25 and I think you might find this one interesting, the

1 last bullet is the GTHTR-300. Okay. This is a plant
2 on the drawing boards in Japan which is intended to be
3 the power reactor concept for the next generation.
4 Let me put this one up. They call that a double
5 confinement. Okay. You have an HTGR system on the
6 lower part of the drawing below grade, and above it
7 you have another volume, and the two are connected by
8 - you can see a vent valve. And the upper containment
9 has a secondary vent valve. Okay.
10 The idea being, that if you have a break
11 in the reactor cooling system, those valves open much
12 as would a confinement-type space to relieve that
13 pressure and to relieve that coolant and fission
14 products that might be the prompt release of fission
15 products, but then following the depressurization,
16 those valves close. The reason being is they want to
17 limit the amount of volume that's available for air to
18 interact with the core graphite. That's the principal
19 reason for that design. And, of course, it still
20 would have the functionality of play-out fission
21 products due to slow heat-up and releases that would
22 occur in a delayed fission product release sense.
23 Okay. The purpose of this design is to prevent core
24 damage.
25 VICE CHAIRMAN WALLIS: How is this thing

1 cooled following an event? How is the K heat removed?
2 MR. RUBIN: Well, as in any modular HTGR,
3 it's through natural --
4 VICE CHAIRMAN WALLIS: It just sits there.
5 MR. RUBIN: It just sits there in like a
6 cup of tea, you know, cooling off.
7 VICE CHAIRMAN WALLIS: So part of the
8 purpose of this thing is also to confine the heat.
9 MR. RUBIN: Oh, yes. Those are the other
10 functions. The reason I threw this up and explained
11 it was to try to point out the function of prevent or
12 limit core damage. This was an example of that second
13 bullet. That's the basis for this design, is to limit
14 the amount of air.
15 VICE CHAIRMAN WALLIS: And it shouldn't be
16 so insulated that it let's it heat up too much. It's
17 got to --
18 MR. RUBIN: Oh, yes. It still has to
19 remove heat and all the other functions.
20 MEMBER APOSTOLAKIS: But would they still
21 have to show here that the release frequency of
22 radioactivity is 10 to the minus 5 or less, with one-
23 tenth of that due to the confinement?
24 MR. RUBIN: The confinement would be
25 taking credit for it in terms of the mechanistic

1 source term would then be used to calculate the
2 releases --
3 MEMBER APOSTOLAKIS: In other words, I
4 thought the goals that Mary is developing will give
5 credit to prevention, but up to a limit. You still
6 want something for the confinement, so that's why I
7 question that bullet. But now you've explained it, I
8 understand it better.
9 MR. RUBIN: Okay.
10 MEMBER APOSTOLAKIS: Prevent or limit
11 potential core damage. We still need something
12 though.
13 MR. RUBIN: Yes. I think that's
14 consistent with --
15 CHAIRMAN BONACA:: But that bullet still
16 is reduce radioactivity release to the environment, so
17 how is that --
18 MR. RUBIN: It has really two functions.
19 CHAIRMAN BONACA:: What are the functional
20 requirements of that?
21 MEMBER APOSTOLAKIS: It's a matter of
22 interpreting the slide. All right.
23 MR. RUBIN: Okay. So anyway, the point
24 I'm trying to make here is among the non-light water
25 reactors we see a range of containment choices,

1 ranging from the traditional confinement vented low
2 pressure containment in the first two, a traditional
3 containment in the HTGR, a double confinement which is
4 a variation to prevent core damage to the air ingress,
5 moving down to the small liquid metal reactors what we
6 see there is the 4S reactor from I think Toshiba, and
7 the STAR, and SSTAR both leak-type pressure retaining-
8 type reactors. And we believe that the Molten Salt
9 reactors are going to be much the same as a
10 traditional-type containment in terms of bottling up
11 fission products.
12 MEMBER KRESS: That Molten Salt reactor,
13 that's a Molten Salt cooled reactor?
14 MEMBE POWERS: Yes.
15 MR. RUBIN: Right.
16 MEMBER KRESS: Not the traditional Molten
17 Salt reactor.
18 MEMBER ROSEN: No, it's not with integral
19 for fuel.
20 MEMBE POWERS: I didn't know anybody gave
21 any credence to the traditional one.
22 MEMBER KRESS: At least one person does.
23 MEMBE POWERS: One person does.
24 MR. RUBIN: The question was asked well,
25 what are the requirements ultimately on containment,

1 and the key first requirement in all the options, and
2 I'll like to just introduce to you now what they are,
3 and these are preliminary subject to refinement,
4 change, et cetera, is that the on-site and off-site
5 radionuclide dose acceptance criteria for the event
6 categories, and the framework is developing curves
7 that will kind of set some context for that.
8 In the first case, the events that would
9 be considered in the containment design basis would go
10 down to let's say the traditional cutoff of 10 to the
11 minus 5th or 10 to the minus 6th, a level that is
12 indicative of -- that does not lead to severe core
13 damage in light water reactors. That would be the
14 cutoff for those kinds of events.
15 The second option is the same as the first
16 option, except that the designer would be forced to
17 include events of lower probability into his design-
18 basis analysis; the idea there being that those
19 additional lower probability events would in some
20 cases have higher consequences in terms of source
21 term, and would challenge the containment design more.
22 And might, in fact, result in additional containment
23 fission product mitigation capabilities.
24 MEMBER KRESS: I read those two as saying
25 they're going to now use the whole spectrum of events

1 as the design-basis?

2 MR. RUBIN: Yes. Essentially.

3 MEMBER KRESS: Okay.

4 MR. RUBIN: Okay. So these are kind of a

5 rationalist spectrum. We're now moving into a

6 structuralist option in item 3, the idea being there

7 the requirement again would be you'd have to meet the

8 dose criteria for the event categories. In this

9 particular item 3, we would go back to the more

10 traditional cutoff of frequency. But the containment

11 would also have to have a capability to handle source

12 terms that were unexpectedly higher than what would be

13 predicted from the mechanistic source term analysis.

14 And we could argue about well, how much higher, and

15 how much additional mitigation capability. Are we

16 talking about a couple of decades of additional

17 mitigative capability to reduce fission products, and

18 that's TBD. But there would be some additional

19 requirement there.

20 And a key within this particular option is

21 that some have called it a hybrid containment design,

22 is that you have the capability to button-up or seal,

23 or make low leakage a containment that was initially

24 a high leakage-type containment. So if there is an

25 unexpected increase down the road a couple of days

1 later of fission products, you will have already taken
2 action to seal it up in a way. Okay.
3 The fourth option is again the traditional
4 conventional containment. Now we tried to establish
5 some measures to how to compare each of these options
6 to one another, and so we developed some valuation
7 metrics, and other considerations.
8 This next page lists what we think are
9 really important considerations from a safety
10 regulator's point of view.
11 MEMBER KRESS: Now when you say dose, are
12 you incorporating some thought of emergency response
13 there, or is this once fission product radioactivity
14 gets to a given point at the site boundary or
15 something?
16 MR. FLACK: I'm assuming this is the Part
17 100 you're talking about at this point.
18 MEMBER KRESS: So that doesn't have
19 anything to do with emergency response.
20 MR. RUBIN: No, no, no. The folks who are
21 working on the framework are trying to develop a
22 consequence versus frequency curve. Okay. And then
23 there is going to be some frequency bands that
24 correspond to abnormal occurrences, design-basis, and
25 then you have emergency planning-basis events. Okay.

1 And so the idea would be the containment needs to --
2 for the various events in those bands needs to meet
3 the consequence criteria that you've established. And
4 we're trying to do it on a technology-neutral basis,
5 and specific plants have proposed specific curves for
6 their plant designs, based on a light water reactor
7 dose requirements Part 100 and the like. But that's
8 the idea.
9 MR. FLACK: TBD.
10 MR. RUBIN: TBD on that. Getting back to
11 Dana's point, would there be any adverse effect on
12 safety functions. Some of these could have adverse
13 effects, and we really don't want to get into that
14 situation.
15 Would the containment option be such that
16 it could undermine the designer's interest in
17 preventing accidents or even being innovative? Could
18 it be so onerous that there'd be no interest in
19 creating fuel that never fails?
20 The next bullet is much like we talked
21 about are there features that would come out in the
22 wash, so to speak, of the containment design that
23 would serve to prevent or limit core damage simply by
24 this particular criteria that we would impose. And
25 you will see some do and some don't.

1 Is the requirement performance-based and
2 risk-informed, which is the intent of this exercise.
3 And would the requirement provide flexibility in the
4 way it's stated.
5 The other considerations which are perhaps
6 not from a safety regulation point of view, as
7 important, but we believe should be brought to the
8 attention of the Commission, are things like is this
9 a technology-neutral type of requirement because we
10 certainly want it to fit within the plans to
11 incorporate into our new framework. Is it something
12 that seems to be in consonance with what the designers
13 are working against now, and have put a lot of design
14 finalization into, or is this something that's going
15 to totally create a new requirement for that
16 containment? Not that that would be all that critical
17 to a safety regulator, but I think they would be
18 interested in knowing about that.
19 We give the increased costs associated
20 with those differences, and would they be commensurate
21 with the safety benefits that one would perhaps get
22 out of it? And do we see the various options as
23 detracting from or adding to public confidence by the
24 nature of that mitigation capability?
25 With that, I'd like to just quickly go

1 through each of those four options in terms of how
2 they would be implemented.
3 MR. FLACK: Well, at this point we should
4 probably have about 10 minutes left.
5 MR. RUBIN: Okay.
6 MR. FLACK: Can you go through them in 10
7 minutes? It's a lot more detailed as you move into
8 each of these options, and maybe we should just leave
9 it up to the Committee whether they want to hear that.
10 MR. RUBIN: Yes. Well, I'm just throwing
11 it open now. I mean, you can see from the slides,
12 they're pretty self-explanatory. The first option
13 again --
14 CHAIRMAN BONACA:: Maybe if there's
15 anything that you want to emphasize in particular,
16 without going over them one by one?
17 MR. RUBIN: Well, I mean the options speak
18 for themselves. I think what we really need to see
19 ultimately is what level of defense-in-depth do we
20 want as a regulatory agency in that containment in
21 terms of a backstop for the uncertainties, the
22 unknowns that we haven't considered in these designs.
23 And that defense-in-depth measure will then drive you
24 toward which option is going to be most optimal.
25 MEMBE POWERS: Let me ask you a question

1 of a philosophical nature concerning your options. In
2 several cases, you say that we're going to use some
3 deterministic engineering judgment to evaluate some of
4 these concepts. And we probably will not have
5 prototypic experimental data on any new containment
6 design. In other words, you're going to have to rely
7 on pure analysis for that judgment. Well, I think for
8 instance, suppose that we just wanted to know how the
9 radioactive aerosols behaved in a containment or a
10 confinement design, and we have a lot of codes that
11 purport to do that, but they have never been tested
12 against real radioactive aerosol. And so there's a
13 leap of faith going on there when we do those
14 analyses. So there presumably has to be a margin
15 above and beyond these -- I mean, there is no
16 engineering judgment here because no one has ever seen
17 radioactive aerosol in a reactor containment. I mean
18 there's no experience with this. There's just
19 approximation of codes, so you have to have some sort
20 of margin beyond what you get from some deterministic
21 calculation. Is that kind of thinking built into the
22 development of these options?
23 MR. RUBIN: Well, yes. That was the
24 intent of the last bullet on each of these slides.
25 The staff will recommend enhancements to address

1 potential areas of high uncertainty, and would be
2 subject to Commission endorsement. And so that really
3 is kind of a caveat to all of these. And in the
4 previous advance reactor designs I do believe there
5 were staff recommended enhancements. I'm not sure
6 they affected the containment, per se. They may or
7 may not. I'm not that familiar with it, and they were
8 endorsed by the Commission, and they became part of
9 the certification of those designs. So that bullet is
10 part of the process.
11 I can't tell you how it's going to turn
12 out. I don't know what kind of technology program
13 they have. They may address it by the time they come
14 in, but it probably won't.
15 MEMBE POWERS: I think you answered my
16 question. And I think you'd be remiss if you tried to
17 go more detailed than this because you don't know what
18 these guys are going to come up with.
19 MR. RUBIN: And the reason I put that
20 bullet on there is to make clear that there is a trap
21 door in a way to even though you start out with a
22 vented low pressure containment, there may be some
23 reason even in entertaining that design where you want
24 to add some additional features or capabilities like
25 sealing down the road in an event that would be awed

1 by that process. But I can't say we will or will not
2 get to enhancement, but the process allows for it
3 based on the uncertainties.
4 MR. KING: Spray system in AP-600. That's
5 the example of what you're talking about.
6 MEMBE POWERS: I mean at that point it was
7 imposed strictly because of overall uncertainty in
8 what the analyses were. As we move into these
9 confinement designs, I worry about things -- I worry
10 about people being over-enamored in our ability to
11 predict these things. For instance, a great deal of
12 stir was created recently over the subject of iodine
13 formation and the effect of silver. And then all of
14 a sudden they find out in subsequent experiments they
15 didn't get all the silver where it's needed to control
16 the iodine. If you've done analyses in-between these
17 two, you might get very different confinement designs.
18 I mean, we're still discovering things because we
19 can't test it full-scale with full prototypicity. You
20 know, you're going to discover these things kind of
21 one at a time, and you have to recognize sometimes
22 there are substantial changes in your understanding.
23 MR. RUBIN: Well, that's really the issue
24 of defense-in-depth. You can only solve so much at
25 the time you're asked to sign on the dotted line, and

1 you want to have something in your back pocket, and
2 the guidance will give us an indication of what that
3 needs to be.
4 MEMBE POWERS: I couldn't have said it
5 better myself.
6 MR. RUBIN: Right. Are there any other
7 questions?
8 MR. FLACK: So you want to skip the
9 options and go to the end.
10 MR. RUBIN: Okay. Let me just tell you
11 where we're headed under the milestones. Following
12 this meeting, we plan to have another public meeting
13 in August, and there the industry wants very much to
14 provide much more substantive presentations on their
15 bases for the various containment options. And we
16 will present where we are too.
17 Again, the defense-in-depth description
18 will be in place in August, and that will give us a
19 good yardstick to then measure the various options.
20 We would like to meet one more time on the final
21 options with the public around the October time frame.
22 We would then come back to the ACRS with what might be
23 viewed as the final options and recommendation. And
24 we will also combine that with a framework. It may
25 take a whole day, but it will be combined with the

1 framework. And then we'll put it in a SECY paper by
2 the end of the year with those proposed options, the
3 pros and cons, and the recommendations.
4 In summary then, we're at a point where we
5 have pushed the assessment to a point where we have
6 some preliminary options that range from you might say
7 totally rationalist to structuralist. The options at
8 this point are focused on reducing radioactivity
9 release to the environment, that particular mitigative
10 function. We're going to look at the merits of
11 developing requirements for the other five functional
12 areas, that's appropriate. And we'll develop those
13 options again as it makes sense.
14 And again, by the end of the year we'll
15 have those final options for your review and the
16 Commission's review. And, hopefully, we will be able
17 to get a policy decision, at least on the mitigative
18 aspect of it. Let me just stop there.
19 MR. FLACK: Okay. And that, I guess,
20 concludes our presentation.
21 MEMBER SIEBER: You didn't do your last
22 slide.
23 MR. RUBIN: Oh, yes.
24 MS. DROUIN: Sorry. We'll go right to the
25 very end.

1 MR. FLACK: All right. Agreement of
2 staff, send letters and form staff recommendations.
3 MEMBE POWERS: Well, I mean the agreement
4 here is -- certainly leads you to be confident that
5 this will be the outcome.
6 MR. FLACK: Well, we appreciate that.
7 MEMBER ROSEN: I think there would
8 probably be 10 plus 1 opinions.
9 MS. DROUIN: We are trying to finish a
10 draft of the framework in time to get it to the ACRS
11 in June. We have a time set for a subcommittee
12 meeting in July. I believe we have it all day. We
13 have a public workshop scheduled in August. I think
14 it's a two-day workshop, I think the 17th and 18th. I
15 might have the dates wrong. We'd like to then come
16 back in the November and December time frame to the
17 Full Committee, where we will be asking for a letter,
18 and to send the framework up to the Commission in
19 December, where we would be releasing it for formal
20 public review and comment. And that's just quickly --
21 MR. FLACK: Things to come.
22 MS. DROUIN: Things to come.
23 MEMBER KRESS: We look forward to it. I
24 turn the session back to you, Mr. Chairman.
25 CHAIRMAN BONACA:: I thank you for the

1 presentations. We'll take a break until 5 after 4.
2 Please be back at 5 after 4. We're really running out
3 of time. We have a lot of work.
4 (Whereupon, the proceedings in the above-
5 entitled matter went off the record at 3:43 p.m.)
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CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: Advisory Committee on Reactor Safeguards 511th Meeting

Docket Number: n/a

Location: Rockville, MD

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Rebecca Silberman

Rebecca Silberman
Official Reporter
Neal R. Gross & Co., Inc.

STABILIZING THE PRA QUALITY EXPECTATIONS AND REQUIREMENTS

Presentation to ACRS

April 15, 2004

D. Harrison, S. Magruder, G. W. Parry,

M. Tschiltz, NRR

M. T. Drouin, RES

PURPOSE OF PRESENTATION

- To present an overview of the draft action plan for response to SRM COMNJD-03-0002 - Stabilizing The PRA Quality Expectations and Requirements
- To seek agreement on approach

PRA QUALITY

- Defined in RG 1.200
  - For a given application, PRA Quality is determined by the appropriateness of
    - Scope (internal and external initiating events, full power and low power and shutdown operating modes)
    - Level of detail
    - Technical acceptability

APPROACH IN THE SRM

- Adopts a phased approach to achieving an appropriate quality for licensee PRAs for NRC's risk-informed regulatory decision-making
- Allows continued practical use of risk insights while progressing towards more complete, and technically acceptable PRAs

SRM DIRECTION

- Directs the staff to develop an action plan to:
  - Define a practical strategy for implementation
  - Address the resolution of technical issues, such as:
    - Model uncertainty
    - Seismic and other external events
    - Human performance issues

STATUS

- Interoffice (NRR/RES) working group established
- Draft plan made available 3/15
- Soliciting input from stakeholders
  - Conducted two public meetings (2/24 and 3/24), a third planned (5/12)
  - Met with ACRS subcommittee (3/25), will meet full committee (4/15)
  - Letters from NEI, and ASME/ANS
- Final plan due to Commission 7/04

THE PHASED APPROACH

- The phases are differentiated by the availability of the guidance documents for using PRA in regulatory applications, and establishing that the PRAs are of sufficient quality. These include:
  - industry consensus standards
  - industry guidance documents
  - regulatory guides
- Staff guidance documents addressing performance of reviews are required for implementation.

PHASE 1

- Phase 1 represents the status quo
- PRA quality judged only in the context of what is needed for the application - no requirement for the review of the base PRA
- All contributors to risk (operational modes and initiating event types) are addressed
- Contributors to risk not in the scope of the PRA model are addressed in a number of ways including qualitative arguments, bounding analysis, and restricting the scope of application

PHASE 2

- An application type ("issue-specific") approach to PRA quality
- PRA quality demonstrated by comparison with an applicable consensus standard for those elements required by the application
- All contributors to risk (operational modes and initiating event types, internal, seismic, fire, etc.) are addressed
- All <u>significant</u> risk contributors applicable to the issue are <u>included in the PRA scope</u>
- Significance of a contributor is determined by whether taking it into consideration could change the decision substantially

PHASE 2 (Cont'd)

- To achieve Phase 2, guidance must exist for
  - Use of PRA in making the decision (e.g., regulatory guides), including definition of scope
  - Assessment of the quality of the base PRA for each scope item used to support the application (e.g., Standards, RG 1.200)

PHASE 3

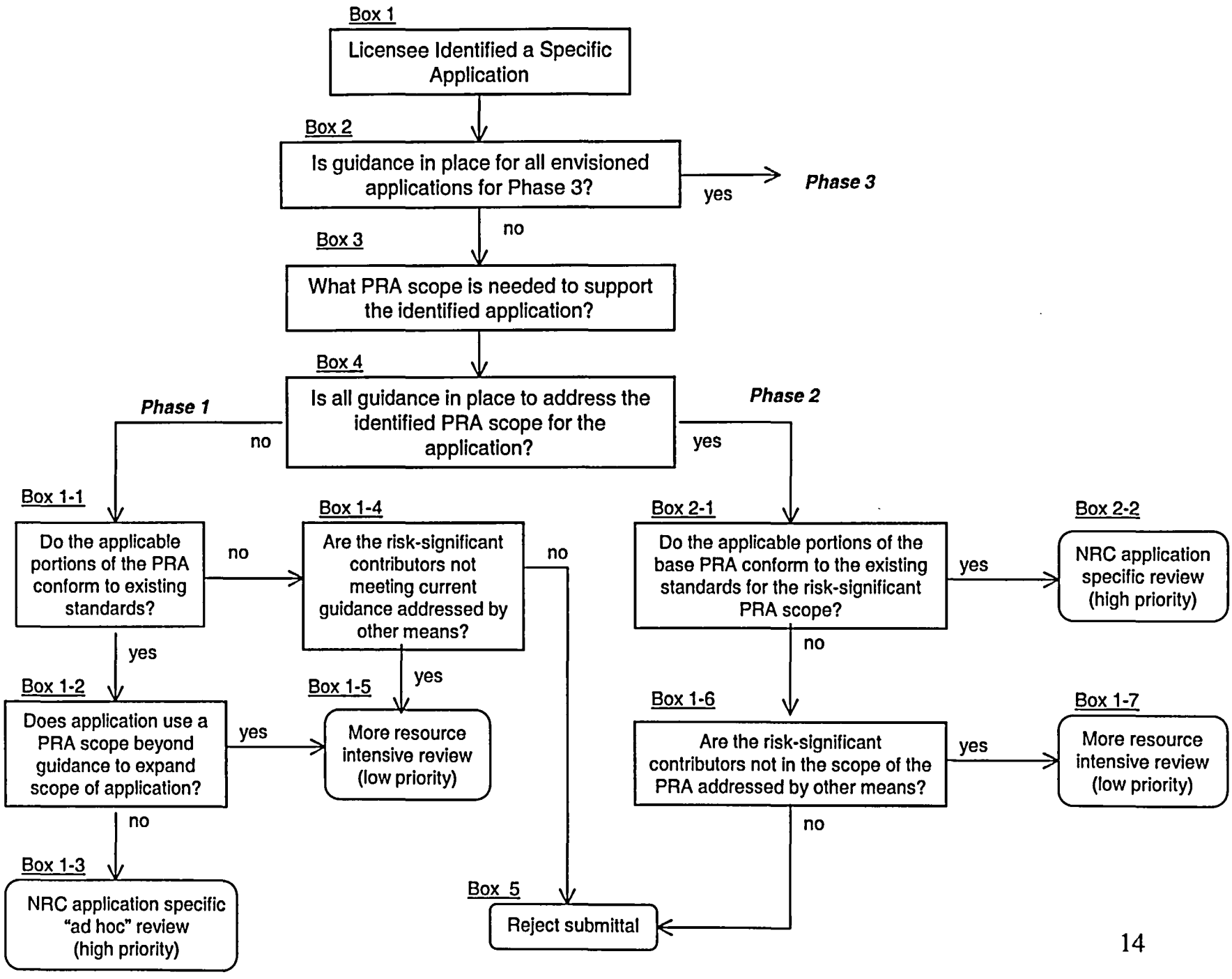
- Regulatory framework is in place that enables licensees to develop a base PRA to conform to all the existing Standards in sufficient depth to address all currently envisioned applications
- Phase 3 is scheduled to be completed by December 31, 2008
  - Consistent with schedule for Standards development
- A licensee enters Phase 3 when its base PRA conforms to all the existing Standards in sufficient depth to address all currently envisioned applications

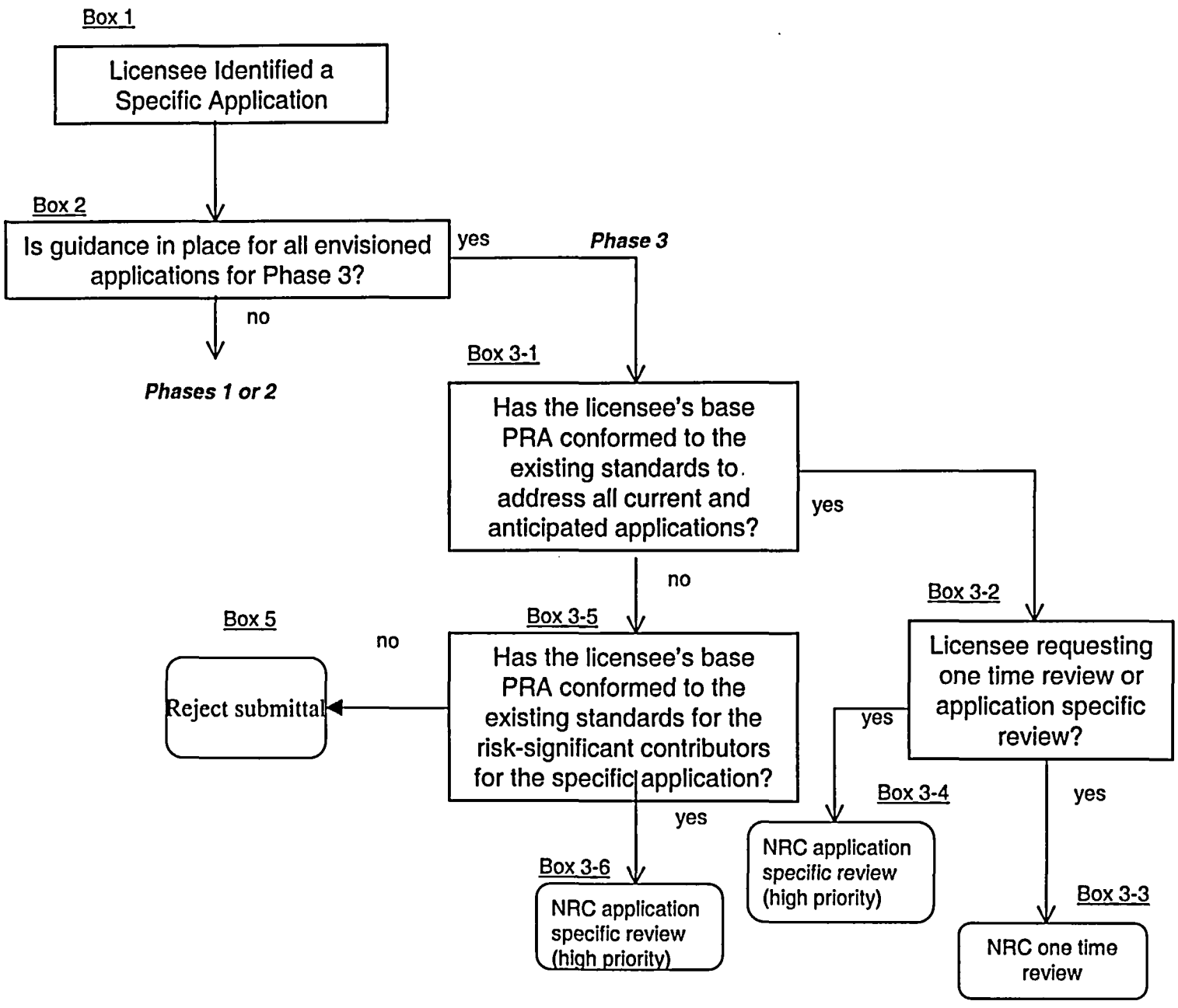
PHASE 4

- Phase 4 will be reached when a PRA has been developed to the state-of-the-art (e.g., CC III)
- It is recognized that reaching this goal will be resource intensive both for licensees and NRC
- Phase 4 involves direct staff review and approval of licensee PRAs
- This plan does not address Phase 4

STAFF REVIEW OF BASE PRA

- Phase 1: currently at the discretion of the reviewer but after trial use completed, will rely on peer review in accordance with RG 1.200 with audit for each application
- Phase 2: reliance on RG 1.200 for all significant contributors
- Phase 3: as for Phase 2 but performed one time sufficient to address all applications
- Phase 4: staff review and approval of base PRA


Box 1
Licensee Identified a Specific Application
Box 2
Is guidance in place for all envisioned applications for Phase 3?
yes
Phase 3
no
Box 3
What PRA scope is needed to support the identified application?
Box 4
Is all guidance in place to address the identified PRA scope for the application?
Phase 1
no
Phase 2
yes
Box 1-1
Do the applicable portions of the PRA conform to existing standards?
no
Box 1-4
Are the risk-significant contributors not meeting current guidance addressed by other means?
no
Box 2-1
Do the applicable portions of the base PRA conform to the existing standards for the risk-significant PRA scope?
yes
Box 2-2
NRC application specific review (high priority)
yes
Box 1-2
Does application use a PRA scope beyond guidance to expand scope of application?
yes
Box 1-5
More resource intensive review (low priority)
yes
no
Box 1-6
Are the risk-significant contributors not in the scope of the PRA addressed by other means?
yes
Box 1-7
More resource intensive review (low priority)
no
Box 1-3
NRC application specific "ad hoc" review (high priority)
Box 5
Reject submittal
no


Box 1
Licensee Identified a Specific Application
Box 2
Is guidance in place for all envisioned applications for Phase 3?
yes
Phase 3
no
Phases 1 or 2
Box 3-1
Has the licensee's base PRA conformed to the existing standards to address all current and anticipated applications?
yes
no
Box 3-2
Licensee requesting one time review or application specific review?
yes
Box 3-4
NRC application specific review (high priority)
yes
Box 3-3
NRC one time review
Box 3-5
Has the licensee's base PRA conformed to the existing standards for the risk-significant contributors for the specific application?
no
Box 5
Reject submittal
yes
Box 3-6
NRC application specific review (high priority)

POTENTIAL POLICY ISSUE #1

- Issue: If a licensee uses a PRA scope greater than that for which standards exist simply to increase the scope of relaxation of requirements, should the submittal be given low priority? Recommendation: Yes
- Pro: - Staff review would be extensive – no agreed upon standards for acceptable quality
  - Incentive to complete standards
- Con: - Potential for disincentive to develop more complete PRAs prior to completion of standards
  - does not reward proactive licensees

POTENTIAL POLICY ISSUE #2

- Issue: If a licensee submits an application for which all the applicable guidance documents are in place (Phase 2), but doe not conform to the guidance, should the application be given low priority (subject to availability of resources) or rejected outright? Recommendation: low priority
- Pro: Rejection would send the message that the submittal would be inadequate, which could be taken to imply that prior applications were approved inappropriately
- Con: Rejection might encourage more development and use of more complete PRAs

POTENTIAL POLICY ISSUE #3

- Issue: When all guidance for all current and anticipated applications is in place (Phase 3), should every licensee be required to conform to that guidance before submitting any risk-informed submittals? Recommendation: No
- Pro: If a licensee is only interested in a small number of applications, development of a full scale PRA would be an unnecessary burden
- Con: - The availability of PRAs of predictable and consistent quality would be beneficial in analyzing events and performing Phase 3 SDP evaluations
  - If not, there is no forcing function to go to Phase 3

POTENTIAL POLICY ISSUE #4

- Issue: When all guidance for all current and anticipated applications is in place (Phase 3), should an application that does not conform to the Phase 2 guidance for that application be rejected outright? Recommendation: Yes
- Pro: - Reinforces the Commission's goal for more complete PRAs

  - Increased efficiency in staff review
- Con: Industry could argue that conservative bounding analyses should still be allowed for significant contributors, since they have been allowed in the past

POTENTIAL POLICY ISSUE #5

- Issue: If the SDOs decline to produce a Standard considered necessary for an application, should NRC develop its own guidance? Recommendation: Yes
- Pro: - Could be performed more quickly and more efficiently than a standard document

  - Staff development of guidance could provide an incentive for industry to develop their own guidance
- Con: Potential for a lack of alignment with industry on a voluntary initiative

STAFF ACTIVITIES TO IMPLEMENT THE PHASED APPROACH

- Supporting development and endorsement of PRA standards
- Updates to regulatory guides (including RG 1.200)
- Development of regulatory guides for new applications (e.g., 50.69, 50.46)
- Developing methods and supporting documents for technical issues (e.g., NUREGs)
- Developing staff implementation guidelines (e.g., SRP, office instructions)

INDUSTRY ACTIVITIES

- Develop consensus standards:
  - low power and shutdown PRA (2005)
  - Fire PRA (2005)
- Develop guides for applications (e.g., NEI-00-04)
- Provide update to NEI-00-02 (self-assessment process)

SCHEDULE

- The schedule for transition to Phase 2 and Phase 3 for all current applications is driven by the schedule on which the relevant guidance documents, in particular, Standards, are developed and endorsed.

Table 3.3 Milestones

MILESTONE	PROJECTED COMPLETION DATE
Identify Current Risk-Informed Applications (e.g., 50.69)	July 30, 2004
Identify PRA Quality Needs for Each Risk-Informed Application	December 30, 2004
Revise Application-Specific Guidance to Address PRA Quality	December 30, 2005
PRA Quality (RG 1.200) Pilots for Internal Events	December 30, 2004
Implementation - Quality for Internal Events PRA (Note 1)	September 30, 2005
Alternate Methods & Treatment of Uncertainties NUREG	December 30, 2004
Standards Development - ANS External Events PRA Quality	*Completed*
NRC Endorsement - ANS External Events Standard	December 30, 2004
Implementation - Quality for External Events PRAs (Note 1)	December 30, 2005
Standards Development - ANS Fire PRA Quality	June 30, 2005
NRC Endorsement - ANS Fire PRA Standard	June 30, 2006
Implementation - Quality for Fire PRAs (Note 1)	June 30, 2007
Standards Development - ANS Low Power & Shutdown PRA	June 30, 2005
NRC Endorsement - ANS Low Power & Shutdown Standard	June 30, 2006
Implementation - Quality for Low Power & Shutdown PRAs	June 30, 2007
Develop Phase 3 Guidance	

Note 1: For the purposes of this draft, it is assumed that the Standards documents will lag the guidance documents for the applications. It is further assumed that a delay of one year between the completion of the quality guidance documents and that time at which each application is expected to conform to those documents is sufficient for the review of the associated PRA elements to be completed. Furthermore, this time delay allows for the staff infrastructure necessary to transition to Phase 2 to be developed.

RESOLUTION OF TECHNICAL ISSUES

- Model uncertainty
  - Guidance document (e.g., NUREG) being developed that addresses the issue of treatment of uncertainties (e.g., model) in both the PRA and in decision making
- Seismic and other external events
  - ANS standard on external events under staff review (preliminary staff position for public review and comment this summer)
  - Above document (on uncertainties) also includes guidance for acceptable alternative methods (e.g., bounding, sensitivity analyses) to a PRA
- Human performance issues
  - NUREG on good HRA practices to supplement the PRA (HRA) standard

NEXT STEPS

- Incorporate stakeholder comments
- Finalize plan
- Send to Commission in July

United States
Nuclear Regulatory Commission

ACRS FULL COMMITTEE MEETING

Status on rulemaking on 10 CFR 50.46 (Large break LOCA redefinition)

Glenn Kelly, NRR
gbk@nrc.gov
Eileen McKenna, NRR
emm@nrc.gov
April 15, 2004

AGENDA

- Purpose
- Background
- Staff Activities
- Technical/regulatory issues and activities to resolve
- Summary and Conclusion

PURPOSE

- Inform ACRS about staff activities for large break LOCA redefinition rulemaking in response to SRM
- Obtain feedback from committee about technical issues and staff activities to resolve these issues and relationship to the rulemaking

BACKGROUND

- Option 3 studies of feasibility of changes to requirements in 50.46

- March 31, 2003, SRM tasked staff for two rulemakings:
  - prepare a proposed rule that allows for a risk-informed alternative to the present maximum LOCA break size

  - prepare a proposed rule that would risk-inform the ECCS functional reliability requirements and thus relax the current requirement for large break LOCA with coincident loss-of-offsite power (LOOP).

- SRM contained several other provisions about the rulemaking features (see next slide)

SRM FEATURES

- Staff to develop rule allowing voluntary risk-informed alternative maximum LOCA break size

- Commission suggests change to definition of LOCA to exclude breaks with low risk contribution.

- Staff must establish "risk cutoff" for defining the maximum LOCA break size (Commission offers examples of possible criteria)

- No changes to functional requirements unless fully risk-informed (For example, no changes to ECCS coolant flow rates or containment capabilities)

SRM FEATURES (cont.)

- Licensees who seek the benefit of redefinition should be required to use best-estimate (ECCS evaluation) codes

- Once standards are in place, the PRA should be level 2 internal and external-initiating event all-mode PRA, which has been subjected to peer review process and submitted to and endorsed by the NRC.

- Operational changes should be reversible if LOCA frequency re-estimates (to be done every 10 years) make changes unacceptable

STAFF ACTIVITIES SINCE 50.46 SRM ISSUANCE

- Analyzed SRM direction, intent and implications.

- Obtained stakeholder input which revealed varying expectations on scope of application of redefinition and implementation requirements. Some industry proposals for plant changes include removal of equipment, power uprates, exclusion of breaks from sump blockage consideration.

- Began development of possible rule concepts for implementing LOCA redefinition. The intent is to coherently integrate all aspects of using risk to redefine the design basis, to make changes to the plant, to incorporate high-quality appropriate-scope PRAs, and to ensure that changes are adequately monitored and controlled over the life of the plant.

STAFF ACTIVITIES (cont.)

- Identified technical and regulatory issues needing further development that would significantly impact on any rulemaking and its implementation.

- Initiated selected research to produce some of the additional information needed to resolve the issues and proceed with rulemaking (e.g., thermal/hydraulic sensitivity studies for selected risk-informed potential changes, such as power uprates).

- Briefed Commission assistants and forwarded Commission paper identifying policy issues for Commission direction and technical issues to be resolved for moving forward with rulemaking. In particular, staff raised issue as to whether rule should be "narrow" (e.g., specific set of changes allowed) or "broad."

TECHNICAL AND REGULATORY ISSUES

1. What are the appropriate criteria and needed confidence in elicitation results (due to significant uncertainties) for determining a new maximum (design basis) LOCA break size? For example, given uncertainties what is the technical justification for use of LOCA frequencies developed through an expert elicitation panel for potentially significant changes in plant safety capability?

2. What is the practical effect (with regard to legal, QA, maintenance requirements, reliability/availability, etc.) of removing specific events and SSCs from the design basis? What can be changed in the plant under the rule, and how is it limited or controlled? For instance, should the rule allow for larger magnitude power uprates (not addressed by the elicitation), reductions in ECCS capability, optimizing flows for smaller breaks, changes in ultimate heat sink capacity, reduced RWST boron concentration, containment EQ temperature profile relaxation?

ISSUES (cont.)

3. Should the rule be very specific about what can be changed, or should it merely provide a process by which changes could be made?

4. What level of mitigation capability should be retained for LOCAs that formerly were in the design basis (e.g., should larger LOCAs not lead to vessel or containment failure with a high conditional probability)? How will this be shown or determined? Uncertainty in core damage and severe accident analyses will need to be addressed.

5. How should adequate defense-in-depth be assured under this rule? To what extent do the guidelines laid out in RG 1.174 need expansion?

ISSUES (cont.)

6. What limitations should be placed on cumulative increases in plant risk under this rule (and in conjunction with other plant changes made under other processes such as RG 1.174), and how should it be controlled?

7. What is the appropriate scope and quality for a PRA that is used to provide risk insights under this rule? Does this apply regardless of the extent of change to be sought, or could requirements for PRA scope and extent of NRC review vary?

8. How can or should we write the rule to cover future designs (that may not even be light water reactors)?

STAFF TECHNICAL ACTIVITIES

- Seven activities outlined in paper to:
  - determine criteria to choose maximum break size
  - identify the level of mitigation required for LOCAs beyond new maximum size
  - develop criteria, including metrics, for plant changes for acceptable effect on risk
  - develop criteria to factor total CDF into process, including accounting for less than full-scope PRAs
  - determine if additional DID criteria are needed and develop them
  - provide guidelines on how to meet RG 1.174 DID criteria
  - develop criteria (and basis) to demonstrate adequate mitigation capability
  - determine information to track for individual changes and guidelines for cumulative risk estimates

STAFF TECHNICAL ACTIVITIES (cont.)

- Ongoing RES work on thermal hydraulics, risk assessment.

- The staff has proposed delaying LOCA/LOOP rulemaking until after completing pilot reviews of exemption requests made under the BWROG's topical report on LOCA/LOOP. This would allow for lessons learned from the pilots and would make effective use of limited staff resources.

SUMMARY AND CONCLUSION

- Application of redefinition must be carefully designed so that severe accident margins provided by a robust design basis are not reduced too much
- Need to reconcile expectations about purpose of rule, changes that would be accepted, and basis
- Staff paper sent to Commission for policy direction
- Staff activities continue in several areas on technical basis development while awaiting Commission policy direction
- Feedback from committee will be considered along with Commission direction in staff's next steps for technical issue resolution and rulemaking.

Development of Passive System LOCA Frequencies for Risk-Informed Revision of 10 CFR 50.46

Robert L. Tregoning
Lee Abramson
US Nuclear Regulatory Commission

Advisory Committee on Reactor Safeguards
April 15, 2004

Objectives and Scope

- Develop generic BWR and PWR piping and non-piping passive system LOCA frequency distributions as function of break size and operating time.
  - LOCAs which initiate in unisolable portion of reactor coolant system.
  - LOCAs related to passive component aging, tempered by mitigation measures.
  - Small, medium, and large-break LOCAs examined. Large break category further subdivided to consider LOCA sizes up to complete break of largest RCS piping.
  - Time frames considered: 25 years (current day), 40 years (end of original license), and 60 years (end of life extension).
- Primary focus: frequencies associated with normal operating loads and expected transients.
- Assume that no significant changes will occur in the plant operating profiles.

Elicitation Insights: BWR & PWR Plants

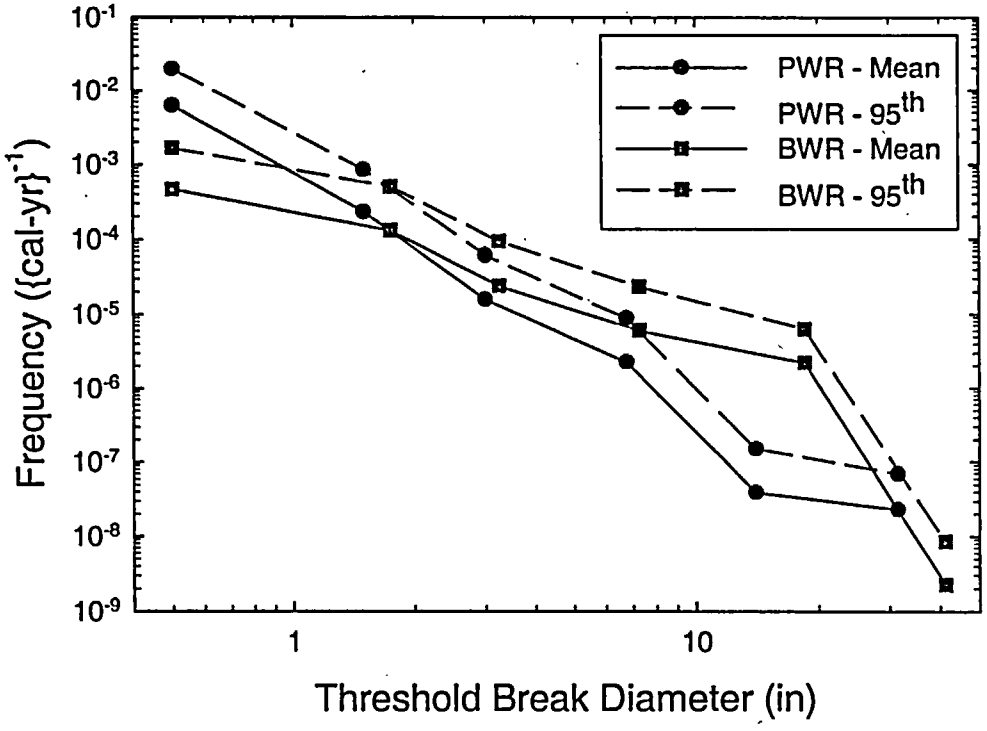
- BWR Plants
  - Thermal fatigue, intergranular stress corrosion cracking (IGSCC), mechanical fatigue, flow accelerated corrosion (FAC) identified as important degradation mechanisms.
  - Increased operating transients (e.g., water hammer) compared to PWR plants.
  - BWR community has more experience identifying and mitigating degradation due to IGSCC experience in the early 1980s.
  - BWR service experience must be carefully evaluated due to preponderance of pre-mitigation IGSCC precursor events.
- PWR Plants
  - Primary water stress corrosion cracking (PWSCC), thermal fatigue, and mechanical fatigue identified as important degradation mechanisms.
  - PWSCC concerns paramount for panel.
    - Near-term frequency increases due to PWSCC are likely before effective mitigation is developed.
    - Most panelists believe that issue will be successfully resolved within the next several years.

Elicitation Insights: Piping & Non-Piping

- Piping
  - Complete failures of smallest piping are more likely than partial failure of larger piping.
  - Aging may have greatest effect on intermediate-size piping (6 – 14″).
    - Smallest piping is governed by service history failure rates.
    - Largest piping is subject to higher quality inspections and have increased leak-before-break margin.
- Non-Piping.
  - Estimation of non-piping failure frequencies is more challenging than piping.
    - Widely varying operating requirements, design margins, materials, and inspectability.
    - Widely varying failure modes and scales.
    - Generally not same wealth of precursor information as piping.
  - Larger non-piping components (e.g., pressurizer, valve bodies, pump bodies, etc) have bigger design margin compared to piping, but decreased inspection quantity and quality.
  - Smaller non-piping components (e.g., steam generator tubes, CRDM nozzles) are expected to benefit most from improved inspection methods and mitigation programs.

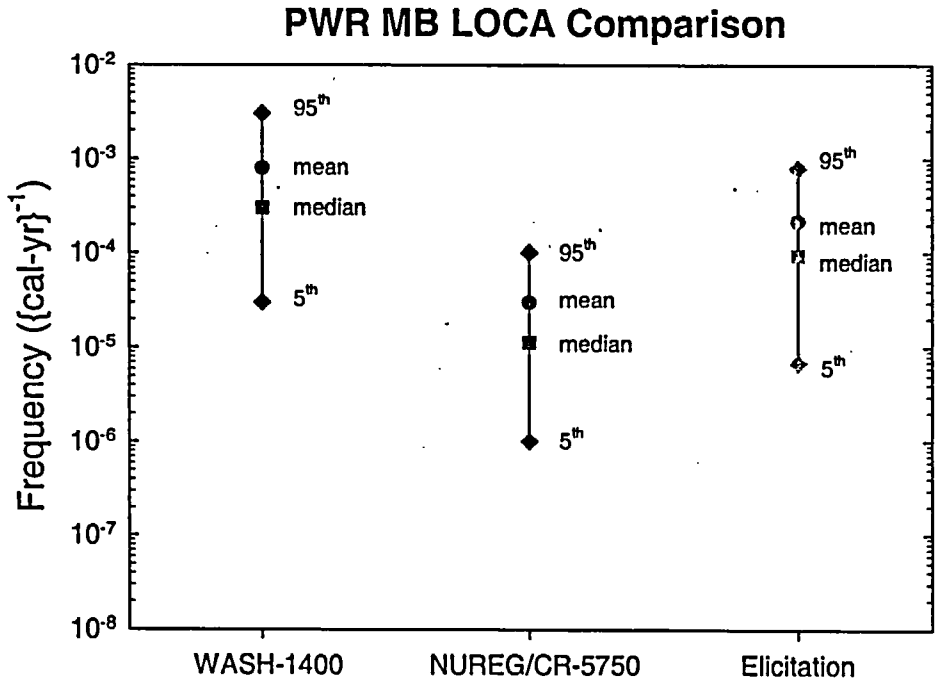
BWR and PWR Total LOCA Frequencies

- BWR.
  - Decreases are gradual with LOCA size due to IGSCC concerns.
  - Only non-piping failures contribute to largest (41″ effective diameter) breaks.
- PWR.
  - Smallest LOCA frequencies are high as due to steam generator and CRDM concerns.
  - Non-piping frequency contributions become important again for largest LOCAs.
- BWR & PWR expected frequencies are similar for effective break diameters between 1 and 10″.
- BWR and PWR ratios between means and 95th percentiles are similar.



Comparison with Prior Studies

Plant Type	LOCA Size	Current Day (25 yrs) Comparison with NUREG/CR-5750 (Current/CR-5750)
BWR	SB	0.7
	MB	2.6
	LB	0.3
PWR	SB	0.8
	MB	7.2
	LB	0.6



- Frequencies are lower than WASH-1400 estimates.
- Elicitation and NUREG/CR-5750 results are comparable.
  - PWR MB LOCA: Largest difference with NUREG/CR-5750.
  - All other differences are within a factor of 3.

Summary

- NRC used formal elicitation process to estimate generic BWR and PWR LOCA frequencies as a function of flow rate and operating time considering both piping and non-piping contributions.
- The process developed quantitative estimates for piping and non-piping base cases which were used to anchor subsequent elicitation responses.
- Panelists provided quantitative estimates supported by qualitative rationale.
  - Determined important contributing factors (piping & non-piping systems, degradation mechanisms) governing LOCA frequencies.
  - Provided the relationships between these factors and the base cases.
- Results.
  - Relatively good agreement about important factors contributing to LOCAs.
  - Large uncertainty and variability in quantifying the frequencies associated with these contributing factors.
  - Generally comparable to NUREG/CR-5750 estimates.

Non-LWR Policy Issue 6: Containment Functional Performance Requirements

April 15, 2004

Stuart D. Rubin, NRC/RES

Pre-decisional

Briefing Objective

- Discuss the current status and future plans to develop policy options for functional performance requirements and criteria for non-LWR containment in response to the SRM on SECY-03-0047

- To obtain verbal feedback from the ACRS on the preliminary options, including their advantages and disadvantages

Policy Decision Background

SECY-03-0047, "Policy Issues Related to Licensing Non-Light Water Reactor Designs" included proposed options and recommended positions sent to the Commission to resolve the non-LWR containment policy issue which had emerged from the Pebble Bed Modular Reactor (PBMR) and the Gas Turbine-Modular Helium Reactor (GT-MHR) pre-application reviews:

Proposed Options:

- Require a low leakage and is pressure retaining containment building.

- Allow a plant to be licensed without a containment building capable of retaining pressure, provided certain performance criteria are met.

Recommendation:

- Approve the use of functional performance requirements to determine the acceptability of non-LWR containment building designs.

- If approved, develop the functional performance requirements.

Policy Decision Background (Cont.)

The Staff Requirements Memorandum (SRM) for SECY-03-0047:

Disapproved the development of functional performance requirements to determine the acceptability of a non-LWR containment building design, because of insufficient information to prejudge the best option. The staff was directed to:

- Develop options for non-LWR containment functional performance requirements and criteria
- Account for such features as core, fuel and cooling system design
- Interact with industry experts and other stakeholders to develop the options
- Submit the options and recommendations to the Commission

Schedule of Completed Milestones

• SRM issued for SECY-03-0047	Jun 2003
• Staff R&D initiated on containment functions and options	Sep 2003
• Public meeting on AR framework and non-LWR containment issue	Nov 2003
• Public meeting on non-LWR containment issue	Jan 2004
• ACRS full committee meeting to discuss status and SECY	**Apr 2004**
• Public meeting on framework and containment issue	~Aug 2004
• Defense-in-depth description for framework developed	~Aug 2004
• Public meeting on draft final containment options	~Oct 2004
• ACRS full committee meeting on proposed final options	~Nov 2004
• SECY on framework, final containment options/recommendations	~Dec 2004

Pre-decisional

Generic Commission Policy Guidance

- Policy on Advanced Nuclear Power Plant Regulation
- Reactor Safety Goals Policy
- Severe Accident Policy
- Use of Probabilistic Risk Assessment Methods in Nuclear Regulatory Activities
- Commission White Paper on Risk-Informed and Performance-Based Regulation

Non-LWR and Containment-Specific Commission Policy Guidance

- A probabilistic approach for selecting events in the (containment) design basis may be increased.
- Scenario-specific source terms with deterministic engineering judgement to bound uncertainties may be used (to assess containment design adequacy).
- A risk-informed, technology neutral description of defense-in-depth for nuclear power plants should be developed, including its objectives scope and elements.
- Containment performance requirements should not discourage accident prevention.
- For HTGR containment designs, consider a loss of RCPB with air ingress leading to severe graphite oxidation and fuel damage.

Relation to New Reactor Framework

To the extent possible, containment functional performance requirements and criteria should conform to the new reactor framework:

- Technology-neutral
- Risk-informed
- Performance-based
- Defense-in-depth description

Commission approved requirements and criteria will provide the basis for developing generic regulations and/or making design-specific regulatory decisions for non-LWR licensing.

NRC and Industry Documents Reviewed

- NRC LWR regulations
- Non-LWR pre-applicant design descriptions and safety analysis reports
- NRC non-LWR preliminary safety evaluation reports
- U.S. DOE Generation IV reactor design information
- Foreign non-LWR design and safety analysis information

Non-LWR Containment Building System: Potential Safety Functional Areas

- *Reduce radioactivity release to the environment*
- Prevent or limit potential core damage (e.g., HTGR graphite core chemical attack, LMR core uncovery)
- Support accident heat removal (to prevent vital equipment from exceeding design/safety limits)
- Protect vital equipment (e.g., shutdown, heat removal, RCPB) from natural phenomena, internal high energy sources
- Protect on-site workers from radiation
- Provide physical protection (i.e., security) for vital equipment

Non-LWR Containment Building System Designs
(*Reduce Radioactivity Release to the Environment*)

- Advanced High Temperature Gas Cooled Reactors (HTGRs):
  - MHTGR, GT-MHR, PBMR, VHTGR - vented, low pressure[1]
  - HTR 10 (test reactor) - vented, low pressure
  - HTTR (test reactor) - leak-tight, pressure-retaining
  - GTHTR300 - "double confinement"
- Advanced Small Liquid Metal Reactors (SLMRs):
  - 4S Reactor - leak-tight, pressure-retaining
  - STAR, SSTAR - leak-tight, pressure-retaining
- Advanced Molten Salt Reactors (MSRs):
  - Generation IV - TBD

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[1] i.e., "confinement"

Non-LWR Containment Functional Area:
Reduce Radioactivity Release to the Environment

Preliminary Options:

1: Meets onsite and offsite radionuclide dose acceptance criteria for the event categories[2]

2: Meets onsite and offsite radionuclide dose acceptance criteria for the event categories with lower probability[3] events included in the design-basis

3: Meets onsite and offsite radionuclide dose acceptance criteria for the event categories with a reserve capacity to reduce releases, including timely establishment of a low leakage barrier

4: Meets onsite and offsite radionuclide dose acceptance criteria for the event categories with an essentially leak-tight barrier against radioactivity release to the environment

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[2] e.g., Events or event sequences with a probability that traditionally does not lead to severe core damage

[3] e.g., Events or event sequences with a probability that is traditionally associated with severe core damage

Evaluation Metrics for Potential Options

Evaluation metrics:

- Would dose criteria be met?
- Would safety functions, systems be adversely impacted?
- Would accident prevention, innovation be discouraged?
- Would selected core damage accidents be prevented/limited?
- Would it compensate for uncertainties/unknowns?
- Is it performance-based, risk-informed?
- Would the designer have flexibility?

Other Considerations for Potential Options

Other considerations:

- Is it technology-neutral?
- Is it consistent with the approach considered by designers?
- Are any increased costs commensurate with safety benefits?
- Would it support public confidence?

Preliminary Option Descriptions and Evaluations

(Reduce Radioactivity Release to the Environment)

Option 1: Meets onsite and offsite dose acceptance criteria for the event categories

Description:

- Probabilistic approach plus deterministic engineering judgement used to select (containment) design-basis events (**e.g.,DBEs $\geq 10^{-6}$/yr**)
- Mechanistic source term analysis with uncertainties for dose assessment; must meet dose criteria for event categories
- Fuel and SSC performance and fission product transport are well-understood and supported by adequate R&D programs; fuel quality will need to be maintained over the life of plant.
- Staff recommend enhancements to address potential areas of high uncertainty are subject to Commission endorsement for implementation

Option 1: Meets onsite and offsite dose acceptance criteria for the event categories

Evaluation:

- Dose criteria would be met; safety functions are not adversely impacted
- Would not discourage accident prevention incentive or innovation
- Does not specifically address prevention of selected "core damage" accidents
- Margins, time factor, enhancements compensate for uncertainties/unknowns
- Performance-based and risk-informed approach
- Designer would have flexibility for design decisions

Other Considerations:

- Technology-neutral
- Consistent with non-LWR designer approach
- Would not directly result in features that increase costs
- The public may view as not providing sufficient DID for unknowns
- Might result in: VLPC for HTGRs and VHTRs, low leakage containment for LMRs and MSRs

Option 2: Meets onsite and offsite dose acceptance criteria for the event categories with lower probability events included in the design-basis

Description:

- Probabilistic approach plus deterministic engineering judgement used to select (containment) design-basis events (**e.g., DBEs $\geq 10^{-8}$/yr**)
- Mechanistic source term analysis with uncertainties for dose assessment; must meet dose criteria for event categories
- Fuel and SSC performance and fission product transport are well-understood and supported by adequate R&D programs; fuel quality will need to be maintained over the life of plant
- Staff recommend enhancements to address potential areas of high uncertainty are subject to Commission endorsement for implementation

Option 2: Meets onsite and offsite dose acceptance criteria for the event categories with lower probability events included in the design-basis

Evaluation:

- Dose criteria would be met; safety functions are not adversely impacted
- Would not discourage accident prevention incentive or innovation
- Does not specifically address prevention of selected "core damage" accidents
- Lower probability events may result in design changes or show margins to compensate for uncertainties/unknowns
- Performance-based and risk-informed approach
- Designer would retain flexibility for design decisions

Other Considerations:

- Technology-neutral
- Modifies containment design approach to include lower probability events
- Might result in features that would increase costs
- The public may view as not providing sufficient DID, but more than Option 1
- Might result in: VLPC for HTGRs and VHTRs, low leakage containment for LMRs and MSRs

Option 3: Meets onsite and offsite dose acceptance criteria for the event categories with a reserve capacity to reduce releases including timely establishment of a low leakage barrier

Description:

- Probabilistic approach plus deterministic engineering judgement used to select (containment) design-basis events (e.g., DBEs $\geq 10^{-6}$/yr)
- Mechanistic source term analysis with uncertainties for dose assessment; must meet dose criteria for event categories
- Fuel and SSC performance and fission product transport are well-understood and supported by adequate R&D programs; fuel quality will need to be maintained over the life of plant
- Containment building system design must have a reserve capability to meet onsite/offsite dose criteria for postulated bounding containment source terms and have a timely capability to be low leakage at low pressure.
- Performance criteria would be used to address potential areas of uncertainty and completeness, diminishing the need for further enhancements

Option 3: Meets onsite/offsite dose acceptance criteria for the event categories with a reserve capacity to reduce releases. including timely establishment of a low leakage barrier

Evaluation:

- Dose criteria would be met; safety functions are not adversely impacted
- Could discourage accident prevention incentive and innovation
- For HTGRs would provided DID to prevent/limit "core damage" due to air ingress
- Would provide additional margin to compensate for uncertainties/unknowns
- Prescriptive requirement; not performance-based or risk-informed
- Prescriptive requirement reduces flexibility for design & response decisions

Other Considerations:

- Not technology neutral
- Not consistent with selected non-LWR containment design (i.e., HTGRs)
- Safety benefit may not be commensurate with additional costs (i.e., HTGRs)
- The public would likely view as providing more DID than Option 1 or 2
- Would result in a re-sealable VLPC for HTGRs and VHTGRs

Option 4: Meets onsite and offsite radionuclide dose acceptance criteria for the event categories with an essentially leak-tight barrier against radioactivity release to the environment

Description:

- Probabilistic approach plus deterministic engineering judgement used to select (containment) design-basis events (e.g., DBEs $\geq 10^{-5}$/yr)
- Mechanistic source term analysis with uncertainties for dose assessment; must meet dose criteria for event categories
- Fuel and SSC performance and fission product transport are well-understood and supported by adequate R&D programs; fuel quality will need to be maintained over the life of plant
- Containment building system design provides a leak-tight barrier against radioactivity release
- Performance criteria explicitly address potential areas of high uncertainty and completeness making the need for further enhancements unlikely

Option 4: Meets onsite and offsite radionuclide dose acceptance criteria for the event categories with an essentially leak-tight barrier against radioactivity release to the environment

Evaluation:

- Dose criteria would be met
- Safety functions could be adversely impacted (i.e., HTGRs)
- Would discourage accident prevention incentive and innovation
- Would increase DID to prevent/limit HTGR air ingress"core damage"
- Would increase margin to compensate for uncertainties/unknowns
- Would preclude performance-based, risk-informed approach
- Would reduce flexibility for design decisions and accident response options

Other Considerations:

- Technology-neutral
- Not consistent with containment design approach for HTGRs
- Safety benefits may not be commensurate with increased costs (i.e., HTGRs)
- Public would likely view as providing enhanced DID compared to other options
- Would result in a conventional containment for HTGRs, LMRs and MSRs

Schedule of Future Milestones

• SRM issued for SECY-03-0047	Jun 2003
• Staff R&D begun on containment functions and options	Sep 2003
• Public meeting on AR Framework and non-LWR containment issue	Nov 2003
• Public meeting on non-LWR containment issue	Jan 2004
• ACRS full committee meeting to discuss containment and SECY	Apr 2004
• Public meeting on framework and containment issue	~Aug 2004
• Defense-in-depth description for framework developed	~Aug 2004
• Public meeting on draft final containment options	~Oct 2004
• ACRS full committee meeting on final options and framework	**~Nov 2004**
• SECY on framework, final containment options/recommendations	~Dec 2004

Pre-decisional

Summary

- Preliminary options for reducing radioactivity release to the environment have been developed and evaluated for non-LWR containment building systems.

- The options for the reducing radioactivity release to the environment will be further refined and evaluated with stakeholder interactions and the defense-in-depth description.

- As appropriate, performance options for the other functional areas will be developed and evaluated.

- Final options and recommendations will be provided by the end of CY 2004 for Commission decision.

Proposed SECY Paper-Response to June 26, 2003 SRM on Non-LWR Policy Issues

Presentation to:

Advisory Committee on Reactor Safeguards

Presented by:

John Flack, Mary Drouin, Stu Rubin, Tom King

April 15, 2004

PRESENTATION OBJECTIVE

- Discuss proposed response to the June 26, 2003 SRM
- Obtain letter from Committee approving staff recommendations

BACKGROUND

- SECY-03-0047 provided 7 policy issues associated with non-LWR licensing for Commission guidance:
  1) Expectations for Safety
  2) Defense-in-Depth
  3) Use of International Consensus Codes & Standards
  4) Probabilistic Licensing Basis
  5) Scenario Specific Licensing Source Term
  6) Containment vs. Confinement
  7) Emergency Preparedness

- June 26, 2003 SRM
  - Approved staff recommendations on Issues 2, 4, 5, and 7
  - Disapproved staff recommendation on Issues 3 and 6
  - Provided direction on Issues 1 and 6

CURRENT SECY

- SECY- responds to Commission direction on Issues 1 and 6
- Attachment 1 - Provides a summary and status of effort to develop a framework for future plant licensing and a description of defense-in-depth
- Attachment 2 - Summarizes the basis for recommendation on integrated risk issue
- Attachment 3 - Provides a discussion and status of non-LWR containment functional performance requirements.
- Attachment 4 - Summarizes Workshop and key points
- Schedule for SECY
  - SECY due to EDO – 4/23/04

OVERVIEW OF PROPOSED SECY

- SECY addresses the following Commission direction in their 6/26/03 SRM:
  - Issue 1 - provide options for and impacts of requiring modular reactor designs to consider integrated risk from the use of multiple reactor modules
  - Issue 6 - develop options for containment functional performance requirements and criteria , provide options and recommendations.

- SECY also intended to:
  - Provide status summary the effort to develop a risk-informed framework and defense-in-depth description
  - Inform Commission of relevance of integrated risk issue to the early site permit reviews

OVERVIEW OF PROPOSED SECY (cont.)

- SECY recommends the Commission:
  - Approve staff recommendation on the treatment of integrated risk for modular reactors
  - Approve the integration of options for containment functional performance requirements with policy recommendations on framework.

OPTIONS ON INTEGRATED RISK

INTEGRATED RISK

- Attachment 2 of SECY
- Issue:
  - should the risk from modular reactors be assessed on a per reactor module or on a per plant (group of modules) basis?
- Options developed based on three factors
  - Risk guidelines for accident prevention and accident mitigation
  - Number of modules at each site
  - Size (MWt) of each module
- Three options identified

INTEGRATED RISK (cont'd)

- Option 1: No consideration of integrated (cumulative) risk
  - Each module has to meet the risk guidelines for both accident prevention and accident mitigation (consistent with current practice)
  - Number of modules is not considered
  - MWt of each module not considered
  - Potentially underestimating risk to the public
    - population around a site is exposed to the risk from everything on the site

INTEGRATED RISK (cont'd)

- Option 2: Consideration of integrated risk (frequency only)
  - The risk from all the modules combined has to meet the guidelines for accident prevention and accident mitigation AND each module has to meet the risk guidelines for both accident prevention and accident mitigation equally
  - Number of modules at site considered
  - MWt of module not considered
  - Not consistent with current practice
  - Recognizes accident prevention is important, regardless of MWt power
  - Likely conservative for accident mitigation (does not allow credit for reactor MWt power)

INTEGRATED RISK (cont'd)

- Option 3: Consideration of integrated risk frequency and reactor power
  - The risk guideline for accident prevention from all modules has to be met
  - The risk guideline for accident mitigation (LERF):
    - Each module has to meet
    - Modules combined have to meet
  - Number of modules at site considered
  - MWt of modules considered
  - Not consistent with current practice
  - Recognizes accident prevention is important, regardless of reactor MWt power
  - More realistic in assessing risk (gives credit for reactor MWt power in accident mitigation)

INTEGRATED RISK (cont'd)

- Recommendation: Option 3
- Implementation:
  - guidance will need to be developed on implementation
  - consistent with approach currently being taken by modular reactor designers
- This issue is important to the current ESP reviews

OPTION ON CONTAINMENT VERSUS CONFINEMENT

SUMMARY

NEXT STEPS

- Complete draft framework
- Meet with ACRS sub-committee (July)
- Public workshop on framework and containment options (August)
- Meet with ACRS full-committee, letter on framework and containment recommendations (November/December)
- Paper to Commission on framework and containment recommendations (December/January)

IN CONCLUSION

- ACRS in agreement with staff and prepared to send letter supporting staff recommendations